COLLEGE OF ENGINEERING AND TECHNOLOGY,
BAMBHORI POST BOX NO. 94, JALGAON – 425001. (M.S.)

(With NBA Accredited Programmes)

Website : www.sscoetjalgaon.ac.in Email : sscoetjal@gmail.com

Mandatory Disclosure

Part-I

August 2016

Shram Sadhana Bombay Trust's
COLLEGE OF ENGINEERING AND TECHNOLOGY
BAMBHORI, POST BOX NO. 94, JALGAON – 425001. (M.S.)
Included under section 2 (f) & 12 (B) of the UGC Act, 1956
ISO 9001: 2008 certified

BAMBHORI,JALGAON
ISO 9001:2008

Website- www.sscoetjalgaon.ac.in
Email: sscoetjal@gmail.com
Principal: Dr. K.S.Wani
M. Tech, DBM, Ph.D.

Phone No. (0257) 2258393
Fax No. (0257) 2258392

Ref. No. COET/ AICTE/MD/ / 16 **Date: 20/08/2016**

C E R T I F I C A T E

Certified that all enclosures contained in PART-I, PART-II & PART-III bearing page no. **01** to page no. **2035** are pertaining to our institution which are being submitted in two separate above mentioned bound booklets/box file of Mandatory Disclosure. All xerox copies may be treated as original.

PRINCIPAL

SSBT's College of Engineering & Technology, Bambhori, Jalgaon.

Mandatory Disclosure

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MANDATORY DISCLOSURE

Mandatory Disclosure by Institutions running AICTE approved Engineering/Technology/Pharmacy programmes to be included in their respective Information Brochure, displayed on their website and to be submitted to AICTE every year latest by 30th April together with its URL

The following information is to be given in the Information Brochure besides being hosted on the Institution's official Website.

"The information has been provided by the concerned institution and the onus of authenticity lies with the institution and not on AICTE."

I. NAME OF THE INSTITUTION

Name	**SSBT's College of Engineering & Technology, Bambhori, Jalgaon.**	
Address	Post Box No. 94 , Jalgaon (Maharashtra State)	
Pin Code	425 001	
Phone No.	(0257) 2258393	
Fax No.	(0257) 2258392	
Web site	www.sscoetjalgaon.ac.in	E-Mail: sscoetjal@gmail.com

II. NAME & ADDRESS OF THE DIRECTOR

Name	**Dr. Kishor Sopan Wani**
Designation	**Principal**
Address	31/2, Annapurna, Gandharva Colony, Jalgaon-425001
STD Code With Phone No.	0257 – 2252989 (R)
Fax No.	0257- 2258392 (O)
E-mail	wani.kishor@gmail.com

III. NAME OF THE AFFILIATING UNIVERSITY

Name	**North Maharashtra University, Jalgaon**		
Address	**Umavi Nagar, Post Box No.80, Jalgaon Dist. Jalgaon** **Pine Code :- 425 001.**		
Phone No.	**(0257) -2258428, 429**		
Fax No.	**(0257) 2258403, 2258406**	**E-Mail**	info@nmu.ac.in ,registrar@nmu.ac.in
		Web site	**www.nmu.ac.in**

IV] GOVERNANCE

* **Members of the Board and their brief background.**

Shram Sadhana Bombay Trust (Phone No. 022-26435608/24950888) is the promoting body of the College of Engineering and Technology, Bambhori, Jalgaon. The trust is a charitable organization registered with Charity Commissioner Bombay vide registration number E-6942 dated 12 Oct. 1978 and status of registration is current and valid. The trust strives to enhance human productivity through various welfare measures and is a leading light in educational research.

Brief background of the promoters are as follows :-

1.	Shri. Rajendrasing D. Shekhawat	Managing Trustee	Ex-M.L.A. .
2.	Mrs. Manjari Shekhawat	Trustee	Social Worker
3.	Shrimati Lata Karamsot	Trustee	Social Worker.

* Shram Sadhana Bombay Trust has entrusted the responsibility of running the college to the Board of Governors who are the apex decision making body. The members of the Board are as under:-

1.	Dr. D. R. Shekhawat	Chairman	Educationist
2.	Shri. Rajendrasing D. Shekhawat	Member	Ex-M.L.A.
3.	Shri. Jayesh Rathore	Member	Technocrat
4.	Shrimati Jyoti Rathore	Member	Engineer & Social Worker.
5.	Dr. K.S. Wani	Principal & Ex-officio Member Secretary	
6.	Shri. S.R. Girase	Member	Asst. Registrar

* **Members of Academic Advisory Body.**

Academic Advisory Body is constituted of following members :-

1.	Dr. Kishor S. Wani	Chairman	Principal
2.	Dr. R.H. Gupta	Member	Academic planning
3.	Dr. M. Hussain	Member	Director, R.& D.
4.	Dr. S.R. Suralkar	Member	Director, Administration
5.	Dr. S.P. Shekhawat	Member	Director, Academics
6.	All Heads of Departments	Members	

*** Frequency of Board Meeting and Academic advisory Body.**

Governing Body meets once in six months and gives broad direction keeping in view the vision of the Trust which is to provide and promote an affordable, accessible quality higher education with emphasis on technology development.

Academic Advisory Body meets once in a quarter or earlier to check compliance of direction given by Governing Body and steer and resolve academic issues which come up during academic session.

* **Organisational Chart and Processes**

The style of management is integrative, participative and consultative at every decision making stage. Duties and responsibilities of various functionaries are well laid down. The organizational chart clearly depicts the flow of authority, responsibility and accountability. Hence the decision making process is transparent.

* **Nature and Involvement of faculty and Students in Academic Affairs and Improvements.**

Extent of faculty involvement in academic affairs is governed at three levels. Principal meets all Heads of Department every month to take stock of academic progress, course coverage activities. A more detailed interaction of faculty is held fortnightly under direction of Director

Academics. Heads of Department are on daily contact with respective faculty, attend their class, offer guidance on teaching skill and methodology beside weekly meeting with all faculties on weekly academic performance, identifying deficiencies and suggesting means to improve upon the same.

Every student gives feedback on all relevant subjects with regard to syllabi, course content, degree of difficulty, if any, in assimilation of the subject and suggestion on improvement. Students have direct access to any faculty, heads of department, coordinator academics and Principal to make suggestion on academic subject.

* **Mechanism /Norms & Procedure for Democratic & Good Governance.**

As mentioned earlier, Apex decision making body is the Board of Governance who decides and give broad direction. Governing Body has nominated local committees i.e.

Local Management cum Finance Committee, Hostel Committee, Grievance Redressal Committee and Academic Advisory Committee which meet once in a quarter or earlier to check compliance of direction given by Governing Body. Day to day operation of the college is managed by Principal and other appointed staff. Various Local Management Committees are well represented by both teaching and non teaching staff who effectively participate in the respective proceedings and help in observance of democratic and good governance practice of the college.

* **Student feedback on Institutional Governance/Faculty Performance**.

A committee of three Heads of Department under guidance of Director, Academics and Principal meets students of all classes in each department and takes feedback on teaching methodology and performance of faculties as perceived by them. This process takes place twice in a semester. The feedback is scrutinized and analyzed with a view to improve faculty performance.

* **Grievance Redressal Mechanism for Faculty, Staff and Students**.

Transparent management and administrative policy is by itself aids the redressal process in the college. The organizational chart gives out clear flow of authority and responsibility on both academic and administrative front. Faculty, Staff and Students are thus aware of the various processes and policies and can approach any functionary with any supposed difficulty which need to be resolved.

There are suggestion boxes placed at vantage points for all personnel to drop their ideas in confidence which are looked into with all seriousness.

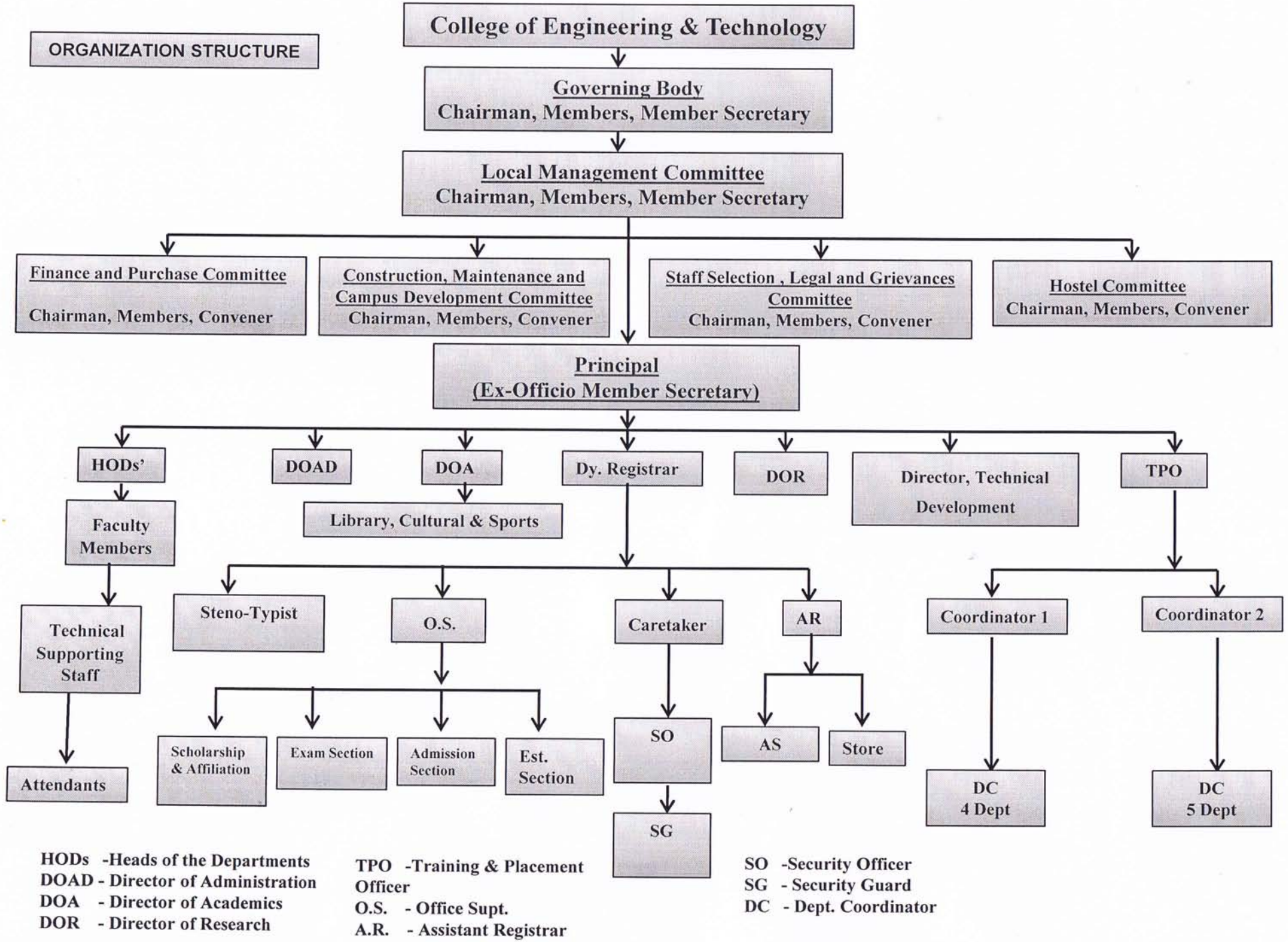
* **Grievance Redressal Mechanism as per affiliating University.**

The vigilance committee is formed and which consists of Chairman

(Member of LMC). All HODs, Rectors and Students representative.

Also grievance cell is functioning in the college. The students grievances are looked into by the H.O.D. Concerned, Principal and if needed, they are referred to the management for appropriate decision. For Hostel the students approach the Rectors (Girls' Hostel and Boys' Hostel) and then they are referred to the Principal for appropriate decision.

ORGANIZATION STRUCTURE



HODs -Heads of the Departments
DOAD - Director of Administration
DOA - Director of Academics
DOR - Director of Research

TPO -Training & Placement Officer
O.S. - Office Supt.
A.R. - Assistant Registrar

SO -Security Officer
SG - Security Guard
DC - Dept. Coordinator

V. PROGRAMMES: ENGINEERING & TECHNOLOGY

A) Name of the Programmes approved by the AICTE 2015-2016

Sr.	Course Name	Number of seats	Duration	Approved by AICTE
	UG Courses			
1	Civil Engineering	120	4 Years	Yes
2	Chemical Engineering	30	4 Years	Yes
3	Computer Engineering	120	4 Years	Yes
4	Mechanical Engineering	120	4 Years	Yes
5	Electrical Engg.	60	4 Years	Yes
6	Electronics and Tele-comm. Engg.	120	4 Years	Yes
7	Information Technology	60	4 Years	Yes
8	Bio-Technology	30	4 Years	Yes
	Total	**660**		
	PG Courses			
1	ME Civil (Environmental Engg.)	18	2 Years	Yes
2	ME Mechanical (Machine Design)	18	2 Years	Yes
3	ME E&TC (Digital Electronics)	18	2 Years	Yes
4	ME Computer Science & Engg.	18	2 Years	Yes
5	ME Electrical (Electrical Power Systems)	18	2 Years	Yes
	Total	**90**		
	Management course			
	MBA	60	2 Years	Yes
	Total	**60**		
	Total Intake	**810**		

B) Name of the Programmes Accredited by the National Board of Accreditation (NBA), New Delhi (up to 01/07/2016)

1	Civil Engineering	120	Yes	Accredited
2	Chemical Engineering	30	Yes	Accredited
3	Biotechnology	30	Yes	Accredited
4	Electronics and Telecommunication Engg.	120	Yes	Accredited

C) Cut off mark/rank for admission during the last three years

Year 2013-2014

Sr.	Branch	Sanction Intake	Duration	Cut off Mark/rank	Tuition Fee
1	Chemical Engineering	30	4 years	42.66	Rs. 61111
2	Civil Engineering	120	4 years	40.00	Rs. 61111
3	Computer Engineering	120	4 years	40.66	Rs. 61111
4	Mechanical Engineering	120	4 years	40.33	Rs. 61111
5	Electrical Engg.	60	4 years	40.33	Rs. 61111
6	E & TC Engg.	120	4 years	40.33	Rs. 61111
7	Information Technology	60	4 years	41.33	Rs. 61111
8	Bio-Technology	30	4 years	40.00	Rs. 61111
	PG Courses				Rs. 61111
1	ME Civil (Environmental Engg.)	18	2 years	58.00	Rs. 61111
2	ME Mechanical (Machine Design)	18	2 years	61.00	Rs. 61111
3	ME Computer Sci. & Engg.	18	2 years	60.00	Rs. 61111
4	ME Elextronics & Tele.(Digital Electronics)	18	2 years	60.00	Rs. 61111
5	MBA	60	2 years	45.00	Rs. 61111

Year 2014-2015

Sr.	Branch	Sanction Intake	Duration	Cut off Mark/rank	Tuition Fee
1	Chemical Engineering	30	4 years	40.00	Rs.63736
2	Civil Engineering	120	4 years	40.33	Rs. 63736
3	Computer Engineering	120	4 years	40.33	Rs. 63736
4	Mechanical Engineering	120	4 years	41.00	Rs. 63736
5	Electrical Engg.	60	4 years	40.33	Rs. 63736
6	E & TC Engg.	120	4 years	40.33	Rs. 63736
7	Information Technology	60	4 years	41.66	Rs. 63736
8	Bio-Technology	30	4 years	42.00	Rs. 63736

	PG Courses				
1	ME Civil (Environmental Engg.)	18	2 years	52.54	Rs. 63736
2	ME Mechanical (Machine Design)	18	2 years	61.00	Rs. 63736
3	ME E&TC (Digital Electronics)	18	2 years	58.00	Rs. 63736
4	ME Computer Science & Engg.	18	2 years	61.42	Rs. 63736
3	MBA	60	2 years	50.00	Rs. 63736

Year 2015-2016

Sr.	Branch	Sanction Intake	Duration	Cut off Mark/rank	Tuition Fee
1	Chemical Engineering	30	4 years	15.09	Rs. 64036
2	Civil Engineering	120	4 years	18.51	Rs. 64036
3	Computer Engineering	120	4 years	15.17	Rs. 64036
4	Mechanical Engineering	120	4 years	20.68	Rs. 64036
5	Electrical Engg.	60	4 years	15.77	Rs. 64036
6	E & TC Engg.	120	4 years	13.88	Rs. 64036
7	Information Technology	60	4 years	28.23	Rs. 64036
8	Bio-Technology	30	4 years	08.55	Rs. 64036
	PG Courses				Rs. 64036
1	ME Civil (Environmental Engg.)	18	2 years		Rs. 64036
2	ME Mechanical (Machine Design)	18	2 years		Rs. 64036
3	ME E&TC (Digital Electronics)	18	2 years		Rs. 64036
4	ME Computer Science & Engg.	18	2 years		Rs. 64036
3	MBA	60	2 years		Rs. 64036

D) Placement Facilities

a) **Training & Placement Cell:** SSBT's C.O.E.T., Bambhori, Jalgaon has an independent T & P Cell devoted to cater to the needs of organizations in conducting campus interviews for placements. It is headed by Training & Placement Officer & Departmental coordinators lead a team of placement representatives from various courses of study assist the Cell.

The cell has the following facilities:

i) Separate Internet connection, computers, laser printer and Scanner for office automation.
ii) Separate lounge for industrialist and visitors.
iii) Newspaper, magazines, etc.
iv) All audio/video facilities for presentations, written test, group discussions and interviews.

b) T & P Activities:

i) Campus Interviews
ii) Industrial Training
iii) Industrial Visits (Students & TPC members)
iv) Expert Lectures
v) Industrial Meet
vi) Job-Oriented Courses
vii) Deputation of faculty members to various training programs.
viii) Mock competitive exams, Interviews, Group Discussions, etc.
ix) Personality development programme.
x) Alumni meet.
xi) Entrepreneurship development programme.

c) Campus placement in last three years with minimum salary, maximum salary and average salary

BRANCH/YEAR	Chemical	Biotech	Civil	Computer	Electrical	E&TC	IT	Mech	MBA	Other	Total
2012-13	00	02	27	93	06	35	34	19	26		242
2013-14	00	00	04	20	03	06	04	09	26		72
2014-15	07	08	03	39	07	38	20	22	02	24	170
2015-16 (Till Date 21/06/16)	17	05	08	36	22	66	17	06	24	12	213

3. MINIMUM SALARY: Rs. 90,000/-

4. MAXIMUM SALARY: Rs. 6,34,000/-

5. AVERAGE SALARY: Rs. 2,50,000/-

- Name and duration of programme(s) having affiliation/collaboration with Foreign University(s)/Institution(s) and being run in the same Campus along with status of their AICTE approval. If there is foreign collaboration, give the following details: Details of the Foreign Institution/University:

NA

- For each Collaborative/affiliated Programme give the following:

NA

- Whether the Collaborative Programme is approved by AICTE? If not whether the Domestic/Foreign Institution has applied to AICTE for approval as required under notification no. 37-3/Legal/2005 dated 16th May, 2005.

NA

Discipline wise existing faculty for the Institution (Please give Department wise information of Existing faculty members in all the course (s) on the date of submitting the application.9 (2015-16) **Annexure III (A)**

Name of the Course	Sr N0	Name (s) Of the Teaching Faculty	Designation (Lecturer) Asstt. Professor	Qualifications with field of Specialization.			Date of Birth	Experience a) Teaching b) Industry c) Research			Date of joining the institute	Pan. No.	Pf. No MH5 0148/	Basic Pay +AGP& Gross Salary pay as on 01.05.2016
				UG	PG	Ph.D.		A	B	C				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Principal														
	01	Dr.K.S.Wani	Principal	B.Sc. Tech. Chem.	.M. Tech Chem.Tech	Biotechnology	24.09.59	18	--	--	14.07.97	AACPW 5827F	340	B=64110/- G=124809/-
A) Existing Faculty														
PG Level **Civil Engg.**	01	Dr. M. Husain	Prof. & HOD	Civil Engg	Environmental Engg.	Solar Energy	05.12.69	19	--	--	15.07.96	ABCPH 4558D	305	B=64110/- G=115398/-
	02	P.A. Shirule	Associate Prof.	Civil Engg.	Environmental Engg.	--	07.06.73	15	01	--	03.07.00	AAATS 0310D	378	B=52330/- G=75734/-
UG Level **Civil Engg.**	01	Dr.S L Patil	Professor	B.Sc. App. Geology	M.Sc. App. Geology	Geology	1-1-1962	27	--	--	01.07.88	AAYPP 8955O	17	B=57920/- G=104256/-
	02	S B Pawar	Associate Prof.	Civil Engg.	Construction Management	_	5-10-66	24	1.6	--	15.01.91	ABAPP 3094Q	46	B=61040/- G=100716/-
	03	Ms.Sonali B. Patil	Asstt.Prof.	Civil Engg.	Environmental Engg.	--	28.11.79	7	--	--	01.02.08	BCCPP 7743J	621	B=25400/- G=43688/-
	04	Ms.Jyoti R. Mali	Asstt.Prof.	Civil Engg.	Environmental Engg.	--	23/04/71	4	--	--	01.07.11	BRMPM 2203F	698	B=24310/- G=38410/-
	05	J.N.Kale	Asstt. Prof.	Civil Engg.	Const Tech.&Mana	_	25/12/65	6	18	--	01.01.09	AQKPK 8134B	658	B=31490/- G=48180/-

First Year Engg.	06	F.I. Chavan	Asstt. Prof.	Civil Engg.	Environmental Engg.	--	13.05.74	16.5	--	--	01.09.98	AFXPC 4580K	418	B=36110/- G=62109/-
	07	Pankaj Ramdas Punase	Asstt. Prof.	Civil Engg.	Structures.	--	05.08.91	1.11	--	--	10.03.16	CJVPP1943 H	940	B=22248/- G=33372/-
	08	Basweshwar S.Jirwankar	Asstt. Prof.	Civil Engg.	TE&M	--	11.04.90	1.4	--	--	10.03.16	AUIPJ1748A	956	B=21600/- G=32400/-
	09	Ravinder Ram Murti Kohli	Asstt. Prof.	Civil Engg.	Environmental	--	30.07.70	8	--	--	09.05.16	ARWPK143 1E	957	B=21600/- G=38400/-
	10	Durgesh Gulabsing Pardeshi	Lecturer	Civil Engg.	--	--	04.01.89	3.5	--	--	20.08.15	CBJPP 2969M	782	30000 Cons.
	11	Ms.Priyanka A. Nehete	Lecturer	Civil Engg.	--	--	03.02.91	1.6	--	--	15.07.15	AWTPN132 5N	915	24000Cons.
	12	Ketan Satish Mahajan	Lecturer	Civil Engg.	--	--	05.02.92	0.6	0.11	--	15.07.15	COZPM9585 H	912	24000Cons.
	13	Ms. Swati P.Yeshirao	Lecturer	Civil Engg.	--	--	01.09.93	0.6	--	--	13.07.15		913	24000Cons.
	14	Kuldip Rajendra Patil	Lecturer	Civil Engg.	--	--	12.09.93	0.6	--	--	24.07.15	CUQPP5186 G	917	24000Cons.
	15	Tushar R. Rajput	Lecturer	Civil Engg.	--	--	17.10.93	0.6	--	--	25.07.15	BITPR0114 C	916	24000Cons.
	16	Ms.Dipli S. Shahane	Lecturer	Civil Engg.	--	--	09.11.93	0	--	--	01.04.16	EWPPS9809 L	951	24000Cons.
	17	Charudatta P. Thosar	Lecturer	Civil Engg.	--	--	25.11.93	0	--	--	11.04.16	AQEPT0110 G	954	24000Cons.
	18	Ms.Vrushali Dipak Tayade	Lecturer	Civil Engg.	--	--	26.01.92	2	--	--	16.04.16	ASVPT1432 E	834	24000Cons.
	19	Sagar Shaligram Patil	Lecturer	Civil Engg.	--	--	30.12.92	0	--	--	27.01.16		931	24000Cons.

Name of the Course	Sr N0.	Name (s) Of the Teaching Faculty	Designation (Lecturer) Asstt. Professor	Qualifications with field of Specialization.			Date of Birth	Experience a) Teaching b) Industry c) Research			Date of joining The institute	Pan. No.	Pf. No. MH50148/	Basic Pay +AGP& Gross Salary pay as on 01.05.2016
				UG	PG	Ph.D		A	B	C				
PG Level **Mech. Engg.**	01	Mr. P.M. Solanki	Asst. Prof.	B.E. Prod.	CAD/CAM	_	06.10.81	8.6	--	`--	08.08.06	BTTPS2528G	606	B=26950/- G=46354/-
	02	Mr. P. N. Ulhe	Asst. Prof.	B.E.Prod.	M/c Design.	_	09.03.74	11.8	02	--	02.06.03	AASPU 0960B	521	B=35050/- G=60286/-
UG Level **Mech. Engg.**	01	Dr.Dheeraj S. Deshmukh	**Professor & H.O.D.**	. Mechanical	M.Tech.(HPE)	Ph.D.in Mech.	10/09/74	03	--	--	01/12/12	AIVPD9743Q	811	B=57980/- G=110162/-
	02	Dr. S.P.Shekhawat	Professor	B.E.Mech,	M.E. M/c Dgn	Ph.D.in Mech.	03.05.74	15.7	--	--	15.07.99	AURPS3142G	429	B=51740/- G=93132/-
	03	Mr. N.K. Patil	Associate Prof.	B.E. Prod.	MTech Energy MBA Mgt.	_	23.09.69	18	--	--	08.01.97	ABHPP 1813C	191	B=55410/- G=91427/-
	04	Mr.K.Shrivastava	Associate Prof.	B.E.Mech,	M.E. Thermal	_	07.11.73	17	--	--	08.01.98	AURPS3200K	379	B=53500/- G=77575/-
	05	Mr. P. G. Damle	Associate Prof.	B.E.Mech,	M.E. M/c Dgn	_	08.10.73	13	--	--	15.02.02	AFJPD7491N	464	B=50710/- G=73530/-
	06	Mr.M.V.Rawalani	Associate Prof.	B.E.Prod.	M.E.Mech. MBA	_	07.06.70	8.7	--	--	01.07.06	AAVPR9327E	280	B=50710/- G=73530/-
	07	Mr. D.B. Sadaphale	Asst. Prof.	B.E.Mech,	M.E. M/c Dgn	_	01.07.76	13	--	--	20.02.02	APCPS4219Q	499	B=35860/- G=61679/-
	08	Pravin D. Patil	Asst. Prof.	B.E. Mechanical	CAD/CAM	_	30.03.80	6.6	0.6	--	25.08.08	ATIPP9771G	653	B=26570/- G=43043/-
	09	Mukherjee Chandan Krishna	Asst. Prof.	B.E. Mech.	MBA	_	09.03.63	6.6	5.8	--	25.08.08	PFZPM3427E	654	B=32980/- G=50459/-
	10	Mahesh V. Kulkarni	Asst. Prof.	B.E. Mech.	M.E. (HPE)	--	23/07/79	02	--	--	01.12.12	AUOPK5456G	810	B=26570/- G=45700/-
	11	Dr.Prashant Bornare	Asst. Prof.	BE Mech	MBA	Ph D	01.06.79	08	--	--	15.01.07	ATVPB6575F	647	B=26880/- G=37094/-
	12	Mr. Ajay Bhardwaj	Asst. Prof.	BE Prod.	M/c Design.	--	05.07.68	7.6	--	--	01.08.07	KRRPB7024M	438	B=26780/- G=34278/-

Name of the Course	Sr N0.	Name (s) Of the Teaching Faculty	Designation (Lecturer) Asstt. Professor	Qualifications with field of Specialization.			Date of Birth	Experience a) Teaching b) Industry c) Research			Date of joining The institute	Pan. No	Pf. No. MH50148/	Basic Pay +AGP& Gross Salary pay as on 01.05.2016
				UG	PG	Ph.D		A	B	C				
UG Level **Mech. Engg.**	13	Dipak C. Talele	Asst. Prof.	B.Tech. Mechanical	M.Tech. CAD//CAM	--	19/06/87	2.7	--	--	15.07.13	AJBPT3747M	813	B=22920/- G=28650/-
	14	Ms. Jagruti R.Surange	Asstt. Prof.	B.E. Production	M/c Design	--	20/11/82	3.3	0.11	--	06.07.15	EINPS4464K	756	B=21600/- G=23760/-
	15	Akhilesh V.Rajput	Asstt. Prof.	B.E. Mechanical	M/c Design	--	06/01/89	2.0	--	--	06.07.15	BBYPR3261E	841	B=21600/- G=23760/-
	16	Ajay Janakrao Puri	Asstt. Prof.	B.E. Mechanical	Production	--	11/03/90	0	1.7	--	06.07.15	BQRPP1707M	950	B=21600/- G=26260/-
	17	Tejas Galu Patil	Asstt. Prof.	B.E. Mechanical	TM	--	19/08/88	3.0	2.0	--	16.03.16	DEEPP7369N	944	B=22248/- G=24473/-
	18	Swapnil Ashok Rajput	Lecturer	B.E. Mechanical	--	--	17/02/88	2.0	1.5	--	06.07.15	BZPPR7256E	855	30000 Cons.
	19	Pratik Tukaram Patil	Lecturer	B.E. Mechanical	--	--	04/12/90	0.6	--	--	13.07.15	BHEPP1529D	919	24000 Cons.
	20	Nishant Dhanore	Lecturer	B.E. Mechanical	--	--	05/12/91	0.6	--	--	13.07.15	BOPPD6474P	920	24000 Cons.
	21	Tilottama A. Chaudhari	Lecturer	B.E. Mechanical	--	--	06/05/93	0.6	--	--	25.07.15	BESPC2520N	921	24000 Cons.
	22	Vilas Prakash Sonawane	Asstt. Prof.	B.E. Mechanical	M.Tech. .	--	01/06/88	1.6	--	--	08.03.16	FCFPS8978M	935	25000 Cons.
	23	Ramakant B.Patil	Lecturer	B.E. Mechanical	--	--	12/06/91	0	--	--	16.03.16	CXYPP1851K	949	24000 Cons.
	24	Ravsaheb T. Patil	Lecturer	B.E. Mechanical	--	--	22/10/88	0	1.4	--	16.03.16	BCJPP4034K	943	24000 Cons.

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				UG	PG	Ph.D.		A	B	C				
UG Level **Chem. Engg.**	01	Dr.Vijay R Diware	Associate Prof.&HOD	B. Tech. Chem.	PGD PM	Chem Tech.	10.10.65	15.5	08	--	23.08.99	AAIPD0087N	432	B=52230/- G=99237/-
	02	Dr. S.A.Thakur	Asst. Prof.	B.Tech. (Chem)	M.Tech. (Chem) , M.B.A.	Mage ment	17.09.68	16.6	08	--	03.08.98	ABUPT8138K	400	B=39480/- G=67906/-
	03	Dr.A.R. Lokhande	Asst. Prof.	B.Sc Tech	M.Tech. Chem Tech	CET	18.10.59	6.7	17	2	10.07.08	AAYPL8598A	619	B=47800/- G=55543/-
	04	N.Y. Ghare	Asst. Prof.	B.Tech.	M.E. Chem.	--	14.01.68	6.7	05	7	10.07.08	AFCPG0896B	618	B=31490/- G=51014/-
	05	V. P. Sangore	Asst. Prof.	B Sc. Chem.	Msc. Poly Chem.	--	29.12.72	15.6	--	--	16.08.99	BAGPS9043G	364	B=35860/- G=61679/-
	06	Yogendra Debidas Thakare	Asstt. Prof.	B.E. Chem	M.Tech Chem	--	19.02.89	1	--	--	06.07.15	AVTPT0086H	879	24,000/-Cons.
First Year	07	*Ms.Payal Navanand Bhautik	Asstt. Prof.	B.E. Chem	M.Tech Chem	--	10.10.90		--	--	18.01.16	BDTPB4845	930	24,000/-Cons.

Name of the Course	S N0.	Name (s) Of the Teaching Faculty	Designation (Lecturer) Asstt.Professor	Qualifications with field of Specialization.			Date of Birth	Experience a) Teaching b) Industry c) Research			Date of joining the institute	Pan No.	Pf No. MH50148/	Basic Pay +AGP& Gross Salary pay as on 01.05.2016
				UG	PG	Ph.D.		A	B	C				
UG Level **Bio-Tech**	01	Dr. I. D. Patil	Professor & HOD	B.Sc. (Chemestry)	M.Sc (Chem Tech.)	Chem Tech.	01.06.72	15.4	--	--	01.10.99	AIEPP2072P	315	B=59660/- G=113354/-
	02	Ms Sarika S. Pawar	Asst. Prof.	B. Tech (Chem.Engg.)	M. Tech Chem.Engg.	--	15.01.82	3.7	--	--	01.07.11	AXQPB5469D	699	B=24310/- G=38410/-
B) Additional Faculty Appointe														
	03	J.P.Parpalliwar	Asstt. Prof.	B.Tech. Bio- Tech	--	--	22.07.86	5.7	--	--	01.07.09	BJBPP3441H	673	B=24650/- G=30813/-
	04	Gaurav Dilip Khodpe	Asstt. Prof.	B.Tech. Bio- Tech	M.Tech Bio-Tech	--	04.02.88	1	--	--	06.07.15	BPFPK5278F	843	B=21600/- G=23760/-.
	05	Ms. Aaisha Farin Sayyad	Lecturer	B.E Bio-Tech	--	--	03.02.83	0.6	--	--	15.07.15	GFSPS3308G	922	24000/-Cons.

Name of the Course	Sr. No.	Name (S) of the teaching faculty	Designation (Lecturer/ Asstt.Prof. Professor)	Qualifications with field of Speciliazation			Date of Birth	Experience in years a)Teaching b)Industry c) Research			Date of Joining of the institute	Pan No.	Pf. No. MH5 0148/	Basic Pay +AGP& Gross Salary pay as on 01.05.2016
				UG	PG	PhD.		A	B	C				
PG Level **Computer Engg.**	**01**	Mr. A. T. Bhole	Associate Prof.	Computer	M.Tech Comp.	--	12/09/76	7	2.1	--	27/11/07	AHRB 8772G	602	B=50710/- G=73530/-
	02	Mr.M.E. Patil	Associate Prof.	Computer	ME Comp.	--	06.10.75	12	1.8	--	02.12.02	AMCPP 1860H	523	B=50710/- G=73530/-
UG Level Computer Engg.	01	Dr.Girish Kumar Patnaik	**Professor &HOD**	B.E. CSE	M.E.CSE	CSE	09.10.69	2.8	--	--	17.06.13	AALPP963 2N	822	B=63130/- G=113634/-
	02	Mr. K. P. Adhiya	Associate Prof.	Computer	M.E.CSE	--	07.12.68	23.5	--	--	26.08.91	AAVPA 2101M	183	B=62880/- G=103752/-
	03	Mr.Sandip.S. Patil	Associate Prof.	Computer	M.Tech.Comp.	--	20.01.80	11	--	--	12.02.04	ARXPP 7021N	561	B=50710/- G=73530/-
	04	Mr.Sanjay S. Gharde	Asst. Prof.	Computer	M.Tech. Inf.Tec.	--	14.09.79	11	2	--	14.02.04	AMDPG 6120G	564	B=34090/- G=58635/-
	05	Ms.Shital A Patil	Asstt. Prof.	Computer	M.E.CSE	--	12.10.82	9	--	--	02.01.06	BBUPP487 1J	576	B=26590/- G=40417/-
	06	Ms. Nilima P. Patil	Asst. Prof.	Computer	M.E.CSE	--	21/10/81	7.6	--	--	14.08.07	BEDPP881 4H	627	B=25400/- G=32512/-
	07	Mr. N.Y.Suryawanshi	Asst. Prof.	Computer	M.E.CSE	--	27.01.81	6	--	--	20.12.08	BVSPS9335Q	655	B=26380/- G=41680/-
	08	Mr.Dinesh D. Puri	Asst. Prof.	Computer	M.Tech Comp	--	15.04.82	2.2	--	--	01.12.12	BCEPP893 7N	788	B=31360/- G=53939/-
	09	Ms.Priti R. Sharma	Asstt. Prof.	Computer	M.E.CSE	--	18/06/82	7	--	--	14/02/08	CRXPS617 5G	624	B=25400/- G=35052/-
	10	Mr. Dipak Bage	Asstt. Prof.	Computer	--	--	01.02.82	5.7	--	--	01.07.09	ARJPB4738J	679	B=24650/- G=30813/-
	11	Ms.Yogeshwari Borse	Asstt. Prof	Computer	M.Tech CSE	--	01.06.79	5.7	--	--	21.07.09	AUYPB2375H	678	B=24650/- G=30813/-

	12	S.D.Rajput	Asstt. Prof	Computer	M.E. Comp. Sc.& Engg.	--	06.07.85	3.7	--	--	01.07.2011	APCPR7490G	706	B=23610/- G=27152/-
	13	Akash D.Waghmare	Asstt. Prof	Computer	M.E. Comp. Sc.& Engg.	--	08.06.82	2.2	--	--	16.12.2013	AAYPW6569N	848	B=26380/- G=41680/-
	14	Ms.Prachi Prakash Chaudhari	Asstt. Prof.	Computer	M.E C.S.E.	--	03.06.89	2.10	--	--	06/07/2015	BCXPC9147G	856	B=21600/- G=23760/-
	15	Sushant S.Bahekar	Asstt. Prof.	Computer	M.Tech C.S.E.	--	14/06.90	4.2	--	--	06/07/2015	BDYPB0815J	739	B=21600/- G=23760/-
	16	Ms.Dhanashree Shashikant Tayade	Asstt. Prof.	Computer	M.E C.S.E.	--	19/10.1985	1.6	--	--	06/07/2015	AFPPT0926E	876	B=21600/- G=23760/-
	17	Ms.Sweta R.Pandey	Asstt. Prof.	I.T	M.Tech I.T	--	30/09/1990	2.1	--	--	13/07/2015	BWFPP5737H	851	B=21600/- G=23760/-
	18	Ms.Archana Raosaheb Shinde	Asstt. Prof.	Computer	Computer	--	29/06/1990	0	1.8	--	16/03/2016	DPGPS8677H	945	B=21600/- G=23760/-
B) Additional Faculty Appointed														
	19	Manoj Ku. Lotan Mahajan	Lecturer	Computer	--	--	17/11/1984	6.11	1	--	06/07/2015	BBJPM5992G	709	30000 Cons.
	20	Vijay Shrikisan Ingale	Lecturer	Computer	M.Tech I.T	--	01/05/1984	5.6	1	--	06/07/2015	ABBPI8824Q	711	30000 Cons.
	21	Jitendra R.Patil	Lecturer	Computer	--	--	04/10/1984	4.0	--	--	06/07/2015	BKFPP5205G	750	30000 Cons.
	22	Ms.Chetana Tulsidas Baviskar	Lecturer	Computer	Computer	--	20/08/1991	1.6	--	--	06/07/2015	BBYTB3985R	877	24,000 Cons.
	23	Ms.Vinaya Balu Savdekar	Lecturer	Computer	--	--	12/09/1990	1.6	1	--	06/07/2015	DELPS3810G	881	24,000 Cons.
	24	Ms.Shrutika S. Mahajan	Asstt. Prof.	Computer	Computer	--	19/01/1991	01	--	--	08/03/2016	CZWPM4190G	934	24,000 Cons.
	25	Narsesh D.Kale	Asstt. Prof.	I.T	Computer	--	21/07/1991	0	1.10	--	08/03/2016	ECPPK3318J	933	24,000 Cons.
	26	Ms.Tejashri Aanil Patil	Lecturer	Computer	--	--	22/09/1993	0	1	--	17/03/2016	CVDPP5815J	947	24,000 Cons.
	27	Ms.SanaParveen M.Deshmukh	Lecturer	Computer	--	--	16/04/1993	0	--	--	17/03/2016	BEBPD6474B	948	24,000 Cons.
	28	Paresh Dharamshil Sharma	Asstt. Prof.	Computer	M.Tech. Computer	--	09/02/1985	0.11	--	--	21/04/2016	CMVPS2432M	955	28,000 Cons.

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				UG	PG	PhD.		A	B	C				
UG Level **Inf.Tech**	01	Dr.Umesh S. Bhadade	**Professor & HOD**	Electronics	Electro nics	Electr ical	16.08.71	23	--		20/07/13	AFDPB 5587K	825	B=63130/- G=119947/-
	02	Mrs. Archana K. Bhavsar	Associate Prof.	B.E. Computer	CSE	--	22.02.77	6.10	--	--	17/03/08	AIIPB 7174L	616	B=52230/- G=70511/-
.	03	Mr.S.J. Patil	Asst. Prof.	B.E. I.T.	CSE	--	16.09.80	8.02	--	--	16.12.05	AVJPP 1704A	589	B=26590/- G=42012/-
	04	Mr.Nitin N. Jagtap	Asst. Prof.	B.E. I.T.	CSE	--	31/05/80	6.3	2.5	--	02/07/07	AKSPJ 0141R	628	B=25400/- G=35052/-
	05	Rajput S.H.	Asst. Prof.	B.E. Computer	CSE		26/10/84	5.9	--	--	20/02/08	AWLPR 7355Q	625	B=25400/- G=35052/-
	06	R.B.Sangore	Asst. Prof.	B.E. Computer	CSE	--	19.09.85	4.5	3	--	17.07.09	CCIPS 3533C	629	B=24650/- G=30813/-
	07	Harshal R. Kotwal	Asstt. Prof.	B.E. (I.T)	M.E. I.T	--	23/05/1986	5.3	--	--	06/07/15	BGCTK 3882K	838	B=21600/- G=23760
	08	Shambhu kumar.Singh	Lecturer	B.E. (I.T)	CSE	--	14/09/1990	2.11	--	--	06/07/15	EKDPS 4366G	797	B=21600/- G=23760
	09	Pravin Keshav Patil	Lecturer	B.E. Comp.	CSE	--	31/08/1991	1.10	--	--	06/07/15	BFEPP 4419J	850	B=21600/- G=23760
	10	Prashnt C.Harne	Lecturer	B.E (CS E)	CSE	--	12/01/1988	5.6	--	--	06/07/15	AHBPH 3609Q	720	30000/-Cons.
B) Additional Faculty Appointed														
	11	Mayur Sunil Patil	Lecturer	B.E. (I.T)	--	--	13/05/1991	1.6	--	--	06/07/15	CFMPP 1564B	888	24000/-Cons.

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				UG	PG	PhD.		A	B	C				
PG Level **E & TC**	01	Dr. P. H. Zope	Asstt. Prof.	BE Ind. Electronic	Digital Electronics	PhD.	24.06.75	11	1	--	01.07.03	AAFPZ 6540B	509	B=35050/- G=65544/-
	02	Mr. A. H. Karode	Asstt. Prof.	BE Electronics	E&TC	--	01.06.76	11	2	--	01.07.03	ALMPK 9914G	496	B=35050/- G=60286/-
UG Level **E & TC**	01	Dr.S.R.Suralkar	**Professor & HOD**	B.E. Electronics	M.E.Inst. & Control	E&TC	28.10.66	24	--	--	17.08.91	ACAPS 3443H	180	B=63910/- G=121429/-
	02	Dr. M. P. Deshmukh	Professor	BE Electronics	ME Inst. & Control	E&TC	20.06.66	21	--	--	01.07.96	AARPD 2514M	32	B=65110/- G=118009/-
	03	D.U.Adokar	Associate Prof & HOD	Electronics	Electronics	--	31.03.65	23	--	--	01.07.09	AAMPA 8549G	666	B=58140/- G=95931/-
	04	Mr. V. M. Deshmukh	Associate Prof	BE Electronics	ME Inst. & Control	--	17.06.65	21	--	--	01.08.98	APRED 2513N	35	B=61040/- G=100716/-
	05	Mr.N.M.Kazi	Asstt. Prof.	BE Electronics	E&TC	--	12.06.72	13	2	--	01.08.02	AAOPW 6412G	502	B=40390/- G=69478/-
	06	Mr. A.C. Wani	Asstt. Prof.	BE Electronics	M.E. Electronics	--	30.07.76	12	--	--	09.06.03	AAOPW 6412G	502	B=35050/- G=60286/-
	07	Mr. S. P. Ramteke	Asstt. Prof.	BE. E&TC	Digital Electronics	--	31.03.79	11	--	--	13.02.04	AJIPR 6640Q	563	B=31350/- G=53922/-
	08	Hingonekar Shailendra A.	Asstt. Prof.	E &TC	Elect.Digen. Tech.	--	06.03.69	6.0	--	--	21/07/10	AAYPH 4559H	694	B=32290/- G=55539/-
	09	Mr. S. K. Khode	Asstt. Prof.	BE E&TC	Digital Elect.	--	01.01.79	8.0	--	--	01/06/07	AZOPK 7406K	607	B=26000/- G=35880/-
	10	Ms.Mayuri J. Deshmukh	Asstt. Prof.	B.E.E&TC.	Digital Elect.	--	23.09.84	8.0	--	--	02/07/07	ASDPD 8751C	634	B=25400/- G=32512/-

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				UG	PG	PhD.		A	B	C				
UG Level **E & TC**	11	Mr. Ashish Bari	Asstt. Prof.	BE E&TC	Digital Elect.	--	26.04.81	8.0	--	--	04/08/07	ATWPB 1739Q	637	B=25400/- G=35052/-
	12	Mrs.Deepika R.Patil	Asstt. Prof.	BE E&TC	Digital Elect.	--	25.06.81	7.0	1.6	--	01.07.09	BBDPP 9701N	668	B=25400/- G=35052/-
	13	Ms.Priyanka Shanbhag	Asstt. Prof.	BE E&TC	Digital Elect.	--	30.04.88	7.0	--	--	21.07.09	CLVPS 3899B	682	B=24650/- G=30813/-
	14	Ms.Akshada B.Sapkal	Asstt. Prof.	BE E&TC	Digital Elect.		20.10.87	4.0	--	--	15.07.13	BLIPS 1544H	714	B=22920/- G=28650/-
	15	Yogesh S. Santwani	Asstt. Prof.	B. E. E &TC	Digital	--	04.05.88	4.6	--	--	06.07.15	CIDPS6822F	716	B=21600/- G=23760/-
B) Additional Faculty Appointed														
	16	Kunal Kishor Pandey	Asstt. Prof.	B. E. E &TC	Digital Elect.	--	01.03.84	5.4	--	--	06.07.15	BPNPP 7125N	791	30000/- Con.
	17	Ranjitsingh S.Kalsi	Lecturer	B. E. E &TC	--	--	14.06.86	3.8	--	--	06.07.15	BJAPK3309N	715	30000/- Con.
	18	Ms.Priyanka D.Girase	Lecturer	B. E. E &TC	--	--	16.04.91	2.0	--	--	06.07.15	BKCPG8231L	869	30000/- Con.
	19	Charansing A. Patil	Lecturer	B. E. E &TC	--	--	22.05.84	1.4	--	--	12.08.15	AUXPP6700B	911	24000/- Con.
	20	Prasad Manohar Khadke	Asstt. Prof.	B. E. E &TC	VLSI	--	11.09.88	0	--	--	08.03.16	AYGPK1137N	937	24000/- Con.
	21	Sarang V. Patil	Asstt. Prof.	B. E. E &TC	M.Tech. (CS)	--	03.04.89	1.0	--	--	08.03.16	BSBPP0959B	936	24000/- Con.
	22	Sagar S.Chavan	Asstt. Prof.	B. E. E &TC	Digital	--	18.02.91	0	--	--	09.03.16	BBZPC1546E	938	24000/- Con.
	23	Ms.Sukruti S.Taori	Asstt. Prof.	B. E. E &TC	Digital	--	12.04.92	0	--	--	10.03.16	AVWPT9114D	939	24000/- Con.
	24	Sadik H. Khan	Lecturer	B. E. E &TC	--	--	24.11.83	7.5	--	--	18.01.16	BDIPK6886J	903	24000/- Con.

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				UG	PG	PhD.		A	B	C				
PG Level **Electrical**	01	V.S.Pawar	Associate Prof	Electrical	EPS	--	08.04.71	19	--	--	16.08.99	AMYPP 3902G	437	B=55410/- G=91427/-
	02	S.M.Shembekar	Asst.Prof	Electrical	EPS	--	31.08.76	10	--	--	01.01.09	BSFPS 5799N	657	B=32240/- G=55453/-
UG Level **Electrical**	01	Dr. P. J. Shah	**Professor & HOD**	B.E.Ind. Ele.	ME Power Electron ics	Electric al	11.08.67	22	1	--	01.08.95	ALBPS 7337J	38	B=62390/- G=118541/-
	02	Dr. P.V. Thakre	Professor	B.E. Electronics	M.Tech.(Energy Engg.)	PhD.	19.07.70	17	--	--	16.07.07	ACZPT 9698L	597	B=60920/- G=109656/-
	03	M.M.Ansari	Asst.Prof	Electrical	EPS	--	11.10.73	16	--	--	05.07.00	AHFPA 4503J	474	B=40390/- G=69471/-
	04	D.S.Patil	Lecturer	Electrical	--	--	23.07.83	6.0	--	--	11.12.07	AYYPP 8759R	643	B=25400/- G=35052/-
	05	N. S. Mahajan	Lecturer	Electrical	EPS	--	17.05.86	3.0	--	--	15.07.13	BEAPM 7927M	807	B=22920/- G=28650/-
B) Additional Faculty Appointed														
	06	Swapnil Suresh Bhuskute	Lecturer	Electrical	--	--	24.08.90	3.6	--	--	06.07.15	BSXPB26 84M	865	30000 /-Con.
	07	Ms.Priyanka S.Patil	Lecturer	Electrical	--	--	12.08.92	0	--	--	16.03.16	COOPP17 22E	942	24000 /-Con.
	08	Lokesh N. Londhe	Lecturer	Electrical	--	--	13.04.93	0	--	--	16.03.16	ANCPL93 13Q	941	24000 /-Con.
	09	*Ms.Nikita D.Sapkar	Lecturer	Electrical	--	--	22.12.92	1.3	--	--	06.07.15		905	24000 /-Con.
	10	*Ms.Neha Rajendra Bhole	Lecturer	Electrical	--	--	28.10.92	0			15.01.16	CFUPB39 04H	928	24000 /-Con.

Name of the Course	Sr. No.	Name (S) of the teaching faculty	Design-ation (Lecturer/ Asstt.Prof. Professor)	Qualifications with field of Specialization			Date of Birth	Experience a)Teaching b)Industry c) Reserch			Date of Joining of the institute	Pan. No.	Pf. No. MH5 0148/	Basic Pay +AGP& Gross Salary pay as on 01.05.2016
				UG	PG	PhD.		A	B	C				
PG Level MBA	01	Dr. V.S.Rana	**Associate Prof. & I/C HOD**	B.Com	MBA	Ph.D.	15.12.80	7.0	--	--	01.07.08	ALIPR 3469D	661	B=47800/- G=57360/-
	02	Pankaj Anawade	Asstt.Prof.	B.E.	MBA	--	05.07.83	6.0	--	--	01.07.08	ALZPA 8024E	662	B=24650/- G=30813/-
	03	Hahshal Salunke	Asstt.Prof.	B.Com	MBA	--	28.07.85	6.0	--	--	01.07.09	CDUPS 6447L	732	B=23610/- G=29513/-
	04	Dr. Richa Modiyani	Asstt.Prof.	BBA	MBA	Sindhi Community	30.04.87	6.0	--	--	01.07.11	DHZPN 9404R	733	B=23610/- G=29513/-
	05	Dr. Saroj B. Patil;	Asstt.Prof.	BBA	M.C.M.	Ph.D.	28.05.74	1.9	--	--	02.05.14	BBBPP 5945C	514	B=22920/- G=26358/-
	06	Mukesh B.Ahirrao	Asstt.Prof.	BBA	M.B.A. Finance M.Com	--	24.06.84	4.0	2	--	06.07.15	AIQPA 7380R	757	B=21600/- G=23760/-
	07	Ms.Faroza A. kazi	Asstt.Prof.	BBA	M.B.A.(H.R) MPM (H.R.)	--	16.02.75	2.10	--	--	06.07.15	BENPK 0046Q	631	B=21600/- G=23760/-

FIRST YEAR ENGG.

Name of the Course	Sr. No.	Name (S) of the teaching faculty	Design-ation (Lecturer/ Asstt.Prof. Professor)	Qualifications with field of Specialization			Date of Birth	Experience a)Teaching b)Industry c) Research			Date of Joining of the institute	Pan. No.	Pf. No. MH5 0148/	Basic Pay +AGP& Gross Salary pay as on 01.05.2016
				UG	PG	PhD.		A	B	C				
UG Level Humanities and Science	01	Dr.Motilal N. Panigrahi	**Professor & HOD**	B.Sc. Mathematics	M.Sc. Mathematics M.Phil Mathematics	Ph.D. Mathematics	27.06.71	23	--	--	22/08/11	ADOPP 8889R	744	B=59660/- G=107388/-
	02	Dr.Vrishali U.Edlabadkar	**Associate Prof.**	B.Sc.	M.Sc. Mathematics	PGD Edu.Adm.	29.08.76	14.5	--	--	01.04.16	AOVPP7743J	953	B=47792/- G=58306/-
	03	Dr. K. S. Patil	Asstt.Prof	B.Sc. (Phy)	MSc.(Phy)	Physics	14.05.74	13	--	--	05.07.00	AJXPP 8679G	420	B=36670/- G=68573/-
	04	Mr. Y. K. Chitte	Asstt.Prof	B.A.(English)	MA (English)	--	01.06.69	11	--	--	02.06.02	ANEPC 0257C	359	B=29990/- G=51583/-
	05	Mahendra B. Patil	Asstt.Prof	B.Sc. (Physics)	M.Sc. (Physics)	--	01.06.85	6.0	--	--	27.07.10	DIZPP 7217C	696	B=23610/- G=29513/-
	06	Ms. Sunita S. Patil	Asstt.Prof	B.Sc. (Math)	MSc(Math)	--	12.05.75	13	--	--	07.09.00	AJXPP 8619A	472	B=32980/- G=56726/-
	07	C.U. Nikam	Asstt.Prof	B.Sc. Physics	M.Sc. Physics	--	05.06.73	6.0	--	--	25.08.08	AIQPN 6539B	652	B=25400/- G=35052/-
	08	Ms. Deepmala I. Desai	Asstt.Prof	B.Sc. Chemistry	M.Sc. Chemistry	--	06.10.79	6.0	--	--	25.08.08	ABOPI 3049J	664	B=25400/- G=35052/-
	09	Ms. Meera Deshpande	Asstt.Prof	B.Sc. (Math)	M.Sc.Maths M.Phil	--	10.06.75	10.6	---	--	16.07.07	AMQPD 8219G	605	B=24310/- G=33548/-
	10	Parag Vijay Patil	Asstt.Prof	B.Sc. (Math)	M. Sc. (Maths)	--	20.01.84	8.4	--	--	20.07.13	ATEPP 6627P	824	B=22920/- G=33234/-
	11	Avinash V,Khambayat	Asstt.Prof	B.Sc. (Math)	M. Sc.(Maths) M.Phil(Maths)	--	11.02.72	17	--	--	06.07.15	AZXPK 1304P	849	35000/-Cons.
	12	Nago Bhika Bhoi	Asstt.Prof	B.A. (English)	M.A. (English)	--	22.06.86	5.0	--	--	06.07.15	BBDPB 4073R	746	B=21600/- G=23760/-
	13	Mali Anil Raju	Asstt.Prof	B.Sc. (Chemistry)	M.Sc. (Chemistry)	--	17.10.87	4.0	--	--	06.07.15	AVATM 2426P	747	B=21600/- G=23760/-
	14	Ujawalsing T. Patil	Asstt.Prof	B.Sc. (Org. Chemistry)	M.Sc. (Org. Chemistry)	--	10.07.85	3.6	3	--	06.07.15	CGYPP 0316E	774	B=21600/- G=23760/-
	15	Mrs. Hemlata A.Wani	Asstt.Prof	B. Sc. Chemistry)	M.Sc.(Analytical Chemistry) M.Phil (Chemistry)	--	21.01.81	10.11	--	--	06.07.15	ADLPW0872	899	24,000/Cons.

	16	Ms.Reema S.Adakmol	Asstt. Prof.	B.A. (English)	M.A. (English)	--	24/12/89	0.6	--	--	25/07/15	BRPPA8830H	925	24000/Cons.
	17	*Sunil Bhagwat Ahire	Asstt. Prof.	B.A. (English)	M.A. (English)	--	13/10/85	0.6	--	--	15/07/15	BIRPA2481B	924	24000/Cons.

Name of the Course	Sr. No.	Name (S) of the teaching faculty	Design-ation (Lecturer/ Asstt.Prof. Professor)	Qualifications with field of Specialization			Date of Birth	Experience a)Teaching b)Industry c) Research			Date of Joining of the institute	Pan. No.	Pf. No. MH 501 48/	Basic Pay +AGP& Gross Salary pay as on 01.05.2016
				UG	PG	PhD.		A	B	C				
Sport	01	J.B. Sisodiya	Phy.Director	B.A. B P Ed	MPEd	--	01/06/63	21	--	--	24/11/94	AQXPS 7849C	276	B=52230/- G=75734/-

Name of the Course	Sr. No.	Name (S) of the teaching faculty	Design-ation (Lecturer/ Asstt.Prof. Professor)	Qualifications with field of Specialization			Date of Birth	Experience a)Teaching b)Industry c) Research			Date of Joining of the institute	Pan. No.	Pf. No. MH 501 48/	Basic Pay +AGP& Gross Salary pay as on 01.05.2016
				UG	PG	PhD.		A	B	C				
Library	01	Sudhir.S.Patil	Librarian	B.Lib.	M.Lib.	--	01/06/78	12	--	--	01/07/03	BDWPP 8131P	527	B=29990/- G=51583/-

Three persons as named above of Computer Engg. Dept have been selected for First year Engineering Introduction to Computing Subject, which is to be taught from January 2010.

Dr. Kishor Sopan Wani (Principal)

Address: (O): SSBT's College of Engineering & Technology, Bambhori, Jalgaon. P.Box No. 94. Jalgaon 425001
(R): 31/2, "Annapurna", Gandharva Colony, Jalgaon-425001.
Contact: Mob- +919423774254
Office: 0275 2258391/93
Email: wani.kishor@gmail.com

ACADEMIC QUALIFICATIONS:

Ph. D.(Biotechnology)
North Maharashtra University, Jalgaon.
M.Tech (Chemical Technology):
Laxminarayan Institute of Technology, Nagpur
D.B.M. : Bharati Vidya Bhavans Rajendra Prasad Institute of Management, Mumbai, (Nagpur Chapter)

PROFESSIONAL EXPERIENCE:

A. Teaching:

Total: 30 Years 9 months.
PG Teacher: 8 years.

B. Administration:

1. Principal, SMIT Polytechnic, Jalgaon.
2. Head, Chemical Engg. Department, SSBT's College of Engineering & Technology, Bambhori, Jalgaon
3. Principal since 14th October, 2011 till date, SSBT's College of Engineering & Technology, Bambhori, Jalgaon

C. General Administration

1. Chairman, Antiragging Committee
2. Chairman, Library Committee
3. Chairman, Vice Chairman &Co-ordinator, Admission Committee
4. Co ordinator: Academics & R&D
5. Member, Proctoral Board
6. Patron of International & National Conferences, Seminars , Workshops, Student Technical Paper Presentations (Milestone 2K Series), SSBT Fest., & other activities from Oct 2011.

RESEARCH & PUBLICATIONS:

RESEARCH:

- Ph.D. Guide in Chemical Engineering & Technology of N.M.U., Jalgaon
- Ph.D. Guide in Biotechnology of N.M.U., Jalgaon

1. No. of Ph.D.'s guided: 01
2. No. of students pursuing Ph.D.: 04
3. No. of M.E. Projects Guided: 06

Patent:

First & true inventor of the patent (dated 2/01/2006) on "A Method for production of orange colored aliphatic pigment by *Chryseobacterium Indologenes* (Patent No. 196509 of 16/12/2003, A-MU/0865).

Reviewer:

P.M.Patil and M. Husain, "Specific microbial degradation kinetics of food waste: a case study" in "Frontiers in Environmental Engineering (FIEE)" on 13 October 2013.

RESEARCH PUBLICATIONS:

A. International Publications

1. V.S.Patil, J.D.Dhake, **K.S.Wani.** "Development of Acetylation Technique for chemical modification of cellulose fiber using baggase, bamboo & pad pulps" , published in "Oriental Journal of Chemistry" ,Vol 19,No.3,2003,pp-681-684.Impact Factor: 0.479,ISSN No: 0970-020X.
2. **K.S.Wani**, B.S.Naphade, B.L.Chaudhari & S.B.Chincholkar. "Pigment Production" published in ,"Concise Encyclopedia of Bioresource Technology",Haworth press publication, New York , 1st April 2004, pp 645 - 652.
3. S.S.Sonawane, G.A.Usmani, V.R.Parate, V.S.Patil, **K.S.Wani.** "Mass transfer and kinetic studies of antacids in acetic acid and its modeling simulation", published in "Material Science and Research India". Vol.5(1), 2008, pp 101-106. ISSN No.online:2394-0565.Index Copernicus Value: 60.97.
4. S.S.Sonawane, G.A.Usmani, V.R.Parate, **K.S.Wani** and S.J.Wagh. "Study the kinetics of catalytic esterification reaction between n-Butanol and Acetic acid", published in "Material Science and Research India". Vol.5(1), 2008,pp135-138. ISSN

No.online:2394-0565. Index Copernicus Value: 60.97.

5. Priti N Chaudhari, **Kishor S Wani**, Bhushan L Chaudhari and Sudhir B Chincholkar " Characteristics of Sulfobacin A from a soil isolate *Chryseobacterium gleum*", published in "Applied Biochemistry and Biotechnology" DOI 10 1007/s12010-008-8417-7, Nov.2008.Impact Factor: 1.735. ISSN No. online: 1559-0291.
6. Sharanappa A., **K.S.Wani**, Pallavi Patil. "Bioprocessing of Food Industrial Waste for Alpha Amylase Production by Solid State Fermentation", published in "International Journal of Advanced Biotechnology and Research". Vol 2, Issue 4, 2011, pp 473-480. Impact Factor: 1.506.ISSN No. 0976-2612.
7. A.R.Lokhande, V.S.Patil, **Wani K.S.**"Preparation of greases from metal soaps of non traditional oil using waste lubricating oil", published in "International Journal of Chemical Engineering Research". Volume 4,Number 1 (2012), pp. 1-7. ISSN No: 0975-6442.
8. M. Husain, **K.S.Wani** and S.P.Pawar. "Pollution Control: A Techno-Spiritual Perspective", published in "Pratibha: International Journal of Science, Spirituality, Business and Technology", ISSN (Print) 2277-7261,Vol.1, No. 1, March 2012, pp.82-85.
9. Lokhande A.R., Patil V.S., **Wani K.S** " Study of Diethanolamide from Custard Apple Seed Oil (*Annona Squamosa L*)", published in " International Journal of Engineering and Technology (IJERT), ISSN No:2278-0181, Vol.2, Issue 9, September-2013 pp 448-452. Impact Factor: 1.76
10. Harshal Nagpure, Vikram Banakar, Rahul Dhanda and **K.S.Wani** " Degradation of Paper Mill Wastewater using Batch (Photocatalytic) Reactor", published in "International Journal of Green Chemistry and Bioprocess", ISSN No:2277-7199, 3(3), 2013, pp 24-29.
11. Abhang R. M., **Wani K.S,** Patil V. S., Pangarkar B. L., and Parjane S. B. "Nano-filtration for Recovery of Heavy Metal Ions from Wastewater- A Review", published in "International Journal of Research in Environmental Science and Technology", ISSN No.:2249-9695, 3(1), 2013, 29-34. Impact Factor: 1.844
12. Sakina Husain, Dr.M. Husain and **K.S.Wani**. "Role of Constitutional Ruling System", published in "Pratibha: International Journal of Science, Spirituality, Business and Technology", ISSN No. (Print) 2277-7261, Vol.1, No. 2, February 2013, pp.82-84.
13. R. M. Abhang, **K.S.Wani,** V.S.Patil and S.H.Sonawane. "Perspectives and Challenges of Hydrogen Storage by Metal-Organic Frameworks", published in "Pratibha: International Journal of Science, Spirituality, Business and Technology", Vol.2, No. 1, November 2013,ISSN No.(Print) 2277-7261, pp.18-24.
14. Anand D. Kulkarni and **Kishor S.Wani.**."Magnetic Field Conditioning: An Energy Efficient Method for Crude Oil Transportation", published in "Pratibha: International Journal of Science, Spirituality, Business and Technology", Vol.2, No. 1, November 2013,ISSN No. (Print) 2277-7261, pp.36-39.
15. N.Y.Ghare, **K.S.Wani** and V.S.Patil. "Recovery of Acids from Spent Pickle Liquor

of a Steel Industry By Ion Exchange Route", published in "International Journal of Emerging Trends in Engineering", ISSN No. 2249-6149 Vol.1, Issue 4, January, 2014, pp 318-326. Impact Factor:2.87

16. Rajendrakumar Abhang, **Kishor Wani** and Vilas Patil. "Advancement and Prospectives of MOF and ZIF as a Filler in Mixed Matrix Membrane for CO_2/N_2 Separation- A Review", published in "Cyber Times International Journal of Technology and Management", ISSN No. 2278-7518, Vol.7. Issue 2, April-September, 2014 ,pp 26-33.Impact Factor: 4.896
17. Anand Kulkarni and **Kishor Wani** "Effect of Magnetic Field on Viscosity and Ultraviolet Spectra of Hydrocarbons", published in "Cyber Times International Journal of Technology and Management", ISSN No. 2278-7518 Vol.7. Issue 2, April-September, 2014 pp 34-40. Impact Factor: 4.896
18. **Kishor S.Wani**, Mujahid Husain[2] and Vijay R Diware, "Detergent Removal from Sullage by Photo-catalytic Process", accepted for the publication in Pratibha: International Journal of Science, Spirituality, Business and Technology (IJSSBT) ISSN (Print) 2277-7261 IJSSBT, VOL. 3, No.1, Dec. 2014, Page No.1 -5,.
19. R.M.Abhang, **K.S.Wani** and V.S.Patil, "Synthesis and characterization of ZIF-8 filler for preparation of mixed matrix membrane", published in "International Journal of Scientific and Engineering Research", ISSN No. 2229-5518,Vol.6. Issue 8, August, 2015, pp 1276-1280.
20. Kulkarni A.D. and **Wani K.S "**Reducing Crude Oil Viscosity Using Diluents**",** Published inInternational Journal of Engineering Trends and Technology, ISSN No.: 2231-5381, Special Issue, ICGTETM Number-1, January 2016 Page No. 85 to 89. DOI: 10.14445/22315381/IJETT-ICGTETM-N1, Impact Factor: 1.795
21. Yogendra D. Thakare, Vijay R. Diware**, Kishor S. Wani "**Decolorization of Malachite Green Dye Using UV + H_2O_2 and Photo Fenton Processes**",** Published inInternational Journal of Engineering Trends and Technology, ISSN No: 2231-5381, Special Issue, ICGTETM Number-1, January 2016, Page No. 90 to 93.DOI: 10.14445/22315381/IJETT-ICGTETM-N1, Impact Factor: 1.795
22. R. M. Abhang, **K. S. Wani**, V. S. Patil, "Performance Studies of ZIF-8/PES Asymmetric Mixed MatrixMembrane for Permeation of CO_2/CH_4" Published inInternational Journal of Engineering Trends and Technology, ISSN No: 2231-5381, Special Issue, ICGTETM Number-2, January 2016 ,Page No. 183 to 187. DOI: 10.14445/22315381/IJETT-ICGTETM-N2, Impact Factor: 1.795
23. A.R.Lokhande, **Kishor Sopan Wani**, Mohd. Afsar S. Siddiqui, "Study of Pectin from Peels of Magnifera Indica andArtocarpus Hetrophyllus"published in International Journal of Engineering Trends and Technology, ISSN No: 2231-5381, Special Issue, ICGTETM Number-3, January 2016, Page No. 375 to 381. DOI: 10.14445/22315381/IJETT-ICGTETM-N3, Impact Factor: 1.795
24. Yogendra D. Thakare, Sunita M. Jadhav, **K.S.Wani**, "Acid Orange 7 Dye Degradation Using Combined Acoustic Cavitation with Fenton and Photo Fenton Processes," published in International Journal of Engineering Science and

Computing, ISSN 2321 3361, Volume 6, Issue 4, April 2016, page no.s 3379 to3386, Impact Factor: 3.868

B. National Publications:

i. National Journals

1. N.Y.Ghare, **K.S.Wani** and V.S.Patil. "A Review on Methods of Recovery of Acid(S) from Spent Pickle Liquor of Steel Industry", published in Journal of Environ. Science and Engg. Vol.55,No.2,April 2013, pp 253-266.ISSN No. 0367-827X.

ii. National Seminar

1. **K.S.Wani** "Microbial Pigments and its Applications". Published in National level Seminar on " Emerging Facets of Chemical Engineering & Biotechnology held on September 28-29,2005 at Laxminarayan Institute of Technology, Nagpur.
2. Sharanappa A, **K.S.Wani "**Molecular Dynamics Simulation: An Aid to Predict Nanobehavior of Biological System". Published in National level Seminar on "Nanotechnology" held on March 08, 2008 at S.S.B.T's, COET, Bambhori. Jalgaon.

C. International Conference / Symposiums

1. **Kishor S Wani**, Priti N Chaudhari, Bhushan L Chaudhari and Sudhir B Chincholkar. "Production of New Sulfonolipid and Some Important Enzymes by Alkaliphilic *Chryseobacterium sp.*" Published in International Conference on " New Horizons in Biotechnology and 4th BRSI Convention" held on November 26-29,2007, organized by The Biotech Research Society[BRSI] and National Institute for Interdisciplinary Science and Technology[NIIST], Trivandrum.
2. Sharanappa A., **K.S.Wani** and Pallavi Patil. " Bioprocessing of Food Industrial Waste for Value Added Product by Solid State Fermentation". Published in International Conference on "Innovative Science and Engineering and Technology (ICISET-2011)" held on 8th& 9thApril,2011, organized by V.V.P. Engineering College, Rajkot (Gujarat).
3. A.R.Lokhande, **K.S.Wani** and V.S.Patil. "Study of Lubricating Greases from Mahua Oil Fatty Acids using Waste Lubricating Oil". Published in "International Congress of Chemistry and Environment (ICCE-2011)" held on 27-29, May-2011 at Dickson, Malaysia.
4. R. M.Abhang, **K. S. Wani,** V.S.Patil and S.H.Sonawane. " Perspectives and Challenges of Hydrogen Storage by Metal-Organic Frameworks", published International Conference on "Advances in Energy Technology" organized by SSBT's College of Engineering and Technology, Bambhori, Jalgaon held on March 29th,2013, page no.101-107, Proceedings.
5. Anand D. Kulkarni and **Kishor S.Wani**."Magnetic Field Conditioning: An Energy Efficient Method for Crude Oil Transportation", published in International Conference on "Advances in Energy Technology" organized by SSBT's College of Engineering and

Technology, Bambhori, Jalgaon, held on March 29th, 2013, page no.89-92, Proceedings.

6. Lokhande A.R., Patil V.S. and **Wani K.S**."Advance Technology in Renewable Energy", published in International Conference on "Advances in Energy Technology" organized by SSBT's College of Engineering and Technology, Bambhori, Jalgaon, held on March 29th,2013, page no.114-117, Proceedings.
7. Lokhande A.R., **Wani K.S**. and Patil V.S. "Design Criterion for Extended Aeration System", published in International Conference on "Advances in Energy Technology" organized by SSBT's College of Engineering and Technology, Bambhori, Jalgaon, held on March 29th,2013, page no.127-131, Proceedings.
8. Kulkarni A.D., Mhaske V.S., Nandi S. and **Wani K.S**., 'Effect of Magnetic Field on the Viscosity of Individual Hydrocarbons" (Poster presentation) in "CHEMCON 2013", (66TH Annual Session of Indian Institute of Chemical Engineers), Joint Indo-North American Symposium, held at Institute of Chemical Technology Campus, Matunga, Mumbai, organized by Indian Institute of Chemical Engineers, Mumbai Regional Centre, in Association with Institute of Chemical Technology, Mumbai on December 27-30, 2013.
9. V.P. Sangore, S.A. Thakur, V.R. Diware, **K.S. Wani**, "Sustainable Development And Challenges Ahead of Chemical Engineering Industries" Published in proceedings of International Conference on "Sustainable Development" organized by SSBT's College of Engineering and Technology, Bambhori, Jalgaon held on February, 25-26th 2014, page no.18-21, Proceedings.
10. A.R. Lokhande, **K.S. Wani**, V.S. Patil, "Chemical Process Engineering for Sustainability" Published in proceedings of International Conference on "Sustainable Development" organized by SSBT's College of Engineering and Technology, Bambhori, Jalgaon held on February, 25-26th 2014, page no.400-404.

D. National Conferences:

1. V.P.Sangore, S.A.Thakur, V.R.Diware and **K.S.Wani**. " Impact of Global Economic Recession on Indian Chemical Industries", Published in U.G.C. Sponsored National Level Conference on " Global Economic Recession : An Opportunity to India" held on 16th and 17th December, 2009, organized by B.G.E. Society's Smt. Laxmibai Radhakisan Toshniwal College of Commerce, Akola.
2. Sharanappa A., **K.S.Wani** and Pallavi Patil. " Biotechnology of Solid State Fermentation", Published in National Conference on " Biochemical Engineering: Present Scenario and Future Perspective" held on 12th and 13th March, 2010, organized by Department of Chemical Engineering, G.H.Patel College of Engineering and Technology, Vallabh Vidyanagar, Gujarat.
3. V.P.Sangore, S.A.Thakur, V.R.Diware and **K.S.Wani**. " Recovery of Bisphenol-A through Depolymerization of Commercial Compact Disc Waste by Alkaline Methanolysis", Published in National Conference on " Emerging Trends in Engineering,

Technology and Management", held on 29th March 2010, organized by SSBT's C.O.E.T.,Bambhori, Jalgaon.

4. N.Y.Ghare, **K.S.Wani** and V.S.Patil. "Recovery of Hydrochloric Acid from Spent Pickle Liquor of Steel Industry", Published in National Conference on " Emerging Trends in Engineering, Technology and Management", held on 29th March 2010, organized by SSBT's C.O.E.T.,Bambhori, Jalgaon.
5. A.R.Lokhande, **K.S.Wani** and V.S.Patil. "Study of Metallic Soaps from Non-Traditional Oil and their Applications as Lubricating Greases and Drier in Paints", Published in National Conference on " Emerging Trends in Engineering, Technology and Management", held on 29th March 2010, organized by SSBT's C.O.E.T.,Bambhori, Jalgaon.
6. A.R.Lokhande, **K.S.Wani** and V.S.Patil. "Study of Lubricating Grease from Mahua Oil Fatty Acids", Published in National Conference on "Recent Innovations in Oil and Food Technology (RIOFT-2010)", held on August 23, 2010, organized by Division of Oils, Fats and Waxes Technology and Division of Food Technology, Department of Chemical Technology, North Maharashtra University, Jalgaon-425001.
7. N.Y.Ghare, V.S.Patil and **K.S.Wani**. "Analysis and Recovery of Sulfuric Acid from Spent Liquor of Electroplating Industry", Published in National Conference on "Environmental Innovations for Resource Sustainability (EIRS-2011)", held on 21st&22nd January 2011, organized by School of Environmental & Earth Sciences, North Maharashtra University, Jalgaon.
8. L. Mahajan and **K.S.Wani**." Study of Adsorption Capacity of Fly Ash for Removal of Lignin", Published in National Conference on "Recent Advances in Chemical Engineering (RACE-2012)",held on 4th February, 2012, organized by University Department of Chemical Technology, North Maharashtra University, Jalgaon.
9. Kishor B. Deshmukh, V.P.Sangore and **K.S.Wani**. "UASBR Technology for Treating Waste Water", Published in National Level Conference on "Green and Clean Technology", held on 11th March 2012, organized by SSBT's College of Engineering and Technology, Bambhori, Jalgaon.

PARTICIPATION IN WORKSHOPS, WINTER / SUMMER SCHOOL ETC:

1. National Symposium on "Recent Trends in Biotechnology of Yeast and Fungi" held at School of Life Sciences, N.M.U., Jalgaon during 13-14th March 1997.
2. Workshop on syllabus framing for S.E. to B.E. NMU Jalgaon conducted at COET , Bambhori, Jalgaon on 06/09/1998.
3. Seminar on "Quality Engineering Education" organised by SSBT's COET, Jalgaon, N.M.U., Jalgaon and Engineering Education Foundation, Pune on Dec. 26th Dec. 1998.
4. QIP short term course on "Recent Developments in Fermentation and Enzyme Technology", conducted at IIT, Bombay during May 8-12, 2000.
5. Workshop on "Paper Setting & Evaluation" conducted at J. T. Mahajan College of Engineering, Faizpur on Sept.22,2002.

6. “Workshop : Insight into Accreditation” conducted at Goa on April 16–17, 2003.
7. Five day SERC school on “Recent Advances In Design and Analysis of Biotechnological Processes” conducted at IIT Bombay during May 13-17,2003.
8. “Orientation Programme for Engineering College Teachers” jointly Organised by SSBT's COET, Jalgaon and Engineering Education Foundation, Pune at COET Bambhori on July 11-13,2003
9. Workshop on “Matlab & Simulink” conducted by India Soft & Cranes in July 2003 at SSBT’s COET , Bambhori, Jalgaon.
10. Workshop on “Intellectual Property Rights with special reference to Patents”. Sponsored by TIFAC, DST (Govt. of India) and S&T Cell (Govt. of Maharashtra)held on Jan 9,2004 at N.M.U. Jalgaon.
11. National symposium on “ Developments in Biotechnology: Emerging Trends and Challenges”. First BRSI Convention, held on November 25-27, 2004 at N.M.U. Jalgaon.
12. National seminar on “Low Cost Automation” held on April 21, 2007 at SSBT’s College of Engineering and Technology, Bambhori, Jalgaon.
13. National seminar on “NANOTECHNOLOGY” held on March, 8 , 2008 at SSBT’s College of Engineering and Technology, Bambhori, Jalgaon.
14. International workshop on "Digital Governance and Hotspot Geoinformatics" directed by Dr.G.P.Patil, Penn State University, U.S.A. and organised by K.C.E.Society's JalaSRI-Watershed Surveillance and Research Institute, Moolji Jaitha College, Jalgaon, during 5 - 7 June, 2009.
15. Three days teachers’ training workshop “SHRAM SADHANA”, held on 9th, 10th and 11th July, 2009, jointly organized by SSBT’s College of Engineering and Technology, Bambhori, Jalgaon and Deepstambh Foundation, Jalgaon.
16. In-plant Training Programme on “Disaster Management” held at the SSBT’s College of Engineering and Technology, Bambhori, Jalgaon, on 23rd January 2010, organized by “National Safety Council, Mumbai chapter.
17. National Level Workshop on “Research Methodology” , held at the SSBT’s College of Engineering and Technology, Bambhori, Jalgaon from 17th to 19th October 2011, jointly organized by Department of Mechanical Engineering and Department of Business Administration.
18. National conference on “Recent Advances in Chemical Engineering”, held at University Department of Chemical Technology, North Maharashtra University, Jalgaon on 4th Feb.2012 organized by U.D.C.T., N.M.U., Jalgaon.
19. International Conference on “Global Trends in Engineering, Technology and Management”, held at SSBT’s COET, Bambhori, Jalgaon. On 9th to 11th January 29, 2015.
20. Training on, “Industrial Automation” held on 12.3.2015 to 13.3.2015, conducted by Technocrat’s Academy of Automation and Control Technology (TAACT), Nashik.
21. International Conference on “Global Trends in Engineering, Technology and Management”, held at SSBT’s COET, Bambhori, Jalgaon. on 4th to 6th January 2016.

HONORS & ACHIEVEMENTS

1. Dean for Faculty of Engineering, Technology and Architecture for the 24th Convocation Ceremony of North Maharashtra University, Jalgaon on 6.6.2016
2. Member of BOS of Chemical Engineering & Technology, NMU, Jalgaon
3. Member of 32/(5) Committee, NMU, Jalgaon.
4. Chairman, Lab Recognition committee , 2016 of NMU, Jalgaon.
5. Invited member for BOE of NMU, Jalgaon.
6. Member of LIC Report Scrutiny Committee 2016.
7. Certificate of recognition for outstanding result in the subject Biochemical Engineering, Oct.2015 examination.
8. Chairman LIC committee (Permanent Affiliation) of NMU, Jalgaon.
9. Organised Jalgaon District Level "Avishkar 2015", NMU, Jalgoan.
10. Sanyojan Samiti Pramukh for "Yuvarang 2015",NMU Jalgaon
11. Vice Chancellor's Research Motivation Scheme (VCRMS)" 2015, Shipharas Samiti Pramukh, NMU, Jalgaon.
12. Letter of Appreciation from MKCL on the eve of Teachers Day, 5.9.2013

PROFESSIONAL MEMBERSHIP:

1. Member of Board of Studies of Chemical Engineering and Technology, North Maharashtra University, Jalgaon.
2. Life Member of ISTE.
3. Life Member of AFST.
4. Life Member of BRSI
5. Life Member of IIChE , India

Dr. K.S.Wani

DEPARTMENT OF APPLIED SCIENCE

1.Name:-Dr. Motilal Panighrahi.
2.Date of Birth.:-27/06/1971
3.Educational Qualification :-M.Sc(Mathematics),Ph.D,
M.Phil, NET, NBHM.

4.Work Experience :
- Teaching :- 19years
- Research :- 08 Years
- Industry : --
- Others : --

5.Area of Specializations : ---
6.Subjects teaching at Under Graduate Level :
1) Engineering Math I 2)Engineering Math II 3)Engineering Math III 4) Probability Statistics 5) Numerical Analysis 6) Simulation and Modeling 7) Discrete Mathematics 8) Linear Algebra 9) Complex Analysis 10) Fuzzy Mathematics.

Post Graduate Level : --
7.Research guidance : Not Applicable

Masters's
Ph.D.

No. of papers published in
- National Journals 03
-International Journals05
- Conferences 01

8.Projects Carried out : - 02
9.Patents : - -
10.Technology Transfer : - -
11.Research Publications :
i) International Journals:--05

12.No. of Books published with details : - 1)Engg. Maths –I Prakash Publication

Signature

DEPARTMENT OF APPLIED SCIENCE

For each Faculty give a page covering
Name: Dr. KIRAN SAHEBRAO PATIL

1. Date of Birth: 14th MAY 1974
2. Educational Qualification: M. Sc.(PHYSICS.) Ph.D

3. Work Experience :
   - Teaching --17
   - Research ---04--
   - Industry -- --
   - Others -----
4. Area of Specializations: - Physics with Electronics
5. Subjects teaching at Under Graduate Level:
   i) Engineering Physics-I ii) Engineering Physics-II
   iii)Environmental Studies.
   Post Graduate Level: –
6. Research guidance: Not Applicable

	No. of papers published in
Master's	- National Journals
Ph.D.	-International Journals 06
	- Conferences 01

Projects Carried out :
Patents :

7. Technology Transfer : - -

8. Research Publications : --
   i) International Journals :

9.No. of Books published with details : --
11.Research Publications : --
   i) International Journals: 06

12.No. of Books published with details : - Engineering Physics-II (Nirali Publication)

Signature

DEPARTMENT OF APPLIED SCIENCE

1.Name:SUNITA SAHEBRAO PATIL
2.Date of Birth : 12TH MAY 1975
3.Educational Qualification : M.Sc.(Maths.) B.Ed.M.Phil

4.Work Experience :
- Teaching -- 16 years
- Research --
- Industry
- Others --

5.Area of Specializations :
6.Subjects teaching at Under Graduate Level :
i) Engineering Maths-I ii) Engineering Maths-II
iii) Engineering Maths-III iv) NACM

Post Graduate Level : --
7.Research guidance : Not Applicable

Masters's
Ph.D.

No. of papers published in
- National Journals-Nil
-International Journals 06
- Conferences 05

8.Projects Carried out : - -
9.Patents : - -
10.Technology Transfer : - -
11.Research Publications : --
i) International Journals 06

12.No. of Books published with details : -

Signature

DEPARTMENT OF APPLIED SCIENCE

For each Faculty give a page covering

Name: CHANDRASHEKHAR. UTTAMRAO. NIKAM.

1. Date of Birth: 05/06/1973
2. Educational Qualification: M.Sc.(Physics), B.Ed,
3. Work Experience : 09Years
   - Teaching 09 Years
   - Research -----
   - Industry -- --
   - Others -----
4. Area of Specializations: - Nuclear Physics
   Subjects teaching at Under Graduate Level:- i) Engineering Physics-I ii) Engineering Physics-II iii)Environmental Studies. iv) Optics v) Quantum mech., vi)Mathematical Phy., vii) Nuclear Physics.
   Post Graduate Level: - Nuclear Physics
5. Research guidance: Not Applicable

   Master's
   Ph.D.

   No. of papers published in
   - National Journals
   - International Journals
   - Conferences 01

   Projects Carried out :
   Patents :

6. Technology Transfer : - -
7. Research Publications : --
   i) International Journals :

9. No. of Books published with details : --
11. Research Publications : --
    i) International Journals

12. No. of Books published with details : - -

Signature

DEPARTMENT OF APPLIED SCIENCE

1.Name:-Deshpande Meera Vilas
2.Date of Birth.:-10/06/1975
3.Educational Qualification :-M.Sc(Mathematics),
B.Ed,M.Phil.

4.Work Experience : 15
- Teaching :- 15 years
- Research :---
- Industry : --
- Others : --

5.Area of Specializations : ---
6.Subjects teaching at Under Graduate Level :
1) Engineering Math I 2)Engineering Math II 3)Engineering Math III 4)F.Y.Bsc I,II,III 5)S.Y.Bsc I,II,III
Post Graduate Level : --
7.Research guidance : Not Applicable

	No. of papers published in
Masters's	- National Journals
Ph.D.	-International Journals
	-Conferences

8.Projects Carried out : - -
9.Patents : - -
10.Technology Transfer : - -
11.Research Publications :
i) International Journals:--

12.No. of Books published with details : - -

Signature

DEPARTMENT OF APPLIED SCIENCE

1.Name:- Parag V. Patil
2.Date of Birth.:- 20/01/1984
3.Educational Qualification :-M.Sc. (Mathematics),

4.Work Experience : 09
- Teaching :- 09years
- Research :---
- Industry : --
- Others : --

5.Area of Specializations : ---
6.Subjects teaching at Under Graduate Level :
1) Engineering Math I
2) 2)Engineering Math II
3) 3)Engineering Math III

Post Graduate Level : --
7.Research guidance : Not Applicable

Masters's
Ph.D.

No. of papers published in 05
National Journals 02
International Journals 03
Conferences 02

8.Projects Carried out : - -
9.Patents : - -
10.Technology Transfer : - -
11.Research Publications :
i) International Journals:--

12.No. of Books published with details : - -

Signature

DEPARTMENT OF APPLIED SCIENCE

For each Faculty give a page covering Name: Yeshwant Kondusing Chitte

1. Date of Birth: 2nd June 1969
2. Educational Qualification: M.A.(English), L.L.B., B.C.J.

3. Work Experience :
   - Teaching --14 yrs
   - Research -----
   - Industry -- --
   - Others -----
4. Area of Specializations: - English Literature
5. Subjects teaching at Under Graduate Level:
   i) Professional Communication
   Post Graduate Level: --
6. Research guidance: Not Applicable

	No. of papers published in
Master's	- National Journals
Ph.D.	- International Journals
	- Conferences

Projects Carried out :
Patents :

7. Technology Transfer : - -

8 Research Publications : --
   i) International Journals :

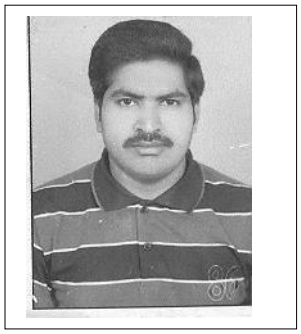
9. No. of Books published with details : --
10. Research Publications : --
    i) International Journals

11.No. of Books published with details : - -

Signature

DEPARTMENT OF APPLIED SCIENCE

For each Faculty give a page covering



Name: MAHENDRA BALU PATIL

01. Date of Birth: 01ST JUNE 1985
02. Educational Qualification: M. Sc. (PHYSICS.)

03. Work Experience:
    - Teaching --06 yrs
    - Research ---03
    - Industry -- --
    - Others -----
04. Area of Specializations: - ENERGY STUDIES
05. Subjects teaching at Under Graduate Level:
    i) Engineering Physics-I ii) Engineering Physics-II
    iii)Environmental Studies.
    Post Graduate Level: --
06. Research guidance: Not Applicable

	No. of papers published in
Master's	- National Journals
Ph.D.	- International Journals
	- Conferences

Projects carried out:
Patents :

07. Technology Transfer: - -

08. Research Publications: --
    i) International Journals : 01

9.No. of Books published with details : --
10. Research Publications : --
    i) International Journals

11.No. of Books published with details : - -

Signature

DEPARTMENT OF APPLIED SCIENCE

For each Faculty give a page covering

Name: Ujwalsing Tryambak Patil

01. Date of Birth: 10th July 1985
02. Educational Qualification: M.Sc. (Chem.)

03. Work Experience:
    - Teaching --4 yrs
    - Research -----
    - Others -----03 Years
04. Area of Specializations: - Organic Chemistry
05. Subjects teaching at Under Graduate Level:
    i) Engineering Chemistry-I ii) Engineering Chemistry -II
    iii)Environmental Studies.
    Post Graduate Level: --
06. Research guidance: Not Applicable

	No. of papers published in
Master's	- National Journals
Ph.D.	- International Journals
	- Conferences

Projects carried out:
Patents :

07. Technology Transfer: - -

08. Research Publications: --
    i) International Journals :

9.No. of Books published with details : --
10. Research Publications : --
    i) International Journals

11.No. of Books published with details : - -

Signature

DEPARTMENT OF APPLIED SCIENCE

For each Faculty give a page covering

Name: Anil Raju Mali

01. Date of Birth: 17th Oct 1987
02. Educational Qualification: M.Sc. (Chem.) NET,SET

03. Work Experience:
    - Teaching --4.9 yrs
    - Research -----
    - Industry -- --
    - Others -----
04. Area of Specializations: - Organic Chemistry
05. Subjects teaching at Under Graduate Level:
    i) Engineering Chemistry-I ii) Engineering Chemistry -II
    iii)Environmental Studies.
    Post Graduate Level: --
06. Research guidance: Not Applicable

	No. of papers published in
Master's	- National Journals
Ph.D.	- International Journals
	- Conferences

Projects carried out:
Patents :

07. Technology Transfer: - -

08. Research Publications: --
    i) International Journals :

9.No. of Books published with details : --
10. Research Publications : --
    i) International Journals

11.No. of Books published with details : - -

Signature

DEPARTMENT OF APPLIED SCIENCE

For each Faculty give a page covering
Name: Nago Bhika Bhoi.

1. Date of Birth: 22nd June 1986
2. Educational Qualification: M.A. English

3. Work Experience :
   - Teaching --6 yrs
   - Research -----
   - Industry -- --
   - Others -----
4. Area of Specializations: - English Literature
5. Subjects teaching at Under Graduate Level:
   i) Professional Communication
   Post Graduate Level: --
6. Research guidance: Not Applicable

	No. of papers published in
Master's	- National Journals
Ph.D.	- International Journals
	- Conferences

Projects Carried out :
Patents :

7. Technology Transfer : - -

9 Research Publications : --
i) International Journals :

9. No. of Books published with details : --
10. Research Publications : --
    i) International Journals

11.No. of Books published with details : - -

Signature

DEPARTMENT OF APPLIED SCIENCE

For each Faculty give a page covering
Name: Renuka Amrutlal Kukkar.

1. Date of Birth: 11May 1989
2. Educational Qualification: Msc. Bed

3. Work Experience :
   - Teaching --3 yrs
   - Research -----
   - Industry -- --
   - Others -----
4. Area of Specializations: - Mathematics
5. Subjects teaching at Under Graduate Level:
   Engineering Math II
   Post Graduate Level: --
6. Research guidance: Not Applicable

Master's
Ph.D.

No. of papers published in
-National Journals
-International Journals
-Conferences

Projects Carried out :
Patents :

7. Technology Transfer : - -

10 Research Publications : --
   i) International Journals :

9. No. of Books published with details : --
10. Research Publications : --
    i) International Journals

11.No. of Books published with details : - -

Signature

DEPARTMENT OF APPLIED SCIENC
For each Faculty give a page covering

Name: Ms. Hemlata Abhijeet Wani

01. Date of Birth: 21st January 1981
02. Educational Qualification: M.Sc,B.Ed ,M.Phil.

03. Work Experience:
- Teaching --9.5 yrs
- Research -----
- Industry -- --
- Others ------

04. Area of Specializations: - Analytical Chemistry
05. Subjects teaching at Under Graduate Level:
i) Engineering Chemistry-I ii) Engineering Chemistry -II
.
Post Graduate Level: --
06. Research guidance: Not Applicable

Master's
Ph.D.

No. of papers published in
-National Journals
-International Journals - 02
-Conferences -01

Projects carried out:
Patents :

07. Technology Transfer: - -

08. Research Publications: --
i) International Journals :

9.No. of Books published with details : --
10. Research Publications : --
i) International Journals

11.No. of Books published with details : - -

Signature

DEPARTMENT OF APPLIED SCIENCE

1.Name:**KHAMBAYAT AVINASH VASANTRAO**
2.Date of Birth : 11/02/1972
3.Educational Qualification : M.Sc.(Maths.) ,M.Phil

4.Work Experience :
- Teaching -- 16 years
- Research --
- Industry
- Others --

5.Area of Specializations :
6.Subjects teaching at Under Graduate Level :
i) Engineering Maths-I ii) Engineering Maths-II
iii) Engineering Maths-III iv) FY /SY BSC- MI,MII,MIII v)DSGT

Post Graduate Level : --
7.Research guidance : Not Applicable

Masters's
Ph.D.

No. of papers published in
- National Journals-Nil
-International Journals 05
- Conferences 08

8.Projects Carried out : - -
9.Patents : - -
10.Technology Transfer : - -
11.Research Publications : --
i) International Journals 05

12.No. of Books published with details : -

Signature

DEPARTMENT OF APPLIED SCIENCE

1.Name: **Dr. (Mrs) Edlabadkar Vrishali U.**
2.Date of Birth : 29/08/1976
3.Educational Qualification : M.Sc.(Maths.) ,Ph. D., PGDEA

4.Work Experience :

- Teaching – 14.5 years
- Research --
- Industry
- Others --

5.Area of Specializations : Relativity and Cosmology
6.Subjects teaching at

Under Graduate Level :

i) Engineering Maths-I ii) Engineering Maths-II
iii) Engineering Maths-III iv) Calculus I and II to B. Sc. Actuarial Sciences

Post Graduate Level : – M. Sc. Mathematics

i) Transform theory ii) Classical Mechanics
iii) Differential Equations

7.Research guidance : Approved Supervisor for RTM Nagpur University, Nagpur.

Masters's : Nil
Ph.D. : Nil

No. of papers published in
-National Journals- 01
-International Journals 06
- Conferences Nil

8.Projects Carried out : - -
9.Patents : - -
10.Technology Transfer : - -
11.Research Publications : --
i) International Journals 06

12.No. of Books published with details : -

Signature

B – BIOTECHNOLOGY

FACULTY PROFILE

1. Name : Dr. INDRASING DAGADU PATIL

2. Date of Birth : 1st June 1972

3. Educational Qualification : M.Sc. (Chem.Tech),

Ph.D. (Chem. Tech.)

4.Work Experience :

- Teaching 20 yrs
- Research 19 yrs
- Industry Nil
- Others

5.Area of Specializations : Chemical Technology, Polymer Engineering, Bioprocess Engineering

6.Subjects teaching at Under Graduate Level : i) Bioprocess calculations ii) IPR & Entrepreneurship

7.Research guidance :

Masters's - 01 on going

Ph.D. - 04 ongoing

No. of papers published in

National Journals: 00

International Journals: 14

Conferences: 14

8.Projects Carried out : - 02

9.Patents :- 00

10.Technology Transfer : - -

11.Research Publications: 28

FACULTY PROFILE

1. **Name :** Mrs. Sarika Shantanu Pawar
2. **Date of Birth :** 15th Jan 1982
3. Educational Qualification : B. Tech . (Chemical Engg.)
   M. Tech (Chemical Engg.)
   GATE qualified (All India Rank 327)
   Ph. D (Pursuing)
4. **Work Experience :**
   - Teaching 08 yrs
   - Research ---
   - Industry -- --
   - Others -----
5. **Area of Specialization:** Chemical Engg.
6. **Subjects teaching at**

   Under Graduate Level:--

   (i) Mass transfer ii) Unit Operation I (iii)Bio Instrumentation & Analysis (iv) Unit Operation II (v) Process heat transfer, vi) Chemical Reaction Engineering

7. **Research guidance :** Not Applicable

No. of papers published in

Masters's **National Journals:** Nil

Ph.D. **International Journals:** 01

Conferences -01

8. **Projects carried out:** Nil
9. **Technology Transfer:** Nil
10. **Research Publications:** 02
11. **No. of Books published with details:** Nil

FACULTY PROFILE

1. **Name :** Mr. Jayant P.Parpalliwar
2. **Date of Birth :** 22nd July 1986
3. **Educational Qualification :** B.Tech . (Biotechnology)
   ME(Biotech & Biochem Engg) pursuing
4. **Work Experience :**
   - Teaching 7.5 Year
   - Research ---
   - Industry -- --
   - Others -----
5. **Area of Specialization:** Biotechnology
6. **Subjects teaching at**

   Under Graduate Level:--

   i) Enzyme Engineering, ii) Molecular Biology, iii) Genetic Engineering iv) Biotechnology of Waste Treatment, v) Pharmaceutical Biotechnology, vi) Bioprocess Industries.

7. **Research guidance :** Not Applicable

No. of papers published in

Masters's: Nil **National Journals:** Nil

Ph.D.:- Nil **International Journals:-** 03

Conferences: 03

8 **Projects carried out: 02**

9. **Technology Transfer:**

10. **Research Publications:** 06

11. **No. of Books published with details:** Nil

FACULTY PROFILE

7. **Name :** Mr. Gaurav D. Khodape
8. **Date of Birth :** 05/02/1988
9. **Educational Qualification :** M. Tech. (Biotechnology)

10. **Work Experience :**
    - Teaching 2.7 Year
    - Research ---
    - Industry -- --
    - Others -----
11. **Area of Specialization:** Biotechnology
12. **Subjects teaching at**

Under Graduate Level:--i) Bioinformatics ii) Plant Tissue Culture iii) Bioprocess Industrial Economics &Management iv) Bioprocess Modelling and Simulation. v) Computer Application, vi) Bioprocess Equipment Design, vii) Bioprocess Engineering

7. Research guidance : Not Applicable

No. of papers published in

Masters's: Nil **National Journals:**

Ph.D.:- Nil **International Journals:-** 01

Conferences: 01

9 Projects carried out:

9. Technology Transfer:

10. Research Publications: 02

11. No. of Books published with details: Nil

FACULTY PROFILE

1. **Name :** Mr.Vikas Tulshiram Dongardive
2. **Date of Birth** : 15th Apr, 1990.
3. **Educational Qualification :** B.E.(Biotechnology)
   M.Tech (Biotechnology

4.**Work Experience :**

- Teaching : 01 Year
- Research ---
- Industry -- --
- Others -----

5. Area of Specialization: Biotechnology

6.Subjects teaching at

Under Graduate Level:--i) Enzyme Engineering ii) Molecular Biology iii) Food Biotechnology

7. Research guidance : Not Applicable

No. of papers published in

Masters's: Nil **National Journals:** Nil

Ph.D.:- Nil **International Journals:- 01**

Conferences: 03

8. Projects carried out:

9. Technology Transfer: Nil

10. Research Publications: Nil

11. No. of Books published with details: Nil

FACULTY PROFILE

1. **Name :** Ms. Aaisha Sayyad
2. **Date of Birth** : 3rd Feb, 1993.
3. **Educational Qualification :** B.E.(Biotechnology)

4.**Work Experience :**

- Teaching : 11 months
- Research ---
- Industry -- --
- Others -----

5. Area of Specialization: Biotechnology

6.Subjects teaching at

Under Graduate Level:--i) Cell Biology ii) Soft Skill iii) Biochemistry iv) Immunology, v)Fermentation Technology

7. Research guidance : Not Applicable

No. of papers published in

Masters's: Nil **National Journals:** Nil

Ph.D.:- Nil **International Journals:- 01**

Conferences: 01

8. Projects carried out:

9. Technology Transfer: Nil

10. Research Publications: 02

11. No. of Books published with details: Nil

SHRAM SADHANA BOMBAY TRUST'S COLLEGE OF ENGINEERING AND TECHNOLOGY, BAMBHORI, JALGAON.

CIVIL ENGINEERING DEPARTMENT

FACULTY PROFILE

1. Name – Dr. M.Husain
2. Date of Birth -5-12-1969
3. Educational Qualification - Ph.D.
4. Work Experience –

   Teaching – 20 Yrs. (UG), 9 years PG (inclusive)

   Research – Nil

   Industry – Six months

   Others - Nil

5. Area of Specialization – Environmental Engineering
6. Subject teaching at under graduate level –

1. Environmental Engg I
2. Environmental Engg II.
3. Elements of Civil Engg and Engineering Mechanics.
4. Theory of Structures I

   At post graduate level – 1. Environmental Engineering Chemistry,

   2. Solid Waste Management

7. Research guidance –

   Masters - 12

   Ph.D. - 10

8. Projects carried out –

   1. Project Titled Experimental Investigations on Salt Gradient Solar Pond costing 125000/- under Shram Sadhana Research Promotion Scheme

   2. IEDC – 1lakh -2013-14

   3. VCRMS – NMU, Jalgaon – 48000/- 2014-16

9. Patents – Nil

10. Technology Transfer – Nil
11. Research Publication –

    National Journals – Nil

    International Journals - 16

    Conferences - 16
12. No. of books published with details - 1 (Everest publication Elements of Civil Engineering)

Signature

FACULTY PROFILE

1. Name – Shivraj L. Patil
2. Date of Birth –1-1-1962
3. Educational Qualification - M.Sc. (Tech)
   Ph. D.
4. Work Experience –
   Teaching – 27 Yrs.
   Research – 3 years (inclusive)
   Industry – Nil
   Others - Nil
5. Area of Specialization – Applied Geology
6. Subject teaching at under graduate level –
   1. Engineering Geology
   2. Watershed management
   3. Elements of Civil Engg and Engineering Mechanics
   4. Surveying I

   At post graduate level – Watershed management
7. Research guidance –
   Masters - 02
   Ph.D. - Nil
8. Projects carried out - Nil
9. Patents – Nil
10. Technology Transfer – Nil
11. Research Publication –
    National Journals - Nil
    International Journals - 08
    Conferences - 16
12. No. of books published with details - 1 (Everest Publication, Pune, Elements of Civil Engineering)

Signature

FACULTY PROFILE

1.Name - Sudhakar Bhika Pawar

1. Date of Birth – 5-10-1966
2. Educational Qualification – M.E. (Civil)
3. Work Experience –

   Teaching – 25 Yrs.

   Research – 02

   Industry – 1.5 Yrs.

   Others - Nil
4. Area of Specialization – Civil (Construction)
5. Subject teaching at under graduate level –

   1. Surveying II
   2. Building Construction and Material

   At post graduate level – Nil
7. Research guidance –

   Masters - 01

   Ph.D. - Nil
8. Projects carried out – Nil
9. Patents – Nil
10. Technology Transfer – Nil
11. Research Publication – National Journals - Nil

    International Journals - 02

    Conferences - 03
12. No. of books published with details - Nil

Signature

FACULTY PROFILE

1. Name - Pravin Ashok Shirule.

2. Date of Birth – 07-6-1973

3. Educational Qualification - M .E. (Civil)

- Ph.D. Persuing

4. Work Experience –

Teaching – 18 Yrs.

Research – Nil

Industry – 1

Others - Nil

5. Area of Specialization – Environmental Engineering

6. Subject teaching at under graduate level –

1. Elements of Civil Engineering and Engineering Mechanics
2. Strength of Materials
3. Structural Design and Drawing III

At post graduate level –

1. Environmental Sanitation
2. Design Operation and maintenance of water supply and sewerage systems

7. Research guidance –

Masters - 07

Ph.D. - Nil

8. Projects carried out –

Sr No	Title of Project	Duration		Grants Received	Funding Agency
		From	To		
01	"An evolutionary approach to reuse	2013	2014	905000/-	MODROB AICTE,

	environmentally nuisance discarded tyre rubber as concrete aggregate"				New Delhi.
02	Seismic Response Analysis of Base Isolated Multistoried Building.	2013	2015	173000/-	UGC, New Delhi.
03	Investigation of Sound and Heat Insulation Properties of Rubberized Concrete.	2012	2013	100000/-	IEDC, DST New Delhi.
04	Steel Scrap Fiber Reinforced Concrete.	2013	2014	100000/-	IEDC, DST New Delhi.
05	"An evolutionary approach to reuse environmentally nuisance discarded tyre rubber as concrete aggregate"	2012	2014	152000/-	SSRP Scheme of SSBT's C. O. E. T., Bambhori, Jalgaon, (MS)

9. Patents – Nil

10. Technology Transfer – Nil

11. Research Publication –

National Journals - Nil

International Journals - 15

Conferences - 15

12. No. of books published with details – One ("Elements of Civil engineering and Engineering Mechanics)

Signature

FACULTY PROFILE

1. Name - Farooq I. Chavan
2. Date of Birth – 13-5-1974
3. Educational Qualification - M.E. (Civil)
4. Work Experience –

   Teaching – 17.5 Yrs.

   Research – Nil

   Industry – Nil

   Others - Nil

5. Area of Specialization – Environmental Engineering, Structural Engineering
6. Subject teaching at under graduate level –

   1. Engineering Mechanics and Elements of Civil Engineering
   2. Strength of materials
   3. Water resources engineering II
   4. Fluid Mechanics I

   At post graduate level –

   1. Environmental Engineering Chemistry
   2. Industrial water and waste Treatment Technology

7. Research guidance –

   Masters - l0

   Ph.D. - Nil

8. Projects carried out – Nil
9. Patents – Nil
10. Technology Transfer – Nil
11. Research Publication –

    National Journals - Nil

    International Journals - 02

Conferences - 07

12. No. of books published with details - Nil

Signature

FACULTY PROFILE

1. Name – Jayant N.Kale

2. Date of Birth – 25th Dec 1965

3. Educational Qualification - B.E. (Civil Engineering)
M E (Construction Technology)

4. Work Experience –

Teaching – 6 years.

Research – Nil

Industry – 18 yrs

Others - Nil

5. Area of Specialization – Construction technology

6. Subject teaching at under graduate level –1. Engineering Mechanics
2. Construction Management

At post graduate level – Nil

7. Research guidance –

Masters - Nil

Ph.D. - Nil

8. Projects carried out – Nil

9. Patents – Nil

10. Technology Transfer – Nil

11. Research Publication – National Journals - Nil
International Journals - 02
Conferences - 03

12. No. of books published with details - Nil

Signature

FACULTY PROFILE

1. Name – Sonali B Patil
2. Date of Birth – 28-11-1979
3. Educational Qualification - B.E. Civil
   M E (Environmental Engineering)
4. Work Experience –
   Teaching – 7 Yrs.
   Research – Nil
   Industry – Nil
   Others - Nil
5. Area of Specialization – Environmental Engineering
6. Subject teaching at under graduate level –
   1. Water Resources Engineering I 2. Fluid Mechanics II
   3. Fluid Mechanics I 4. Environmental Engineering I
   5. Industrial water pollution control

   At post graduate level –
   1. Air Pollution
   2. LAB Practice II
7. Research guidance –
   Masters - 05
   Ph.D. - Nil
8. Projects carried out – Nil
9. Patents – Nil
10. Technology Transfer – Nil
11. Research Publication – National Journals - Nil
    International Journals - 03
    Conferences – 03

12. No. of books published with details – Nil

Signature

FACULTY PROFILE

1. Name – Jyoti Raghunath Mali.
2. Date of Birth – 23-04-1971
3. Educational Qualification - M.E. Civil
4. Work Experience –

   Teaching – 7 years.

   Research – Nil

   Industry – Nil

   Others - 5

5. Area of Specialization – Environmental engineering
6. Subject teaching at under graduate level – 1. Engineering Mechanics
   2. Concrete technology
   3. Theory of structures I
   4. Infrastructure engg. II
   5. Structural design and drawing
   6. Building design and drawing

   At post graduate level –

   1. Design, Maintenance of water supply and sewerage system
   2. Advanced waste water engg.

7. Research guidance –

   Masters - 06

   Ph.D. - Nil

8. Projects carried out – Nil
9. Patents – Nil
10. Technology Transfer – Nil
11. Research Publication – National Journals - 07
    International Journals - 06
    Conferences - 05

12. No. of books published with details.

Signature

FACULTY PROFILE

1. Name – Mr. Ravinder Kohli
2. Date of Birth -30-07-1970
3. Educational Qualification - M.E. (Environmental Engineering)
4. Work Experience –

   Teaching – 11 Yrs. (UG),

   Research – Nil

   Industry – 11 Yrs.

   Others - Nil

5. Area of Specialization – Environmental Engineering
6. Subject teaching at under graduate level –

1. Environmental Engg I
2. Environmental Engg II.
3. Elements of Civil Engg and Engineering Mechanics.
4. Water Resource Engineering-I and II

7. Research guidance –

   Masters - Nil

   Ph.D. - Nil

8. Projects carried out –

   1. Design and Execution of ETPs at Different Industries.

   2. Air Pollution control device and Stacks for lime industries in Uttarakhand.

   3. Vermi composting units with Ahaliya Mata Gaoushala, Indore, MP.

9. Patents – Nil
10. Technology Transfer – Nil
11. Research Publication –

National Journals – 03

International Journals - 01

Conferences - 12

12. No. of books published with details - Nil

Signature

FACULTY PROFILE

1. Name – Mr. Basweshawar Subhash Jirwankar
2. Date of Birth -11-04-1990
3. Educational Qualification - M.E. (Environmental Engineering) Pursuing
4. Work Experience –

   Teaching – 2 Yr. (UG),

   Research – Nil

   Industry – 0.8 Yrs.

   Others - Nil

5. Area of Specialization – Transportation Engineering and Management
6. Subject teaching at under graduate level –
   1. Transportation Engineering-I
   2. Basics of Civil Engg.
   3. Pavement Design.
   4. Infrastructure Engineering-I
   5. Environmental Engineering-I
   6. Advanced Surveying
7. Research guidance –

   Masters - Nil

   Ph.D. - Nil

8. Projects carried out –
   1. Analysis to develop Intelligent Transport System for Nagpur City.
   2. Analysis of Properties of Aggregate with the help of Digital Image Process.
9. Patents – Nil
10. Technology Transfer – Nil
11. Research Publications -National Journals – Nil

International Journals - 02

Conferences - 06

12. No. of books published with details – 01. Construction of Economics and Finance for Nagpur University,

Signature

FACULTY PROFILE

1. Name – Durgesh Gulabsing Pardeshi.

2. Date of Birth – 04/01/1989

3. Educational Qualification - B .E. (Civil)

- M.E. Persuing

4. Work Experience –

Teaching – 4 Yrs.

Research – Nil

Industry – Nil

Others - Nil

5. Area of Specialization –Building Science & Technology

6. Subject teaching at under graduate level –

1. Building Design & Drawing.
2. Water Resource Engineering-II
3. Quantity Surveying & Valuation
4. Elements of Civil Engineering and Engineering Mechanics
5. Geotechnical Engineering –II
6. Geotechnical Engineering –I

7. Research guidance –

Masters - Nil

Ph.D. - Nil

8. Projects carried out – Nil

9. Patents – Nil

10. Technology Transfer – Nil

11. Research Publication –

National Journals - Nil

International Journals - Nil

Conferences - 03

12. No. of books published with details – Nil

Signature

FACULTY PROFILE

1. Name – Mr. Charudatta Prakash Thosar
2. Date of Birth -25-11-1993
3. Educational Qualification - M.E. (Environmental Engineering) Pursuing
4. Work Experience –

   Teaching – 1 Yr. (UG),

   Research – Nil

   Industry – 0.4 Yrs.

   Others - Nil

5. Area of Specialization – Environmental Engineering
6. Subject teaching at under graduate level –

1. Geo technical Engineering-I
2. Elements of Civil Engg and Engineering Mechanics.
3. Water Resource Engineering-I and II

7. Research guidance –

   Masters - Nil

   Ph.D. - Nil

8. Projects carried out –

   1. Use of Waste plastic in concrete with the partial replacement of sand.

9. Patents – Nil
10. Technology Transfer – Nil
11. Research Publication –

    National Journals – Nil

    International Journals - Nil

    Conferences - 01

12. No. of books published with details - Nil

Signature

FACULTY PROFILE

1. Name – Miss. Vrushali Tayade
2. Date of Birth – 26/01/1992
3. Educational Qualification - B.E. Civil Engineering
4. Work Experience –

   Teaching – 3 Yrs. (UG),

   Research – Nil

   Industry – Nil

   Others - Nil

5. Area of Specialization – Civil Engineering
6. Subject teaching at under graduate level –

1. Theory of Structures- II
2. Fluid Mechanics -I
3. Water Resource Engineering-II
4. Construction Management- I
5. Infrastructure Engineering- I
6. Elements of Civil Engineering and Engineering Mechanics

7. Research guidance –

   Masters - Nil

   Ph.D. - Nil

8. Projects carried out –

   1. Analysis of Quality control and Safety of Highway Infrastructure.

9. Patents – Nil
10. Technology Transfer – Nil
11. Research Publication –

National Journals – Nil

International Journals - Nil

Conferences - 01

12. No. of books published with details - Nil

Signature

FACULTY PROFILE

1. Name – Miss. Dipali Shahane
2. Date of Birth – 09/11/1993
3. Educational Qualification - B.E. Civil Engineering
4. Work Experience –

   Teaching – 1.2 Yr. (UG),

   Research – Nil

   Industry – 0.6 Yrs.

   Others - Nil

5. Area of Specialization – Civil Engineering
6. Subject teaching at under graduate level –

1. Concrete Technology
2. Building Construction
3. Transportation Engineering-I
5. Construction Materials

7. Research guidance –

   Masters - Nil

   Ph.D. - Nil

8. Projects carried out –

   1. River Linking

9. Patents – Nil
10. Technology Transfer – Nil
11. Research Publication –

National Journals – Nil

International Journals - Nil

Conferences - Nil

12. No. of books published with details - Nil

Signature

FACULTY PROFILE

1. Name – Mr. Pankaj Ramdas Punase
2. Date of Birth – 05/08/1991
3. Educational Qualification - M.E. Structural Engineering
4. Work Experience –

   Teaching – 1.8 Yrs. (UG),

   Research – Nil

   Industry – Nil

   Others - Nil

5. Area of Specialization – Structural Engineering
6. Subject teaching at under graduate level –

   1. Theory of Structures- II

   2. Elements of Civil Engineering and Engineering Mechanics

   3. Structural Design -I and II

7. Research guidance –

   Masters - Nil

   Ph.D. - Nil

8. Projects carried out –

   1. Experimental Analysis of Scrap Tyre Rubber Aggregates an Steel Scraps Infilled Beams by Method of Initial Functions.

9. Patents – Nil
10. Technology Transfer – Nil
11. Research Publication –

    National Journals – 02

    International Journals - 01

    Conferences - 02

12. No. of books published with details - Nil

Signature

FACULTY PROFILE

1. Name – Mr. Ketan Mahajan
2. Date of Birth – 05/02/1993
3. Educational Qualification - M.E. Structural Engineering (Pursuing)
4. Work Experience –
   Teaching – 1 Yr. (UG),
   Research – Nil
   Industry – 1 Yr
   Others - Nil
5. Area of Specialization – Structural Engineering
6. Subject teaching at under graduate level –
   1. Theory of Structures- II
   2. Elements of Civil Engineering and Engineering Mechanics
   3. Structural Design -I and II
7. Research guidance –
   Masters - Nil
   Ph.D. - Nil
8. Projects carried out –
   1.Design and analysis of check dam.
9. Patents – Nil
10. Technology Transfer – Nil
11. Research Publication –
    National Journals – 02
    International Journals - 01
    Conferences - 02

12. No. of books published with details - Nil

Signature

FACULTY PROFILE

1. Name – Mrs. Priyanka Ashok Nehete
2. Date of Birth – 03/02/1991
3. Educational Qualification - M.E. Environmental Engineering (Pursuing)
4. Work Experience –

   Teaching – 2 Yr. (UG),

   Research – Nil

   Industry – Nil

   Others - Nil
5. Area of Specialization – Environmental Engineering
6. Subject teaching at under graduate level –

   1. Environmental Engineering -1

   2. Transportation Engineering-I

   3. Water Resource Engineering-I
7. Research guidance –

   Masters - Nil

   Ph.D. - Nil
8. Projects carried out –

   1.Biomedical Waste Management in Hospitals (Jalgaon City)
9. Patents – Nil
10. Technology Transfer – Nil
11. Research Publication –

    National Journals – Nil

    International Journals - Nil

Conferences - 02

12. No. of books published with details - Nil

Signature

FACULTY PROFILE

1. Name – Miss. Swati Yeshirao
2. Date of Birth – 01/09/1993
3. Educational Qualification - M.E. Environmental Engineering (Pursuing)
4. Work Experience –

   Teaching – 2 Yr. (UG),

   Research – Nil

   Industry – Nil

   Others - Nil

5. Area of Specialization – Environmental Engineering
6. Subject teaching at under graduate level –

   1. Environmental Engineering -1

   2. Transportation Engineering-I

   3. Water Resource Engineering-I

7. Research guidance –

   Masters - Nil

   Ph.D. - Nil

8. Projects carried out –

   1.Solid waste management by vermicomposting.

9. Patents – Nil
10. Technology Transfer – Nil
11. Research Publication –

    National Journals – Nil

    International Journals - Nil

    Conferences - 02

12. No. of books published with details - Nil

Signature

FACULTY PROFILE

1. Name – Mr. Kuldip Rajendra Patil
2. Date of Birth – 12/09/1993
3. Educational Qualification - B.E. Civil Engineering
4. Work Experience –

   Teaching – 1 Yr. (UG),

   Research – Nil

   Industry – Nil

   Others - Nil
5. Area of Specialization – Civil Engineering
6. Subject teaching at under graduate level –

   1. Surveying -1

   2. Geo technical Engineering-I

   3. Strength of materials

   4. Elements of Civil Engineering and Engineering Mechanics
7. Research guidance –

   Masters - Nil

   Ph.D. - Nil
8. Projects carried out –

   1.Waste Water Treatment By Using Algae & Slow Sand Filter
9. Patents – Nil
10. Technology Transfer – Nil
11. Research Publication –

    National Journals – Nil

    International Journals - Nil

    Conferences - Nil

12. No. of books published with details - Nil

Signature

FACULTY PROFILE

1. Name – Mr. Tushar Rajput
2. Date of Birth – 17/10/1993
3. Educational Qualification - B.E. Civil Engineering
4. Work Experience –

   Teaching – 1 Yr. (UG),

   Research – Nil

   Industry – Nil

   Others - Nil

5. Area of Specialization – Civil Engineering
6. Subject teaching at under graduate level –

   1. Surveying -II

   2. Geo technical Engineering-I

   3. Building Drawing

   4. Concrete Technology

7. Research guidance –

   Masters - Nil

   Ph.D. - Nil

8. Projects carried out –

   1.Waste Water Treatment By Using Algae & Slow Sand Filter

9. Patents – Nil
10. Technology Transfer – Nil
11. Research Publication –

    National Journals – Nil

    International Journals - Nil

    Conferences - Nil

12. No. of books published with details - Nil

Signature

FACULTY PROFILE

1. Name – Mr. Sagar Patil
2. Date of Birth – 30/12/1992
3. Educational Qualification - B.E. Civil Engineering
4. Work Experience –

   Teaching – 1 Yr. (UG),

   Research – Nil

   Industry – Nil

   Others - Nil

5. Area of Specialization – Civil Engineering
6. Subject teaching at under graduate level –

   1. Infrastructure Engineering -I

   2. Concrete Technology

   3. Fluid Mechanics- II

7. Research guidance –

   Masters - Nil

   Ph.D. - Nil

8. Projects carried out –

   1.Waste Water Treatment By Using Algae & Slow Sand Filter

9. Patents – Nil
10. Technology Transfer – Nil
11. Research Publication –

    National Journals – Nil

    International Journals - Nil

    Conferences - Nil

12. No. of books published with details - Nil

Signature

B – CHEMICAL ENGINEERING

FACULTY PROFILE

1.Name : DR.KISHOR SOPAN WANI

2.Date of Birth : 24th September 1959

3.Educational Qualification: M Tech. (Chemical Technology), D.B.M.,

Ph. D : Biotechnology

4.Work Experience

- Teaching 30 yrs
- Research 08 yrs
- Industry : --
- Others : --

5.Area of Specializations : Chemical Engineering &Technology ,Biotechnology.

6.Subjects teaching at Under Graduate Level :

i) Chemical Reaction Engineering – I ii) Process Engineering Economics & Costing

iii) Biochemical Engineering

Post Graduate Level: --

7.Research guidance : Recognized Ph.D. guide in Chemical Engineering & Technology of N.M.U., Jalgaon

No. of Ph.D.'s guided: 01, No. of students pursuing Ph.D.: 04, No. of M.E. Projects Guided: 06

No. of papers published in

Masters's : - - - National Journals : 01

Ph.D.: - - -International Journals: 24

-Conferences: 21

8.Projects Carried out : 02

9.Patents : - 01

10.Technology Transfer : - -

11.Research Publications : 25

12.No. of Books published with details : -01, Chapter in Encyclopedia of Bioresorces Technology Published by Haworth Press Publication, New York

FACULTY PROFILE

1.Name : VIJAY RAMKRISHNA DIWARE

2.Date of Birth : 10th October 1965

3.Educational Qualification : B.Tech. (Chemical),

Ph.D (Chemical Technology)

PGDPM

4.Work Experience

- Teaching 19 yrs
- Research 0 6 yrs
- Industry 0 8 yrs
- Others

5.Area of Specializations : Chemical Technology

6.Subjects teaching at Under Graduate Level :

i) Chemical Reaction Engineering – II ii) Chemical Plant Design and Project Engineering iii) Process Equipment Design– I and II

Post Graduate Level : --

7.Research guidance : Not Applicable

No. of papers published in

Masters's : - - - National Journals : ---

Ph.D.: - - -International Journals :20

-Conferences : 20

8.Projects Carried out : - 02

9.Patents : - -

10.Technology Transfer : - -

11.Research Publications : 20

12.No. of Books published with details : - -

FACULTY PROFILE

1. Name : Dr.A.R.LOKHANDE
2. Date of Birth : 18th October 1959
3. Educational Qualification : M.Tech.(Chem. Tech) ,D.B.M.
   D.C.A. MIE.(Chem)
   Ph.D (Chemical Engineering)

Work Experience :

- Teaching: 14 yrs
- Research :08 yrs
- Industry : 17 yrs
- Others : --

4. Area of Specializations: : Chemical Engineering &Technology ,
   Solvent Extraction Plant, Vegetable Oil Refinery

5. Subjects teaching at Under Graduate Level:
i) Energy Engineering. ii) Computer aided Process Equipment Design , Modeling and Simulation iii) Mechanical Operations iv) Process Heat Transfer

Post Graduate Level : -- -

7. Research guidance : Not Applicable

No. of papers published in

Masters : - -

Ph.D.: -- -

- National Journals :06
- International Journals: 04
- Conferences: 09

8. Projects Carried out : Studies of Alkanolamides & Metallic Soap from Non Traditional Oils.

9. Patents : - -
10. Technology Transfer : - -
11. AICTE Fund:- Received Travel grant from AICTE
12. Sponsership:-IEDC sanctioned Rs.1 lakh for project entitled,
    1.Preparation of Greases From Non-Traditional Oils
    2.Effective Recycling of Paper Waste
13. Research Publications : 10

14. No.of Books published with details : - -

FACULTY PROFILE

1.Name: Dr.SANDEEP AVINASH THAKUR

2.Date of Birth : 17th September 1968

3.Educational Qualification : M.Tech. (Chemical Engineering)

MBA, Ph.D (Management)

4.Work Experience :

- Teaching: 18 yrs
- Research 06 yrs
- Industry: 08 yrs
- Others -- -

5.Area of Specializations : Chemical Engineering and Management

6.Subjects teaching at Under Graduate Level :

i) Process Dynamics & Control ii) Mass Transfer – I iii) Process Engineering Economics & Costing iv) Industrial Economics & Management v) Plant Utility

Post Graduate Level : --

7. Research guidance : Not Applicable

No. of papers published in

Masters: - - - National Journals: 01

Ph.D: - - -International Journals: 10

-Conferences : 16

8.Projects Carried out : 01

9.Patents : - -

10.Technology Transfer : - -

11.Research Publications : 11

12.No. of Books published with details : -01

1. **Thakur S.A.** and Gupta R.H. (2011), "Customer Satisfaction and Role of Agents in Life Insurance Industry: A Special Reference to Jalgaon and Akola City of Maharashtra State", Nurturing Service Industry for Economic Development, Himalaya Publishing House, ISBN: 978-93-5024-768-6, Page 274-280.

FACULTY PROFILE

1.Name : VIJAY PRABHAKAR SANGORE

2.Date of Birth : 29th December 1972

3.Educational Qualification : M.Sc. (Poly. Chemistry)

Ph.D (Pursuing)

4.Work Experience

- Teaching -19 yrs
- Research – 05 year
- Industry - ---
- Others -- --

5.Area of Specializations: Polymer Chemistry

6.Subjects teaching at Under Graduate Level :

i) Chemical Engineering Processes-I iii) Applied Organic Chemistry iv) Applied Inorganic Chemistry v) Applied Physical Chemistry

Post Graduate Level : - -

7.Research guidance : Not Applicable

No. of papers published in

Masters's : - - National Journals: - -

Ph.D.: - - International Journals: - 02

Conferences: 15

8.Projects Carried out : - -

9.Patents : - -

10.Technology Transfer : - -

11.Research Publications : 02

12.No. of Books published with details: - -

FACULTY PROFILE

1 Name : NIKHIL YESHWANT GHARE

2. Date of Birth : 14 January 1968

3. Educational Qualification : B.Tech. (Chem. Engg.)

M.E (Chem. Engg.)

Ph.D (Pursuing)

4. Work Experience :

- Teaching: 12 yrs Research :12 yrs
- Industry :05 yrs Others : 02 yrs

5. Area of Specializations : Chemical Engineering, Waste Water Engineering

6 Subjects teaching at Under Graduate Level

i) Transport Phenomenon ii) Chemical Engineering Thermodynamics

iii) Mass Transfer-II iv) Process Calculation

Post Graduate Level : - -

7. Research guidance : Not Applicable

No. of papers published in

Masters's: - - National Journals : 03

Ph.D: - - International Journals : 03

Conferences :05

8.Projects Carried out : 02

i) College Level : Recovery of Hydrochloric Acid from Pickling Waste Water

ii) IEI Sponsored : Recovery of Acids(Sulphuric/Nitric Acid) from Industrial Waste Water

9. Patents : -- --

10. Technology Transfer : - -

11. Research Publications: 06

12.No of Books published with details : - -

FACULTY PROFILE

1. Name : YOGENDRA DEBIDAS THAKARE
2. Date of Birth : 19/02/1989
3. Educational Qualification :B.E.(Chemical Engineering)
   M. Tech (Chemical Engineering)
   Ph. D (Pursuing)
4. Work Experience:
   - Teaching : 2 Years
   - Research : -- --
   - Industry : - - -
   - Others : ----
5. Area of Specializations: Chemical Engineering
6. Subjects teaching at Under Graduate Level:
   i) Fluid Flow Operation ii) Instrumentation & Instrumental Analysis iii) Chemical Engineering Thermodynamics iv) Industrial Pollution Control
   Post Graduate Level: - -
7. Research guidance: Not Applicable

	No. of papers published in
Bachelor	- National Journals: -- --
Masters's	- National Journals : -- --
Ph.D.	-International Journals : 04
	- Conferences : 03

8. Projects Carried out : - -
9. Patents :- -
10. Technology Transfer : - -
11. Research Publications :
    i) International Journals : 04
    ii) National Journals :
12. No of Books published with details : - -

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1.	Name	: Dr. Girish Kumar Patnaik
2.	Date of Birth	: October 9th, 1969
3.	Educational Qualification	: Ph. D. M.E. (Computer Science & Engg.) B.E. (Computer Science & Engg.)
4.	Work Experience	:
	- Teaching	: 25 Years 11 Months
	- Research	: Nil
	- Industry	: Nil
5.	Area of Specialization	: Computer Engineering
6.	Subject Taught at P.G. level	: NIL
	Subject Taught at U.G. level	: Advanced Computer Network, Compiler Design
7.	Research guidance at	
	- Masters's level	: 02
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: 01
	- International Journals	: 15
	- National Conferences	: NIL
	- International Conferences	: 03
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: 16
12.	No. of books published with details	: NIL

Signature

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1. Name : Krishnakant Prabhudas Adhiya.

2. Date Of Birth : 07-12-1968
3. Educational Qualification : M.E. (Computer Science & Engg.)
   B.E. (Computer Engineering)
4. Work Experience :
   - Teaching : 24 Years 09 Months
   - Research : Nil
   - Industry : Nil

5. Area of Specialization : Computer Engineering

6. Subject Taught at P.G. level : Distributed Systems, Parallel Computing
   Subject Taught at U.G. level :Advanced Unix programming, 8085 Microprocessor, Computer Fundamentals, Programming lab-I , Digital System Design, Computer Peripherals & Interfacing , Computer Organization, Microprocessor-I,Microprocessor-II, Operating System, Advanced Computer Architecture , Embedded System, Microprocessor and Microcontroller
7. Research guidance at
   - Master's level : 17
   - Ph.D. level : Nil

   No. of papers published in
   - National Journals : 01
   - International Journals : 25
   - National Conferences : 27
   - International Conferences : 07

8. Projects carried out : Nil
9. Patents : Nil
10. Technology Transfer : Nil
11. Research publications : 26
12. No. of books published with details : 06 (1. Software Engineering,
    2. Computer Organization
    3. Computer Network
    4. Embedded Systems
    5. Microprocessor-III
    6. Advanced Computer Architecture)

Signature

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1. Name : Sandip Shankarrao Patil

2. Date of Birth : 20/01/1980

3. Educational Qualification : M. Tech. Computer Science & Engineering
: B.E. Computer Engineering
: Ph. D. (Pursuing)

4. Work Experience :
- Teaching : 15 Years
- Research : 02 Years
- Industry : Nil

5. Area of Specialization : Soft Computing

6. Subject Taught at P.G. level : Advanced Software Engineering, Soft Computing

Subject Taught at U.G. level : Artificial Intelligence, Computer Networks, Advanced Computer Architecture, Data Structures

7. Research guidance at
- Masters's level : 28 Students
- Ph.D. level : Nil

No. of papers published in
- National Journals : Nil
- International Journals : 22
- National Conferences : 27
- International Conferences : 10

8. Projects carried out : Nil

9. Patents : Nil

10. Technology Transfer : Nil

11. Research publications : 22

12. No. of books published with details : 06 (System Programming, Artificial Intelligence & Neural Networks, Software Matrices & Quality Assurance,Computer Programming, Advanced Computer Architecture, Data Structures)

Signature

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1. Name : Manoj Eknath Patil

2. Date Of Birth : 06/10/1975

3. Educational Qualification : M.Tech. (Computer Science & Engineering)
   B. E. (Computer Engineering.)

4. Work Experience :
   - Teaching : 12.2 Years
   - Research : Nil
   - Industry : 01 Year 10 Month

5. Area of Specialization : Computer Science and Engineering

6. Subject Taught at P.G. level : Software Project Management, STQA
   Subject Taught at U.G. level : Instrumentation and Diagnostic Tools, System Programming, Software Engineering, Software Metrics and Quality Assurance, Embedded System.

7. Research guidance at
   - Masters's level : 12
   - Ph.D. level : Nil

   No. of papers published in
   - National Journals : 02
   - International Journals : 11
   - National Conferences : 07
   - International Conferences : 08

8. Projects carried out : Nil

9. Patents : Nil

10. Technology Transfer : Nil

11. Research publications : 13

12. No. of books published with details : 02 (Database Management Systems, Software Metrics and Quality Assurance)

Signature

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1.	Name	:	Ashish Tryambak Bhole
2.	Date Of Birth	:	12/09/1976
3.	Educational Qualification	:	B.E. in Computer Engineering, M. Tech. in CSE, Pursuing Ph.D. in CSE.
4.	Work Experience	:	
	- Teaching	:	14 Years
	- Research	:	07 Years
	- Industry	:	Nil
5.	Area of Specialization	:	Computer Science & Engineering
6.	Subject Taught at P.G. level	:	Network Centric Computing, Web Engg.
	Subject Taught at U.G. level	:	Software Engineering, Object Oriented Modeling & Design, Mobile Computing, Computer Networks, Advanced, Computer Networks, Software Metrics & Quality, Assurance, Microprocessor-III, Internet Security, E-Commerce, Advanced Computer Architecture, Microprocessor-II.
7.	Research guidance at		
	- Masters's level	:	16
	- Ph.D. level	:	Nil
	No. of papers published in		
	- National Journals	:	01
	- International Journals	:	21
	- National Conferences	:	11
	- International Conferences	:	10
8.	Projects carried out	:	Nil
9.	Patents	:	Nil
10.	Technology Transfer	:	Nil
11.	Research publications	:	22
12.	No. of books published with details	:	Nil

Signature

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1. Name : Sanjay Sadhashio Gharde

2. Date Of Birth : 14/09/1979

3. Educational Qualification : B. E. Computer Technology
   M. Tech. Information Technology

4. Work Experience :
   - Teaching : 11 Years and 06 Months
   - Research : 03 Years
   - Industry : 02 Years

5. Area of Specialization : Information Technology

6. Subject Taught at P.G. level : Applied Algorithms, Advanced DBMS
   Subject Taught at P.G. level : Compiler Construction, Object Oriented Modeling Design, Theory of Computer Science,Management Information system, Database Management System, Data warehousing And Mining

7. Research guidance at
   - Masters's level : 09
   - Ph.D. level : Nil

   No. of papers published in
   - National Journals : Nil
   - International Journals : 13
   - National Conferences : 19
   - International Conferences : 08

8. Projects carried out : Nil

9. Patents : Nil

10. Technology Transfer : Nil

11. Research publications : 13

12. No. of books published with details : 13
    (Support Vector Machine (International, Lap Lambert, Germany), Object Oriented Modeling & Design, Theory of Computer Science, DBMS, Data Warehousing and Mining, Software Engineering,)

Signature

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1. Name : Miss. Nilima Prakash Patil

2. Date Of Birth : 21/10/1981

3. Educational Qualification : M.E.(Computer Science & Engineering)

.

4. Work Experience :
   - Teaching : 9 years
   - Research : Nil
   - Industry : 1 year

5. Area of Specialization : B.E.Computer Engineering,

6. Subject Taught at P.G. level : Nil

   Subject Taught at U.G. level : Computer Science-I,
   Computer Science-II.
   Programming Lab-I,
   Programming Lab-II,
   Microprocessor-I,
   Computer Graphics
   System Programming
   DWM,OOT,IME

7. Research guidance at
   - Masters's level : 02
   - Ph.D. level : Nil

   No. of papers published in
   - National Journals : Nil
   - International Journals : 4
   - National Conferences : 4
   - International Conferences : Nil

8. Projects carried out : Nil

9. Patents : Nil

10. Technology Transfer : Nil

11. Research publications : 4

12. No. of books published with details : Nil

Signature

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1. Name : ShitalAbhimanyuPatil

2. Date Of Birth : 12/10/1982

3. Educational Qualification : B.E.Computer Engineering

4. Work Experience :
   - Teaching : 11 Years 04 Months
   - Research : Nil
   - Industry : Nil

5. Area of Specialization : ----

6. Subject Taught at P.G. level : Nil

   Subject Taught at U.G. level : System Programming,
   Advanced Computer Architecture,
   Computer Graphics,
   Data Structure & files,
   Discrete structure and graph theory,
   Application Development Tools Laboratory
   Programming Lab-I ,
   Programming Lab-II,
   Analysis and design of algorithm,
   Introduction to computing

7. Research guidance at
   - Masters's level : Nil
   - Ph.D. level : Nil

   No. of papers published in
   - National Journals : Nil
   - International Journals : 00
   - National Conferences : 02
   - International Conferences : Nil

8. Projects carried out : Nil

9. Patents : Nil

10. Technology Transfer : Nil

11. Research publications : 02

12. No. of books published with details : Nil

Signature

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1. Name : Mr. NitinYashwant Suryavanshi

2. Date Of Birth : 27/01/1981

3. Educational Qualification : M.E.(Computer Science & Engineering)

4. Work Experience :
   - Teaching : 10 Years 9 Months
   - Research : Nil
   - Industry : Nil

5. Area of Specialization : Computer Science And Engineering

6. Subject Taught at P.G. level :Nil

   Subject Taught at U.G. level : Formal Language and Automata Theory, Analysis & Design of Algorithm

7. Research guidance at
   - Masters's level : 03
   - Ph.D. level : Nil

   No. of papers published in
   - National Journals : Nil
   - International Journals : 04
   - National Conferences : 03
   - International Conferences : 01

8. Projects carried out : Nil

9. Patents : Nil

10. Technology Transfer : Nil

11. Research publications : 04

12. No. of books published with details : 01

Signature

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1. Name : Dinesh Dagadu Puri

2. Date Of Birth : 15/04/1982

3. Educational Qualification : M.Tech in Computer Engg.

4. Work Experience :
   - Teaching : 10Years and 6 Months
   - Research : Nil
   - Industry : NIL

5. Area of Specialization : Computer science and Engineering

6. Subject Taught at P.G. level : Software Architecture
   Parallel Computing
   Distributed system

   Subject Taught at P.G. level : Data Communication, Computer network, Distributed System, Mobile computing, Management and information system, System operation and Maintenance, Discrete structure, Computer graphics

7. Research guidance at
   - Masters's level : 03
   - Ph.D. level : Nil

   No. of papers published in
   - National Journals : 01
   - International Journals : 05
   - National Conferences : 02
   - International Conferences : 02

8. Projects carried out : Nil

9. Patents : Nil

10. Technology Transfer : Nil

11. Research publications : 06

12. No. of books published with details : 01

Signature

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1.	Name	: Akash Dnyandeo Waghmare
2.	Date Of Birth	: 08/06/1982
3.	Educational Qualification	: M.E. in CSE, B.E. in CSE
4.	Work Experience	:
	- Teaching	: 9 Years 6 Months
	- Research	: Nil
	- Industry	: Nil
5.	Area of Specialization	: Computer Science & Engineering
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	: Object Oriented Modeling and Design, Advanced Computer Architecture,Computer Network,Data Communication,Advanced Database Management System, Database Management System,Programming Programming Paradigm,Information Retirval
7.	Research guidance at	
	- Masters's level	: 02
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: Nil
	- International Journals	: 02
	- National Conferences	: 07
	- International Conferences	: 04
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: 02
12.	No. of books published with details	: Nil

Signature

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1.	Name	: Dipak Devachand Bage
2.	Date Of Birth	: 01/02/1982
3.	Educational Qualification	: M.E. (Computer Science & Engg.) B.E. Computer Engineering, Diploma in Computer Technology
4.	Work Experience	:
	- Teaching	: 6 year 6 months
	- Research	: Nil
	- Industry	: Nil
5.	Area of Specialization	: Image Processing, Embedded System and Operating System.
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	: Microprocessor-II, Microprocessor-III, Operating System, Embedded Systems.
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: Nil
	- International Journals	: 01
	- National Conferences	: 07
	- International Conferences	: Nil
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: 01
12.	No. of books published with details	: 02 (Microprocessor-III, Embedded Systems.)

Signature

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1.	Name	:Miss Priti R.Sharma
2.	Date Of Birth	: 18/06/82
3.	Educational Qualification	: M.E. (Computer Science & Engineering) B.E. Computer Engineering
4.	Work Experience	:
	- Teaching	: 7 Years
	- Research	: Nil
	- Industry	: Nil
5.	Area of Specialization	: Computer science and Engineering
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	:,Discreate structure & Files, Microprocessor -1, Theory of computer Science,Digital System & Microprocessor, Advanced Development Tool Laboratory, Computer Graphics,Operating System,Software Engineering ,Data Warehouse & Mining, Advanced Computer Architecture, Embedded System, Computer Programming.
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: Nil
	- International Journals	: 01
	- National Conferences	:02
	- International Conferences	: Nil
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: 01
12.	No. of books published with details	: Nil

Signature

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1. Name : Satpalsing D. Rajput

2. Date Of Birth : 06/07/1985

3. Educational Qualification : M.E (CSE)
   B.E (Computer Engineering)

4. Work Experience :
   - Teaching : 6 Years 5 Months
   - Research : Nil
   - Industry : 1 Year 2 months

5. Area of Specialization : Computer Science & Engineering

6. Subject Taught at P.G. level : Nil

   Subject Taught at U.G. level : Introduction to Computing (TH & PR),
   Industrial Management and Economics (TH),
   Digital System Design (TH),
   ADTL (PR), Computer Graphics (PR),
   PL-I (PR), Software Engineering (TH & PR),
   DBMS(PR)
   SEPM (Th)
   Data Communication (TH & PR),

7. Research guidance at
   - Masters's level : Nil
   - Ph.D. level : Nil

   No. of papers published in
   - National Journals : Nil
   - International Journals : 02
   - National Conferences : 05
   - International Conferences : 03

8. Projects carried out : Nil

9. Patents : Nil

10. Technology Transfer : Nil

11. Research publications : 02

12. No. of books published with details : Nil

Signature

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1.	Name	: Smt.Yogeshwari S. Borse
2.	Date Of Birth	: 01/06/1979
3.	Educational Qualification	: M.Tech CSE
4.	Work Experience	:
	- Teaching	: 7 Years 8 Months
	- Research	: Nil
	- Industry	: Nil
5.	Area of Specialization	: Computer Engineering
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	: Computer Network, Programming Lab-II, Introduction to computing, Database Management System Computer Programming Software metrics and Quality assurance
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: Nil
	- International Journals	: 02
	- National Conferences	: 05
	- International Conferences	: 02
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: 02
12.	No. of books published with details	: Nil

Signature

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1. Name : Manojkumar Lotan Mahajan

2. Date of Birth : 17/11/1984

3. Educational Qualification : B.E. Information Technology Engineering

4. Work Experience :
   - Teaching : 7 Years
   - Research : Nil
   - Industry : 1 Year

5. Area of Specialization : B.E. Information Technology Engineering

6. Subject Taught at P.G. level : Nil

   Subject Taught at U.G. level : Data Structure and Files, Data Structures, Programming Lab-II, Computer Programming, Data Warehouse and Mining, Principles of Management, Artificial Intelligence (PR).

7. Research guidance at
   - Masters's level : Nil
   - Ph.D. level : Nil

   No. of papers published in
   - National Journals : Nil
   - International Journals : Nil
   - National Conferences : 01
   - International Conferences : 01

8. Projects carried out : Nil

9. Patents : Nil

10. Technology Transfer : Nil

11. Research publications : Nil

12. No. of books published with details : Nil

Signature

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1.	Name	: Ingle Vijay Shrikisan
2.	Date Of Birth	: 01/05/1984
3.	Educational Qualification	: B.E. Information Technology
4.	Work Experience	:
	- Teaching	: 4 year 6 months
	- Research	: Nil
	- Industry	: 1 year
5.	Area of Specialization	: Information Technology.
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	: Microprocessor – I, Microprocessor – II, Microprocessor – III, Advanced Development Tools & Laboratory, Compiler Construction, Advanced Computer Architecture, Operating System, Embedded System.
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: 01
	- International Journals	: Nil
	- National Conferences	: Nil
	- International Conferences	: Nil
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: 01
12.	No. of books published with details	: Nil

Signature

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1. Name : Sushant Sudhakar Bahekar

2. Date of Birth : 14-06-1990

3. Educational Qualification : B.E. (Computer), M.Tech. (CSE)

4. Work Experience :
   - Teaching : 3 Year 7 Months
   - Research : Nil
   - Industry : Nil

5. Area of Specialization : Artificial Intelligence, Network Security

6. Subject Taught at P.G. level : Nil
   Subject Taught at U.G. level : Artificial Intelligence, Operating System, Computer Programming, Analysis and Design of Algorithm

7. Research guidance at
   - Master's level : Nil
   - Ph.D. level : Nil

8. No. of papers published in
   - National Journals : 02
   - International Journals : 02
   - National Conferences : 02
   - International Conferences : Nil

9. Projects carried out : Nil

10. Patents : Nil

11. Technology Transfer : Nil

12. Research publications : 04

13. No. of books published with details : 05 (Computer Programming, Embedded System, Computer Graphics, Computer Organization, Data structure and files)

Signature

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1.	Name	: Jitendra Ranjitsingh Patil
2.	Date of Birth	: 04-10-1984
3.	Educational Qualification	: B.E. Information Technology
4.	Work Experience	:
	- Teaching	: 4.5 Year
	- Research	: Nil
	- Industry	: Nil
5.	Area of Specialization	: Information Technology
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	: Data Communication, Object Oriented Technology Computer programming
7.	Research guidance at	
	- Master's level	: Nil
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: Nil
	- International Journals	: 02
	- National Conferences	: 01
	- International Conferences	: Nil
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: 02
12.	No. of books published with details	: 01

Signature

COMPUTER ENGINEERING DEPARTMENT

FACULTY PROFILE

1. Name : Chaudhari Prachi P.

2. Date of Birth : 03-06-1989

3. Educational Qualification : B.E. (Comp)
   M.E. (CSE)

4. Work Experience :
   - Teaching : 3 years
   - Research : Nil
   - Industry : Nil

5. Area of Specialization : Computer Science & Engineering

6. Subject Taught at P.G. level : Nil

   Subject Taught at U.G. level : Computer Networks, Compiler Construction, Microprocessor & Microcontroller Interfacing, Artificial Intelligence.

7. Research guidance at
   - Master's level : Nil
   - Ph.D. level : Nil

   No. of papers published in
   - National Journals : Nil
   - International Journals : Nil
   - National Conferences : Nil
   - International Conferences : Nil

8. Projects carried out : Nil

9. Patents : Nil

10. Technology Transfer : Nil

11. Research publications : Nil

12. No. of books published with details : Nil

Signature

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1. Name :Chetana Tulshidas Baviskar.

2. Date Of Birth : 20-08-1991

3. Educational Qualification : B.E. (Computer Engineering)
   M.E. (CSE Appear)

4. Work Experience :
   - Teaching : 1 Year 07 Months
   - Research : Nil
   - Industry : Nil

5. Area of Specialization : Computer Science and Engineering
6. Subject Taught at P.G. level : Nil

   Subject Taught at U.G. level : Advanced Unix programming, Linux Lab, Management Information System, Web Programming Lab, Computer Programming-II (LAB)

7. Research guidance at
   - Masters's level : Nil
   - Ph.D. level : Nil

   No. of papers published in
   - National Journals : Nil
   - International Journals : 01
   - National Conferences : 01
   - International Conferences : 01

8. Projects carried out : Nil

9. Patents : Nil

10. Technology Transfer : Nil

11. Research publications : 01

12. No. of books published with details : Nil

Signature

COMPUTER ENGINEERING DEPARTMENT

FACULTY PROFILE

1.	Name	: Dhanashree S. Tayade
2.	Date Of Birth	: 19-10-1985
3.	Educational Qualification	: M.E. (Computer Science & Engg.) B.E. (Computer Engineering)
4.	Work Experience	:
	- Teaching	: 2 Year 07 Months
	- Research	: Nil
	- Industry	: Nil
5.	Area of Specialization	: Computer Science and Engineering
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	: Advanced Unix programming, Linux Lab, Dataware Housing and Mining, Computer Programming Lab.
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: 00
	- International Journals	: 01
	- National Conferences	: 01
	- International Conferences	: 01
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: 01
12.	No. of books published with details	: Nil

Signature

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1.	Name	: Vinaya Balu Savadekar
2.	Date Of Birth	: 12/09/1990
3.	Educational Qualification	: B. E. (Computer Engineering)
4.	Work Experience	:
	- Teaching	: 7 Months
	- Research	: Nil
	- Industry	: 01 Year
5.	Area of Specialization	: Computer Science and Engineering
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	: Computer Programming, Advance Computer Architecture
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: 01
	- International Journals	: 00
	- National Conferences	: 01
	- International Conferences	: 00
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: Nil
12.	No. of books published with details	: Nil

Signature

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1. Name : Sweta Pandey

2. Date Of Birth : 30/09/1990

3. Educational Qualification : Ph.D (Pursuing)
   M. Tech. (Information Technology)
   B.E. (Information Technology)

4. Work Experience :
   - Teaching : 3 Years
   - Research : Nil
   - Industry : Nil

5. Area of Specialization : Information Technology

6. Subject Taught at P.G. level : Nil
   Subject Taught at U.G. level : Computer Programming
   Data Structure
   Software Engineering & Project Management
   Discrete Structure & Graph Theory
   Artificial Intelligence & Neural Network
   JAVA
   Advance Development Language
   Management Information Sytem

7. Research guidance at
   - Masters's level : Nil
   - Ph.D. level : Nil

   No. of papers published in
   - National Journals : 00
   - International Journals : 07
   - National Conferences : 00
   - International Conferences : 00

8. Projects carried out : Nil

9. Patents : Nil

10. Technology Transfer : Nil

11. Research publications : 07

12. No. of books published with details : Nil

Signature

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1.	Name	: Mr. Paresh Dharmshil Sharma
2.	Date of Birth	: February 9th, 1985
3.	Educational Qualification	: M.Tech. (Software Systems) B.E. (Computer Engineering)
4.	Work Experience	:
	- Teaching	: 06 Years 10 Months
	- Research	: Nil
	- Industry	: Nil
5.	Area of Specialization	: Computer Engineering
6.	Subject Taught at P.G. level	: NIL
	Subject Taught at U.G. level	: NIL
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: 03
	- International Journals	: 06
	- National Conferences	: 04
	- International Conferences	: 05
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: 06
12.	No. of books published with details	: NIL

Signature

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1.	Name	: Naresh Dnyaneshwar Kale
2.	Date of Birth	: July 21th, 1991
3.	Educational Qualification	: M.E. (Computer Science & Engg.) B.E. (Information Technology)
4.	Work Experience	:
	- Teaching	: 04 Months
	- Research	: Nil
	- Industry	: Nil
5.	Area of Specialization	: Computer Engineering
6.	Subject Taught at P.G. level	: NIL
	Subject Taught at U.G. level	: Database Management System, Computer Graphics.
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: Nil
	- International Journals	: 01
	- National Conferences	: Nil
	- International Conferences	: Nil
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: 01
12.	No. of books published with details	: Nil

Signature

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1. Name : Shrutika Shailendra Mahajan

2. Date Of Birth : 19/01/1991

3. Educational Qualification : B. E. (Computer Engineering)

4. Work Experience :
   - Teaching : 15 Months
   - Research : Nil
   - Industry : Nil

5. Area of Specialization : Computer Science and Engineering

6. Subject Taught at P.G. level : Nil
   Subject Taught at U.G. level : Advance Computer Networks(TH)
   Java Programming (TH+PR)
   System Programming Lab

7. Research guidance at
   - Masters's level : Nil
   - Ph.D. level : Nil

   No. of papers published in
   - National Journals : 00
   - International Journals : 02
   - National Conferences : 00
   - International Conferences : 00

8. Projects carried out : Nil

9. Patents : Nil

10. Technology Transfer : Nil

11. Research publications : 02

12. No. of books published with details : Nil

Signature

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1. Name : Archana Raosaheb Shinde

2. Date Of Birth : 25-06-1990

3. Educational Qualification : M.E. (Computer Engineering)

   : B.E. (Computer Engineering)

4. Work Experience
   - Teaching : Nil
   - Research : Nil
   - Industry : 1.8 Years

5. Area of Specialization : Computer Engineering

6. Subject Taught at P.G. level : Nil

   Subject Taught at U.G. level :Nil

7. Research guidance at
   - Masters's level : Nil
   - Ph.D. level : Nil

   No. of papers published in

   International Journals : 02
   National Conference : 01

8. Projects carried out : Nil

9. Patents : Nil

10. Technology Transfer : Nil

11. Research publications : 02

12. No. of books published with details : Nil

Signature

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1. Name : Tejashri Patil
2. Date Of Birth : 1/6/1989
3. Educational Qualification : B.E.(Computer Engineering)
4. Work Experience :
   - Teaching : 2 Months
   - Research : Nil
   - Industry : Nil
5. Area of Specialization : Computer Engineering
6. Subject Taught at P.G. level : Nil

   Subject Taught at U.G. level : Nil
7. Research guidance at
   - Masters's level : Nil
   - Ph.D. level : Nil

   No. of papers published in
   - National Journals : Nil
   - International Journals : Nil
   - National Conferences : Nil
   - International Conferences : Nil
8. Projects carried out : Nil
9. Patents : Nil
10. Technology Transfer : Nil
11. Research publications : Nil
12. No. of books published with details : Nil

Signature

COMPUTER ENGINEERING DEPARTMENT
FACULTY PROFILE

1.	Name	: Sana Deshmukh
2.	Date Of Birth	: 1/6/1989
3.	Educational Qualification	: B.E.(Computer Engineering)
4.	Work Experience	:
	- Teaching	: 2 Months
	- Research	: Nil
	- Industry	: Nil
5.	Area of Specialization	: Computer Engineering
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	: Nil
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: Nil
	- International Journals	: Nil
	- National Conferences	: Nil
	- International Conferences	: Nil
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: Nil
12.	No. of books published with details	: Nil

Signature

FACULTY PROFILE

1. NAME : Dr.**Suralkar S. R.**

2. Date Of Birth : 28/10/1966

3. Educational Qualification : BE (Electronics)
   ME (Control & Instru.)
   Ph.D

4. Work Experience (Years) :
   - Teaching : 26Yrs
   - Research : 07 Yrs.
   - Industry : -
   - Others : -

5. Area Of Specializations : Image processing and pattern recognition.

6. Subject Teaching At
   - Under graduation Level : Electronics Measurement, Digital Tech. and App.
   - Post Graduate Level : Advanced Instrumentation System, IP&PR

7. Research Guidance :
   - ❖ Master's : 09
   - ❖ Ph.D. : -
   - No. of paper published in :-
     - ❖ National Journals : --
     - ❖ International Journals : 22
     - ❖ Conference : 13

8. Projects Carried Out : 01

9. Patents : -

10. Technology Transfer : -

11. Research Publications : 22

12. No. Of Books Published - With Details : -

Signature

FACULTY PROFILE

1. NAME : **Deshmukh M.P.**

2. Date Of Birth : 20/06/1966.

3.Educational Qualification : BE (Electronics),
ME (Control & Instru.)
Ph.D (E&TC)

4. Work Experience (Years) :
   - Teaching : 26Yrs
   - Research : -
   - Industry : -
   - Others : Patent Filed

5. Area Of Specializations : E&TC

6. Subject Teaching At
   - Under graduation Level : AE, ECD, EEE,ECM,SDC,ECA
   - Post Graduate Level : Microelectronic Circuit Design

7. Research Guidance :
   - ❖ Master's : 04
   - ❖ Ph.D. : -
   - No. of paper published in :-
     - ❖ National Journals : -
     - ❖ International Journals : 5
     - ❖ Conference : 3

8. Projects Carried Out : -

9. Patents : One filed

10.Technology Transfer : -

11. Research Publications : 05

12. No. Of Books Published - With Details : -

Signature

FACULTY PROFILE

1. NAME : Adokar D. U.

2. Date Of Birth : 31/03/1965.

3.Educational Qualification : BE (Electronics),
ME (Electronics)
Ph.D (Persuing)

4. Work Experience (Years) :
   - Teaching : 28Yrs
   - Research : -
   - Industry : -
   - Others : -

5. Area Of Specializations : Multimedia Processing

6. Subject Teaching At
   - Under graduation Level : DTA, MP, MPI, EEEE, Analog Electronics
   - Post Graduate Level : DSD, MPMC

7. Research Guidance :
   - ❖ Master's : 03
   - ❖ Ph.D. : -
   - No. of paper published in :-
     - ❖ National Journals : -
     - ❖ International Journals : 5
     - ❖ Conference : 3

8. Projects Carried Out : -

9. Patents : -

10.Technology Transfer : -

11. Research Publications : -

12. No. Of Books Published -
With Details : -

Signature

FACULTY PROFILE

1. NAME : **DESHMUKH V. M.**

2. Date Of Birth : 17/06/1965

3. Educational Qualification : B.E.(Electronics),
   M.E.(Control Systems)

4. Work Experience (Years) :
   - Teaching : - 26Yrs
   - Research : -
   - Industry : -
   - Others : - 7 Yrs (Visiting lecturer)

5. Area Of Specializations : Electromagnetic & signal system

6. Subject Teaching At
   a. Under graduation Level : EME,NAS, ADSP
   b. Post Graduate Level :

7. Research Guidance :
   - ❖ Master's : 01
   - ❖ Ph.D. : -
   - No. of paper published in :-
     - ❖ National Journals : - 02
     - ❖ International Journals : - 01
     - ❖ Conference : - 14

8. Projects Carried Out : -

9. Patents : -

10. Technology Transfer : -

11. Research Publications : 01

12. No. Of Books Published - With Details :

Signature

FACULTY PROFILE

1. NAME : **Kazi Nafees Ahmad M**.

2. Date Of Birth : 22/06/1972

3. Educational Qualification : B.E(Electronics),
   ME (Electronics)
   Ph.D (Persuing)

4. Work Experience (Years) :
   - Teaching : 18Yrs
   - Research : -
   - Industry : 3Yrs
   - Others : -

5. Area Of Specializations : T.V. Engg, Computer networks

6. Subject Teaching At
   - Under graduation Level : CCN, TNM

Post Graduate Level : Advanced Computer Network,Parellel Computing

7. Research Guidance :
   - ❖ Master's : 05
   - ❖ Ph.D. : -

   No. of paper published in :-
   - ❖ National Journals : -
   - ❖ International Journals : 05
   - ❖ Conference : 14

8. Projects Carried Out : -

9. Patents : -

10. Technology Transfer : -

11. Research Publications : -

12. No. Of Books Published - 03 i) CCN ii)AICA iii) LIC
    With Details :

Signature

FACULTY PROFILE

1. NAME : **Wani Amol C.**

2. Date Of Birth : 30/07/1976

3. Educational Qualification : B.E.(Electronics),
M.E. (Electronics)

4. Work Experience (Years) :
   - Teaching : 16 Yrs
   - Research : -
   - Industry : -
   - Others : -

5. Area Of Specializations : Basic Electronics, Circuit Design and Communication.

6. Subject Teaching At
   - Under graduation Level : SSDC I, SSDC II, EEEE, ECD etc.
   - Post Graduate Level : Microelectronics Circuit Design

7. Research Guidance :
   - ❖ Master's : 02
   - ❖ Ph.D. : -

   No. of paper published in :-
   - ❖ National Journals : -
   - ❖ International Journals : 03
   - ❖ Conference : 06

8. Projects Carried Out : -

9. Patents : -

10. Technology Transfer : -

11. Research Publications : 03

12. No. Of Books Published 02

    With Details : Elements of Electrical Electronics Engineering. Prakash Publication
    Electronics Circuit Design – Prakash Publication

Signature

FACULTY PROFILE

1. NAME : **Karode Atul H.**

2. Date Of Birth : 01/06/1976

3 Educational Qualification : M.E (Digital Electronics),

4. Work Experience (Years) :
   - Teaching : 14 Yrs
   - Research : -
   - Industry : 2Yrs
   - Others : -

5. Area Of Specializations : - Image processing and pattern rec.

6 Subject Teaching At
   - Under graduation Level : Digital Electronics& Logic Design, CDIT
   - , EM, Industrial Management.
   - Post Graduate Level : Advanced Instrumentation System, IP&PR, Advance Digital Instrumentation

7. Research Guidance :
   - ❖ Master's : 12
   - ❖ Ph.D. : -
   - No. of paper published in :-
     - ❖ National Journals : -
     - ❖ International Journals : 14
     - ❖ Conference : 08

8. Projects Carried Out : -

9. Patents : -

10.Technology Transfer : -

11. Research Publications : 14

12. No. Of Books Published - With Details :

Signature

FACULTY PROFILE

1. NAME : **Dr.Zope Pankaj H.**

2. Date Of Birth : 24/06/1975

3. Educational Qualification : Ph.D (E&TC)
   ME (Digital Electronics),
   B.E(Indust. Electronics),
   C-DAC

4. Work Experience (Years) :
   - Teaching : 15
   - Research :
   - Industry : 01
   - Others : -

5. Area Of Specializations : Electronics and Nano Electronics and Nano Technology

6 Subject Teaching At
   - Under graduation Level : Microprocessor and Microcontroller, Embedded System
   - Post Graduate Level : VLSI-D,ADSP

7. Research Guidance :
   - ❖ Master's : - 15
   - ❖ Ph.D. : -

   No. of paper published in :-
   - ❖ National Journals : -
   - ❖ International Journals : 20
   - ❖ Conference : 22

8. Projects Carried Out : 06

9. Patents : -

10. Technology Transfer : -

11. Research Publications : 20

12. No. Of Books Published With Details : 01

Signature

FACULTY PROFILE

1. NAME : Surendra P.Ramteke.

2. Date of Birth : 31.03.1979

3. Educational Qualification: M.E (Digital Electronics)
BE E&TC, PhD (Persuing)

4. Work Experience (Years) :
   - Teaching : 12.6Yrs
   - Research : -
   - Industry : -
   - Others : -

5. Area Of Specializations : Digital Image processing

6 Subjects Teaching At
   - Under graduation Level : Radiation&Microwave Techniques,Analog Communication,Digital Electronics,digital Image Processing , Microprocessor, Communication System I
   - Post Graduate Level: Advanced Digital Communication, Digital Systrem Design

7. Research Guidance :
   - ❖ Master's : 09
   - ❖ Ph.D. : -

No. of paper published in :-
   - ❖ National Journals : -
   - ❖ International Journals : 09
   - ❖ Conference : 13

8. Projects Carried Out : 01

9. Patents : -

10.Technology Transfer : -

11. Research Publications : 09

12. No. Of Books Published - 01
With Details :

Signature

FACULTY PROFILE

1. NAME : Sunil K. Khode

2. Date Of Birth : 01.01.1979

3. Educational Qualification :
M.E(Digital Electronics.)

4. Work Experience (Years) :
- Teaching : 10.10 Yrs
- Research : -
- Industry : -
- Others : -

5. Area Of Specializations : Digital Electronics

6 Subject Teaching At
Under graduation Level : Analog & Digital Electronics,IED,Digital Communication,Information Theory & Coding Tech.,NL,PE , EEEE

- Post Graduate Level : -

7. Research Guidance :
- ❖ Master's : -
- ❖ Ph.D. : -

No. of paper published in :-
- ❖ National Journals : -
- ❖ International Journals : 03
- ❖ Conference : 08

8. Projects Carried Out : -

9. Patents : -

10.Technology Transfer : -

11. Research Publications : -

12. No. Of Books Published With Details :

Signature

FACULTY PROFILE

1. NAME : Deshmukh Mayuri T.

2. Date Of Birth : 23-09-84

3. Educational Qualification : M.E E&TC (Digital electronics)

4. Work Experience (Years) :
   - Teaching : 9 Yrs.
   - Research : -
   - Industry : -
   - Others : -
   -

5. Area Of Specializations :- - Digital Electronics

6.Subject Teaching At
   - Under graduation Level : Telematics,EEE,DC, LIC, CS-1,IM
   - Post Graduate Level : -

7. Research Guidance : -
   - ❖ Master's : -
   - ❖ Ph.D. : -

No. of paper published in :-
- ❖ National Journals : Nil
- ❖ International Journals : 03
- ❖ Conference : 02

8. Projects Carried Out : -

9. Patents : -

10.Technology Transfer : -

11. Research Publications : 03

12. No. Of Books Published With Details : -

Signature

FACULTY PROFILE

1. NAME : Mr.Ashish R Bari

2. Date Of Birth : 26-04-81

3. Educational Qualification : M.E(Digital Electronics)

4 Work Experience (Years) :

- Teaching : 8.10Yrs
- Research : -
- Industry : -
- Others : -
-

5. Area Of Specializations :- -

6.Subject Teaching At

- Under graduation Level : EEE , ECM ,AICA , LIC, CSII, ADE , EEEE
- Post Graduate Level :

7. Research Guidance :

- ❖ Master's :
- ❖ Ph.D. :

No. of paper published in :-

- ❖ National Journals : -
- ❖ International Journals : -
- ❖ Conference : 04

8. Projects Carried Out : -

9. Patents : -

10.Technology Transfer : -

11. Research Publications : 04

12. No. Of Books Published -
With Details :

Signature

FACULTY PROFILE

1. NAME : Dipeeka R. Patil

2. Date Of Birth : 25-06-1981

3. Educational Qualification : M.E(Digital Electronics)

4. Work Experience (Years) :
   - Teaching : 10 years
   - Research : -
   - Industry : 1.5 years
   - Others : -

5. Area Of Specializations : Digital Electronics

6.Subject Teaching At
   Under graduation Level : FCS, EEEE, NAS, AC
   - Post Graduate Level : -

7. Research Guidance :
   - ❖ Master's : -
   - ❖ Ph.D. : -
   - No. of paper published in :-
     - ❖ National Journals : -
     - ❖ International Journals : 02
     - ❖ Conference : 02

8. Projects Carried Out : -

9. Patents : -

10.Technology Transfer : -

11. Research Publications : 02

12. No. Of Books Published -
    With Details :

Signature

FACULTY PROFILE

1. NAME : Priyanka M. Shanbhag

2. Date Of Birth : 30/ 04/ 1988
3. Educational Qualification : M.E. (Digital Electronics)
4. Work Experience (Years) :
   - Teaching : 7 Yrs
   - Research : -
   - Industry : -
   - Others : -

5. Area Of Specializations : - Digital Electronics

6. Subject Teaching At
   Under graduation Level : ADE, EEEE, SS I
   Post Graduate Level : -

7. Research Guidance :
   - ❖ Master's : -
   - ❖ Ph.D. : -
   - No. of paper published in :-
     - ❖ National Journals : -
     - ❖ International Journals : 03
     - ❖ Conference : 02

8. Projects Carried Out : -

9. Patents : -

10. Technology Transfer : -

11. Research Publications : 01

12. No. Of Books Published -
    With Details : -

Signature

FACULTY PROFILE

1. NAME : Shailendra A.Hingonekar

2. Date Of Birth : 06/03/1969

3. Educational Qualification: B.E(E&Tc)
   M.Tech (Electronics Design Technology)

4. Work Experience (Years) :
   - Teaching : 15Yrs
   - Research : -
   - Industry : 07Yrs
   - Others : -

5. Area Of Specializations : Electronics design technology

6. Subject Teaching At
   Under graduation Level : FOC , TV&CE, Automotive Electronics
   - Post Graduate Level :

7. Research Guidance :
   - ❖ Master's : -
   - ❖ Ph.D. : -
   - No. of paper published in :-
     - ❖ National Journals : -
     - ❖ International Journals : 01
     - ❖ Conference : 02

8. Projects Carried Out : -

9. Patents : -

10. Technology Transfer : -

11. Research Publications : 01

12. No. Of Books Published -
    With Details : -

Signature

FACULTY PROFILE

1. NAME : Akshada B Sapkal

2. Date Of Birth : 27/10/1987

3. Educational Qualification : M.E (Digital electronics)

4. Work Experience (Years) :
   - Teaching : 06
   - Research : -
   - Industry :
   - Others : -

5. Area Of Specializations : Digital electronics

6.Subject Teaching At
   Under graduation Level : EEE, Telematics, DTA
   - Post Graduate Level :

7. Research Guidance :
   - ❖ Master's :
   - ❖ Ph.D. :
   - No. of paper published in :-
     - ❖ National Journals : Nil
     - ❖ International Journals : 02
     - ❖ Conference : 01

8. Projects Carried Out : -

9. Patents : -

10. Technology Transfer : -

11. Research Publications : 02

12. No. Of Books Published -
    With Details :

Signature

FACULTY PROFILE

1. NAME : Ranjeetsingh Surendrasingh Kalsi

2. Date Of Birth : 14/06/1986

3. Educational Qualification : BE (Electronics & Communication)

4. Work Experience (Years) :
   - Teaching : 4.5 Years
   - Research : -
   - Industry :
   - Others : -

5. Area Of Specializations : Electronics & Communication

6.Subject Teaching At
   Under graduation Level : SAT-COMM
   - Post Graduate Level :

7. Research Guidance :
   - ❖ Master's :
   - ❖ Ph.D. :
   - No. of paper published in :-
     - ❖ National Journals : 01
     - ❖ International Journals : 01
     - ❖ Conference : 01

8. Projects Carried Out : -

9. Patents : -

10.Technology Transfer : -

11. Research Publications : -

12. No. Of Books Published -
    With Details : -

Signature

FACULTY PROFILE

1. NAME : Yogesh S Santwani

2. Date Of Birth : 04/05/1988

3. Educational Qualification : M.E. (Digital Electronics)

4. Work Experience (Years) :
   - Teaching : 6 YrS
   - Research : -
   - Industry : 0.5Yrs
   - Others : -

5. Area Of Specializations : Electronics Measurements, Communication, Antenna

6.Subject Teaching At
   Under graduation Level : Electronics Machines & Industrial Electronics , NAS,LIC, FOC, AVE
   - Post Graduate Level :

7. Research Guidance :
   - ❖ Master's :
   - ❖ Ph.D. :
   - No. of paper published in :-
     - ❖ National Journals : Nil
     - ❖ International Journals : 01
     - ❖ Conference : 01

8. Projects Carried Out : -

9. Patents : -

10.Technology Transfer : -

11. Research Publications : -

12. No. Of Books Published -
    With Details : -

Signature

FACULTY PROFILE

1. NAME : Kunal Kishore Pandey

2. Date Of Birth : 01/03/1984

3. Educational Qualification : M.E (DE)

4. Work Experience (Years) :
   - Teaching : 6.6 Yrs
   - Research : -
   - Industry :
   - Others : -

5. Area Of Specializations : Digital Electronics

6.Subject Teaching At
   Under graduation Level : EMC,AE,EMIE,RMT,DC, SSDCI, AVE, DIP, IP, DSP
   - Post Graduate Level :

7. Research Guidance :
   - ❖ Master's : -
   - ❖ Ph.D. : -
   - No. of paper published in :-
     - ❖ National Journals : -
     - ❖ International Journals : 02
     - ❖ Conference : 03

8. Projects Carried Out : -Image fusion using DWT and FDCT

9. Patents : -

10.Technology Transfer : -

11. Research Publications : -

12. No. Of Books Published -
    With Details : -

Signature

FACULTY PROFILE

1. NAME : Khan Sadik H

2. Date Of Birth : 24/11/1983

3. Educational Qualification :

B.E. Hons. (E&TC)
M.Tech(VLSI Design)

4. Work Experience (Years) :

- Teaching : - 8
- Research : -
- Industry : -
- Others : -

5. Area Of Specializations : VLSI Design

6 Subject Teaching At
Under graduation Level : IETR , PE,MP, ED-I, ED-II, VLSI,

- Post Graduate Level : -

7. Research Guidance :

- ❖ Master's : -
- ❖ Ph.D. : -

No. of paper published in :-

- ❖ National Journals : 01
- ❖ International Journals : 02
- ❖ Conference : 15

8. Projects Carried Out : -

9. Patents : -

10.Technology Transfer : -

11. Research Publications : -0

12. No. Of Books Published
With Details :02 I) EDC II) CS

Signature

FACULTY PROFILE

1. **NAME** : Charansingh Ashok Patil
2. **Date of Birth** : 22/05/1984
3. **Educational Qualification** : M.E (Appear)
4. **Work Experience(Years)** :
   - **Teaching :** 2.5 Yrs
   - **Research :** -
   - **Industry :** -
   - **Others :** -
5. **Area Of Specialization** : Digital Electronics
6. **Subject Teaching At** : -
   Under graduation level : -
   - **Post graduation level**
7. **Research Guidance**
   - ❖ **Master's** : -
   - ❖ **Ph.D** : -
     - **No. of paper published in**
       - ❖ **National Journals** : -
       - ❖ **International Journals** : 01
       - ❖ **Conference** : -
8. **Project Carried Out** : -
9. **Patents** : -
10. **Technology Transfer** : -
11. **Research Publications** : 01
12. **No. Of Books Published With Details** : -

Signature

FACULTY PROFILE

1. NAME : Priynka Devendrasing Girase

2. Date of Birth : 16/04/1991

3.Educational Qualification : BE (Electronics & Telecommunication)
M.E (Persuing)

4.Work Experience(Years) :

- **Teaching :** 2.5 Yrs
- **Research :** -
- **Industry :** -
- **Others :** -

5. Area Of Specialization : Digital Electronics

6. Subject Teaching At : -

Under graduation level : VLSI, SSDC II, PE, ECM, NAS

- **Post graduation level**

7.Research Guidance

- ❖ **Master's** : -
- ❖ **Ph.D** : -
  - **No. of paper published in**
    - ❖ **National Journals** : -
    - ❖ **International Journals** : 01
    - ❖ **Conference** : 01

8. Project Carried Out : -

9. Patents : -

10. Technology Transfer : -

11. Research Publications : 01

12. No. Of Books Published : -

With Details

Signature

FACULTY PROFILE

1. NAME : Sarang V. Patil

2. Date Of Birth : 03/04/1989.

3.Educational Qualification : BE(Electronics& Telecommunication),

M.Tech.(Control Systems)

4. Work Experience (Years) :
   - Teaching : 0.25Yrs
   - Research : -
   - Industry : -
   - Others : -

5. Area Of Specializations : Control Systems

6. Subject Teaching At
   - Under graduation Level : FCS
   - Post Graduate Level :

7. Research Guidance :
   - ❖ Master's : -
   - ❖ Ph.D. : -
   - No. of paper published in :-
     - ❖ National Journals : -
     - ❖ International Journals : -
     - ❖ Conference : -

8. Projects Carried Out : -

9. Patents : -

10.Technology Transfer : -

11. Research Publications : -

12. No. Of Books Published - With Details : -

Signature

FACULTY PROFILE

1. NAME : Prasad M. Khadke

2. Date Of Birth : 11/09/1988.

3.Educational Qualification : BE(Electronics& Telecommunication), M.E.(VLSI & Embedded Systems)

4. Work Experience (Years) :
   - Teaching : 0.3Yrs
   - Research : -
   - Industry : -
   - Others : -

5. Area Of Specializations : VLSI & Embedded Systems

6. Subject Teaching At
   - Under graduation Level : Digital Signal Processors
   - Post Graduate Level :

7. Research Guidance :
   - ❖ Master's : -
   - ❖ Ph.D. : -
   - No. of paper published in :-
     - ❖ National Journals : -
     - ❖ International Journals : 01
     - ❖ Conference : 01

8. Projects Carried Out : -

9. Patents : -

10.Technology Transfer : -

11. Research Publications : 01

12. No. Of Books Published - With Details : -

Signature

FACULTY PROFILE

1. NAME : Sagar S. Chavan

2. Date Of Birth : 18/02/1991.

3.Educational Qualification : BE(Electronics& Telecommunication),

M.E.(VLSI & Embedded Systems)

4. Work Experience (Years) :
   - Teaching : 0.3Yrs
   - Research : -
   - Industry : -
   - Others : -

5. Area Of Specializations : VLSI & Embedded Systems

6. Subject Teaching At
   - Under graduation Level : Fiber Optic Communication
   - Post Graduate Level :

7. Research Guidance :
   - ❖ Master's : -
   - ❖ Ph.D. : -
   - No. of paper published in :-
     - ❖ National Journals : -
     - ❖ International Journals : -
     - ❖ Conference : -

8. Projects Carried Out : -

9. Patents : -

10.Technology Transfer : -

11. Research Publications : -

12. No. Of Books Published - With Details : -

Signature

FACULTY PROFILE

1. NAME : Sukruti S. Taori

2. Date Of Birth : 12/04/1992.

3.Educational Qualification : BE(Electronics& Telecommunication),

M.E.(Microwave)

4. Work Experience (Years) :
   - Teaching : 0.3Yrs
   - Research : -
   - Industry : -0.3Yrs
   - Others : -

5. Area Of Specializations : Microwave

6. Subject Teaching At
   - Under graduation Level : SS III, CP III
   - Post Graduate Level :

7. Research Guidance :
   - ❖ Master's : -
   - ❖ Ph.D. : -
   - No. of paper published in :-
     - ❖ National Journals : -
     - ❖ International Journals : 01
     - ❖ Conference : -

8. Projects Carried Out : -

9. Patents : -

10.Technology Transfer : -

11. Research Publications : 01

12. No. Of Books Published - With Details : -

Signature

ELECTRICAL ENGINEERING DEPARTMENT

PROFILE OF FACULTY

1. Name : Dr. Praesh J. Shah
2. Date of Birth : 11/08/1967
3. Educational Qualification: Ph.D. (Electrical Engineering)
   M.E. Electrical Engineering (P.E.)
   BE (Industrial Electronics)
4. Work Experienced:
   a. Teaching : 26 Years
   b. Research : 05 Years
   c. Industry : 01 Years
   d. Other : NIL
5. Area of Specialization : Power Quality, Power Electronics & VLSI Design
   Subjects teaching at UG level : Power Electronic, Analog & Digital Electronics
   Subjects teaching at PG level : DSP
6. Research's Guidance Master's : 07
   PhD : Nil
7. No. of paper published in
   a. National journal : 01
   b. Internal national journal : 15
   c. International Conference : 10
   d. National Conference : 19
8. Project carried out : Nil
9. Patents : Nil
10. Technology Transfer : Nil
11. Research publication : 16
12. No. of book published with detail: 07

Signature

PROFILE OF FACULTY

1. Name : Dr. P. V. Thakre
2. Date of Birth : 19/07/1970
3. Educational Qualification: Ph.D. (Energy Engineering)
   M. Tech. Energy Engineering
   BE (Electronics Engineering)
4. Work Experienced:
   a. Teaching : 20 Years
   b. Research : 06 Years
   c. Industry : NIL
   d. Other : NIL
5. Area of Specialization : Solar Photo Voltaic
   Subjects teaching at UG level : NA, IDC
   Subjects teaching at PG level : DSP
6. Research's Guidance Master's : 04
   PhD : Nil
7. No. of paper published in
   a. National journal : Nil
   b. Internal national journal : 07
   c. International Conference : 06
   d. National Conference : 01
8. Project carried out : 01
9. Patents : Nil
10. Technology Transfer : Nil
11. Research publication : 13
12. No. of book published with detail : Nil

Signature

PROFILE OF FACULTY

1. Name : Vijay S Pawar
2. Date of Birth : 08/04/1971
3. Educational Qualification: BE Electrical, ME (Power System)
4. Work Experienced:
   a. Teaching : 22 Years
   b. Research : Nil
   c. Industry : Nil
   d. Other : Nil
5. Area of Specialization: Electrical Power System
   Subjects teaching at UG level: CS, PSDP, IEE
   Subjects teaching at PG level: PSD, PSOT
6. Research's Guidance Master's : 04
   PhD : Nil
7. No. of paper published in
   a. National journal : Nil
   b. Internal national journal : 04
   c. International Conference : 05
   d. National Conference : 09

   Project carried out : 01
   Patents : Nil
   Technology Transfer: Nil
   Research publication: 09
12. No. of book published with detail: Nil

Signature

PROFILE OF FACULTY

1. Name : M Mujtahid Ansari
2. Date of Birth : 11/10/1973
3. Educational Qualification: BE Electrical, ME (EPS)
4. Work Experienced:
   - a Teaching : 17 Years
   - b Research : Nil
   - c Industry : 02 Year, 8 Month
   - d Other
5. Area of Specialization : Electrical Power System
   Subjects teaching at UG level : EM/C-I, EM/C-II , PSS, PSOC & EAC
   Subjects teaching at PG level : PSD,HVPT
6. Research's Guidance Master's : 03
   PhD : Nil
7. No. of paper published in
   - a. National journal : Nil
   - b. Internal national journal : 09
   - c. Internal national Conference : 03
   - d. National Conference : 02
8. Project carried out : 01(MODROBS)
9. Patents : Nil
10. Technology Transfer : Nil
11. Research publication : 09
12. No. of book published with detail : 01, Element of Electrical Engineering
    Vrinda Publication, Jalgaon.

Signature

PROFILE OF FACULTY

1. Name : Suhas Manohar Shembekar
2. Date of Birth: 31/08 /1976
3. Educational Qualification: BE Electrical, ME (EPS)
4. Work Experienced:
   - a. Teaching : 17 Years
   - b. Research : Nil
   - c. Industry : Nil
   - d. Other : Nil
5. Area of Specialization : Electrical Power System
   Subjects teaching at UG : PS-II, PSOC, SGP, PSDP ,EIED
   Subjects teaching at PG level : PSMC,FACTS&PQ
6. Research's Guidance Master's : 02
   PhD : Nil
7. No .of paper published in
   - a. National journal : 02
   - b. Internal national journal : 14
   - c. Internal national Conference : 08
   - d. National Conference : 02
8. Project carried out : Nil
9. Patents : Nil
10. Technology Transfer : Nil
11. Research publication : 26
12. No. of book published with detail: Nil

Signature

PROFILE OF FACULTY

1. Name : Dhanesh S. Patil
2. Date of Birth : 23 /07 /1983
3. Educational Qualification: ME (EPS) Pursuing
   BE Electrical
4. Work Experienced:
   a. Teaching : 08 Year
   b. Research : Nil
   c. Industry : Nil
   d. Other : Nil
5. Area of Specialization : Electrical Power System
   Subjects teaching at UG level: EEM, HVE, NT, EM-II
   Subjects teaching at PG level: Nil
6. Research's Guidance Master's : Nil
   PhD : Nil
7. No .of paper published in
   a. National journal : Nil
   b. Internal national journal : 02
   c. Internal national Conference : Nil
   d. National Conference : Nil
8. Project carried out : Nil
9. Patents : Nil
10. Technology Transfer : Nil
11. Research publication : 02
12. No. of book published with detail: Nil

Signature

PROFILE OF FACULTY

1. Name : Mahajan Nilesh Suresh
2. Date of Birth: 17/05/1986
3. Educational Qualification: M.E. (EPS)
   BE Electrical
4. Work Experienced:
   a. Teaching : 04 & Half Year
   b. Research : Nil
   c. Industry : 01 Year
   d. Other : Nil
5. Area of Specialization : Electrical Power System
   Subjects teaching at UG level: PE, CMPS, IDC
   Subjects teaching at PG level: Power system Planning & Reliability, Computer Methods on Power System
6. Research's Guidance Master's : Nil
   PhD : Nil
7. No. of paper published in
   a. National journal : Nil
   b. Internal national journal : 08
   c. Internal national Conference : 02
   d. National Conference : 01
8. Project carried out : Nil
9. Patents : Nil
10. Technology Transfer : Nil
11. Research publication : 04
12. No. of book published with detail: Nil

Signature

PROFILE OF FACULTY

1. Name : Swapnil S. Bhuskute
2. Date of Birth: 24/08/1990
3. Educational Qualification: ME Electrical Power System
   BE Electrical
4. Work Experienced:
   a. Teaching : 3 Year
   b. Research : Nil
   c. Industry : Nil
   d. Other : Nil
5. Area of Specialization : Electrical Power System
   Subjects teaching at UG level: EMD, BEDC, IDC (Pr.) , CS (Pr.) SGP (Pr.).
   Subjects teaching at PG level: Nil
6. Research's Guidance Master's : Nil
   PhD : Nil
7. No. of paper published in
   a. National journal : 01
   b. Internal national journal : 03
   c. Internal national Conference : 01
   d. National Conference : 01
8. Project carried out : Nil
9 . Patents : Nil
10. Technology Transfer : Nil
11. Research publication : 03
12. No. of book published with detail: Nil

Signature

PROFILE OF FACULTY

1. Name : Miss. Sanmeet Kaur S. Chhabra
2. Date of Birth: 27/02/1992
3. Educational Qualification: B.E. (Electrical)
4. Work Experienced:
    a. Teaching : 01 Years
    b. Research: Nil
    c. Industry : Nil
    d. Other : Nil
5. Area of Specialization Electrical

    Subjects teaching at UG level: EM-I, PE (Pr.), ADE(PR), CP/Matlab (lecture+pr), PSDP(tu)

    Subjects teaching at PG level: Nil
6. . Research's Guidance Master's : Nil
    PhD : Nil
7. No. of paper published in
    a. National journal : Nil
    b. Internal national journal : Nil
    c. International Conference : Nil
    d. National Conference : Nil
8. Project carried out : Nil
9. Patents : Nil
10. Technology Transfer : Nil
11. Research publication : Nil
12. No. of book published with detail: Nil

Signature

PROFILE OF FACULTY

1. Name : Miss. Nikita Sapkar
2. Date of Birth: 22/12/1992
3. Educational Qualification: B.E. (Electrical)
4. Work Experienced:
    a. Teaching : 01 Years
    b. Research : Nil
    c. Industry : Nil
    d. Other : Nil
5. Area of Specialization Electrical

    Subjects teaching at UG level: IOM, HVE (Pr.), Software Application(pr), EDS(pr),EW(Pr.) Em/c-II(Pr.), BEDC

    Subjects teaching at PG level: Nil
6. Research's Guidance Master's : Nil
    PhD : Nil
7. No. of paper published in
    a. National journal : Nil
    b. Internal national journal : Nil
    c. International Conference : Nil
    d. National Conference : Nil
8. Project carried out : Nil
9. Patents : Nil
10. Technology Transfer : Nil
11. Research publication : Nil
12. No. of book published with detail: Nil

Signature

PROFILE OF FACULTY

1. Name : A. R. Khan
2. Date of Birth: 17/09/1989
3. Educational Qualification: BE Electrical
4. Work Experienced:
    a. Teaching : 01 Years
    b. Research : Nil
    c. Industry : Nil
    d. Other : Nil
5. Area of Specialization : Electrical

    Subjects teaching at UG level: SA-I, SS-III, IEE (PR.), SA-I(Pr), SS-III(Pr)

    Subjects teaching at PG level: Nil
6. Research's Guidance Master's : Nil
    PhD : Nil
7. No. of paper published in
    a. National journal : 00
    b. Internal national journal : 00
    c. Internal national Conference : 00
    d. National Conference : 00

8. Project carried out : Nil
9 . Patents : Nil
10. Technology Transfer : Nil
11. Research publication : Nil
12. No. of book published with detail: Nil

Signature

PROFILE OF FACULTY

1. Name : Miss. N.D. Bhole
2. Date of Birth: 28/10/1992
3. Educational Qualification: ME (EPS) Pursuing
   BE Electrical
4. Work Experienced:
   a. Teaching : 06 Months
   b. Research : Nil
   c. Industry : Nil
   d. Other : Nil
5. Area of Specialization : Electrical Power System
   Subjects teaching at UG level: ED, PSS(Pr), WP-II
   Subjects teaching at PG level: Nil
6. Research's Guidance Master's : Nil
   PhD : Nil
7. No. of paper published in
   a. National journal : 00
   b. Internal national journal : 00
   c. Internal national Conference : 00
   d. National Conference : 00

8. Project carried out : Nil
9. Patents : Nil
10. Technology Transfer : Nil
11. Research publication : Nil
12. No. of book published with detail: Nil

Signature

PROFILE OF FACULTY

1. Name : Miss. Priyanka S. Patil
2. Date of Birth: 12/08/1992
3. Educational Qualification: ME (EPS) (Pursuing)
   BE Electrical
4. Work Experienced:
   a. Teaching : 06 Months
   b. Research : Nil
   c. Industry : Nil
   d. Other : Nil
5. Area of Specialization : Electrical Power System
   Subjects teaching at UG level: SA-I (Pr.)
   Subjects teaching at PG level: Nil
6. Research's Guidance Master's : Nil
   PhD : Nil
7. No. of paper published in
   a. National journal : 00
   b. Internal national journal : 00
   c. Internal national Conference : 00
   d. National Conference : 00

8. Project carried out : Nil
9. Patents : Nil
10. Technology Transfer : Nil
11. Research publication : Nil
12. No. of book published with detail: Nil

Signature

PROFILE OF FACULTY

1. Name : Lokesh N. Londhe
2. Date of Birth: 23/04/1993
3. Educational Qualification: M.Tech (PE & PS) (Pursuing)
   BE Electrical
4. Work Experienced:
   a. Teaching : 06 months
   b. Research : Nil
   c. Industry : Nil
   d. Other : Nil
5. Area of Specialization : Power Electronics and Power System
   Subjects teaching at UG level: BEDC (TH & PR)
   Subjects teaching at PG level: Nil
6. Research's Guidance Master's : Nil
   PhD : Nil
7. No. of paper published in
   a. National journal : 00
   b. Internal national journal : 00
   c. Internal national Conference : 00
   d. National Conference : 00
8. Project carried out : Nil
9. Patents : Nil
10. Technology Transfer : Nil
11. Research publication : Nil
12. No. of book published with detail: Nil

Signature

FACULTY PROFILE

1. Name : Dr. Umesh S. Bhadade
2. Date of Birth : 16/08/1971
3. Educational Qualification : B.E., M.E. (Electronics), PhD(Electrical Engg.)
4. Work Experience :
   - Teaching : 22 Years
   - Research : Nil
   - Industry : Nil

5. Area of Specialization : Data Compression

6. Subject Taught at P.G. level : Software Project Management, Digital System Design
   Subject Taught at U.G. level : Computer Network, Programming Paradigm & Methodology, Microprocessor (8085/8086/80386), Microcontrollers, Software Engineering, Data Structure

7. Research guidance at
   - Master's level : 5
   - Ph.D. level : 07 + 02

   No. Papers published/presented in
   - National Journal : Nil
   - International Journal : 11
   - National Conferences : 15
   - International Conferences : 16

8. Projects carried out : 01

9. Patents :01 (filed)

10. Technology Transfer : Nil

11. Research publications : 42

12. No. of books published with details : --

Signature

FACULTY PROFILE

1. Name : Sandeep Jagannath Patil

2. Date of Birth : 16/09/1980

3. Educational Qualification : **ME (CSE)**
   BE (IT)

4. Work Experience :
   - Teaching : 11 Years 6 Months
   - Research : Nil
   - Industry : Nil

5. Area of Specialization : Computer Science and Engg.

6. Subject Taught at P.G. level : Nil
   Subject Taught at U.G. level : Internet Security, Computer Network, Cryptography & Network Security, E-Commerce, Programming Paradigm & Methodology, Web Design

7. Research guidance at
   - Master's level : Nil
   - Ph.D. level : Nil

   No. Papers published/presented in
   - National Journal : Nil
   - International Journal : 09
   - National Conferences : 03
   - International Conferences : 03

8. Projects carried out : Nil

9. Patents : Nil

10. Technology Transfer : Nil

11. Research publications : 09

12. No. of books published with details : 03
    1. Title - : Computer Network
       Publication: Prakash Publication, Jalgaon
    2. Title - : Advanced Computer Network
       Publication: Prakash Publication, Jalgaon
    3. Title - : Computer Communication Network
       Publication: Prakash Publication

Signature

FACULTY PROFILE

1.	Name	: Archana K. Bhavsar
2.	Date of Birth	: 22/02/1977
3.	Educational Qualification	: **M. Tech (CSE),** **B.E. (Computer Engg.)**
4.	Work Experience	:
	- Teaching	: 11 Years 6 Months
		: 3 Years 4 Months as a Programmer
	- Research	: Nil
	- Industry	: Nil
5.	Area Specialization	: Computer Science & Engg.
6.	Subject Taught at P.G. level	: Parallel Computing
	Subject Taught at U.G. level	: Object Oriented Modeling & Design , Software Engineering, Data Communication, Programming Paradigm & Methodology,
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
	No. papers published in	
	- National Journals	: Nil
	- International Journal	: 02
	- National Conferences	: 03
	- International Conferences	: Nil
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: Nil
12.	No. books published with details	: 03
	Title -	: Object Oriented Modeling and Design
	Publications	: Prakash Publication, Jalgaon
	Title -	: Software Engineering
	Publications	: Prakash Publication, Jalgaon
	Title -	: Computer Network
	Publications	: Prakash Publication, Jalgaon

Signature

FACULTY PROFILE

1.	Name	: Mr. Nitin Pundlik Jagtap
2.	Date of Birth	: 31/05/80
3.	Educational Qualification	: **M.E. (CSE)** B.E. (I T)
4.	Work Experience	:
	- Teaching	: 8 years 11 Months
	- Research	: Nil
	- Industry	: 1 year 5 month.
5.	Area Specialization	: Computer Science and Engg.
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	: Cloud Computing,Enterprise Resource Planning, Industrial Management and Economics Database Management System, Information Theory, Management Information System, System Programming, Artificial intelligence and Neural Network, Embedded System, Data ware housing and Mining, Programming Paradigm and Methodology, Discrete Structure & Graph Theory.
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
	No. Papers published in	
	- National Journals	: 04
	- International Journal	: 09
	- National Conferences	: 02
	- International Conferences	: 02
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	:17
12.	No. of Books published with details	: 01) Implementation of Data watcher for Data Leakage Detection system Lambert Publication, Germany 02) Data ware house and Mining Prakash Publication

Signature

FACULTY PROFILE

1.	Name	: Mr. S.H.Rajput
2.	Date of Birth	: 26/10/1984
3.	Educational Qualification	: **M.E. (CSE)** B.E. (Computer)
4.	Work Experience	:
	- Teaching	: 7 Year 1 Months
	- Research	: Nil
	- Industry	: Nil
5.	Area Specialization	: Computer Engineering
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	: Digital System and Microprocessor, Theory of Computer Science, Software Metrics and Quality Assurance, Microprocessor and Microcontroller interfacing.
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
	No. papers published in	
	- National Journals	: Nil
	- International Journals	: 02
	- National Conferences	: 04
	- International Conferences	: Nil
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: Nil
12.	No. books published with details	: Nil

Signature

FACULTY PROFILE

1.	Name	: Mr. Rohidas B.Sangore
2.	Date of Birth	: 18/09/1985
3.	Educational Qualification	: M Tech (IT) B.E. (IT)
4.	Work Experience	:
	- Teaching	: 6 Years 11 Months
	- Research	: Nil
	- Industry	: 3 Months
5.	Area Specialization	: Information Technology
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	: Enterprise Resource Planning, ERP&SAP, Operating System, Mobile Computing, E-commerce, Data Communication, Computer Organization, Multimedia Technique, & Industrial Management and Economics
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
No.	Papers published in	
	- National Journals	: Nil
	- International Journal	: 06
	- National Conferences	: 03
	- International Conferences	: Nil
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: Nil
12.	No. Books published with details	: Nil

Signature

FACULTY PROFILE

1.	Name	: Prashant Chandrakant Harne
2.	Date of Birth	: 12/01/1988
3.	Educational Qualification	: M Tech CSE, BE (CSE)
4.	Work Experience	:
	- Teaching	: 5 years 11Months
	- Research	: Nil
	- Industry	: Nil.
5.	Area Specialization	: Computer Science and Engg.
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	: System Programming Management Information System Artificial Intelligence & Neural Network Enterprise Resource Planning
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
	No. Papers published in	
	- National Journals	: Nil
	- International Journals	: 04
	- National Conferences	: 02
	- International Conferences	: Nil
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: Nil
12.	No. Books published with details	: Nil

Signature

FACULTY PROFILE

1.	Name	: Harshal Rajas Kotwal
2.	Date of Birth	: 23/05/1986
3.	Educational Qualification	: **ME IT,** B.E. (IT)
4.	Work Experience	:
	- Teaching	: 6 years and 6 months
	- Research	: Nil
	- Industry	: Nil.
5.	Area Specialization	: Information Technology
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	: Object Oriented Technology Computer Graphics & Multimedia Management Information System Principles of Management
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
	No. Papers published in	
	- National Journals	: 1
	- International Journals	: 3
	- National Conferences	: 1
	- International Conferences	: 1
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: 5
12.	No. Books published with details	: Nil

Signature

FACULTY PROFILE

1.	Name	: Shambhu Kumar Singh
2.	Date of Birth	: 14/09/1990
3.	Educational Qualification	: **M.E. (CSE), B.E. (I.T)**
4.	Work Experience	:
	- Teaching	: 3 Years, 6 Months
	- Research	: Nil
	- Industry	: 5 months
5.	Area Specialization	: Information Technology.
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	: Data Structures, Advanced Unix Programming, Data Warehousing and Mining
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
	No. Papers published in	
	- National Journals	: Nil
	- International Journals	: 07
	- National Conferences	: Nil
	- International Conferences	: 01
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: 07
12.	No. Books published with details	: Nil

FACULTY PROFILE

1.	Name	: Pravin Keshav Patil
2.	Date of Birth	: 31/08/1991
3.	Educational Qualification	: **M.E. (CSE)** **B.E. (CSE)**
4.	Work Experience	:
	- Teaching	: 2 Years 4 months
	- Research	: Nil
	- Industry	: 0 months
5.	Area Specialization	: Information Technology.
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	: DSM, CO, Operating System, Web Design, ADL, Linux, E Commerce, DWM.
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
	No. Papers published in	
	- National Journals	: Nil
	- International Journals	: 07
	- National Conferences	: Nil
	- International Conferences	: 03
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: 07
12.	No. Books published with details	: Nil

Signature

FACULTY PROFILE

1.	Name	: Mayur S. Patil
2.	Date of Birth	: 13/05/1991
3.	Educational Qualification	: **M.E. (CSE)** Appear **B.E. (I T)**
4.	Work Experience	:
	- Teaching	: 6 Month
	- Research	: Nil
	- Industry	: 0 months
5.	Area Specialization	: Information Technology.
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	: Soft Skills-III, Microprocessor and Microcontroller Interfacing Lab
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
	No. Papers published in	
	- National Journals	: Nil
	- International Journals	: 01
	- National Conferences	: Nil
	- International Conferences	: Nil
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: Nil
12.	No. Books published with details	: Nil

Signature

MECHANICAL ENGGINEERING DEPARTMENT

FACULTY PROFILE

1.	Name	: **Dr. Dheeraj Sheshrao Deshmukh**.
2.	Date of Birth	: 10/09/1974
3.	Educational Qualification	: Ph.D. in Mechanical Engineering
4.	Work Experience	:
	- Teaching	: 19 Years
	- Research	: 0 Years
	- Industry	: Nil
5.	Area of Specialization	: Thermal Engineering
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	: Engg. Graphics, EDEME, EME, Fluid Mechanics. Applied Thermodynamics, Heat Transfer, Turbo Machines, Automobile Engineering, RAC
7.	Research guidance at	
	- Masters's level	: 4
	- Ph.D. level	: 10
	No. of papers published in	
	- National Journals	: Nil
	- International Journals	: 28
	- National Conferences	: 03
	- International Conferences	: 19
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: 50
12.	No. of books published with details	: 01

Signature

FACULTY PROFILE

1.	Name	: **Er. N. K. Patil**.
2.	Date of Birth	: 23/09/1969
3.	Educational Qualification	: M. Tech (Energy Mgt.), M.E. (Machine Design) M B A (Marketing) Ph.D Pursing
4.	Work Experience	:
	- Teaching	: 21 Years
	- Research	: 0 Years
	- Industry	: 02 Years
5.	Area of Specialization	: Design, Thermal, Management
6.	Subject Taught at P.G. level	: MTD, CMMD
	Subject Taught at U.G. level	: Engg. Graphics, Mechanics, EME, TOM-I, MMM, OR.,EDEME
7.	Research guidance at	
	- Masters's level	: 10
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: 01
	- International Journals	: 03
	- National Conferences	: 13
	- International Conferences	: 09
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: 02
12.	No. of books published with details	: 06

Signature

FACULTY PROFILE

1.	Name	: **Krishna Shrivastava**.
2.	Date of Birth	: 07 / 11 / 1973
3.	Educational Qualification	: M.E. Mech. Engg. (Thermal Power) Ph.D. (Pursuing)
4.	Work Experience	:
	- Teaching	: 17 Years
	- Research	: Nil
	- Industry	: 01
5.	Area of Specialization	: Thermal Power
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	: Engg. Graphics, EDEME, EME, HTMT, Turbo Machinery's, RAC, Thermodynamics
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: 00
	- International Journals	: 03
	- National Conferences	: 10
	- International Conferences	: 05
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: 18
12.	No. of books published with details	: 01

Signature

FACULTY PROFILE

1.	Name	: Dr.**Sanjay Pratapsingh Shekhawat**
2.	Date of Birth	: 03/ 05/74
3.	Educational Qualification	: Ph.D.
4.	Work Experience	:
	- Teaching	: 16 Years
	- Research	: Nil
	- Industry	: Nil
5.	Area of Specialization	: Energy
6.	Subject Taught at P.G. level	: IACS, Mechatronics
	Subject Taught at U.G. level	: EME, Theory of Mechanics-I, Theory of Mechanics-II, Automobile Eng.
7.	Research guidance at	
	- Masters's level	: 05
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: 02
	- International Journals	: 10
	- National Conferences	: 02
	- International Conferences	: 08
8.	Projects carried out	: 01
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: 10
12.	No. of books published with details	: 01

Signature

FACULTY PROFILE

1.	Name	: **P.G. Damle**.
2.	Date of Birth	: 08 / 10 / 1973
3.	Educational Qualification	: M. E. (M/c Design)
4.	Work Experience	:
	- Teaching	: 15 Years
	- Research	: Nil
	- Industry	: 01
5.	Area of Specialization	: Design
6.	Subject Taught at P.G. level	: Vibration Engg., DSM
	Subject Taught at U.G. level	: Engg. Graphics, Machine Design-I, Machine Design-II, EDEME
7.	Research guidance at	
	- Masters's level	: 10
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: 00
	- International Journals	: 01
	- National Conferences	: 05
	- International Conferences	: 02
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: 02
12.	No. of books published with details	: 01

Signature

FACULTY PROFILE

1.	Name	: **Devendra B. Sadaphale**.
2.	Date of Birth	: 01 / 07 / 76
3.	Educational Qualification	: M. E. (M/c Design)
4.	Work Experience	:
	- Teaching	: 15 Years
	- Research	: Nil
	- Industry	: 01
5.	Area of Specialization	: Machine Design
6.	Subject Taught at P.G. level	: AMED, OTD, MTD
	Subject Taught at U.G. level	: Fluid Mechanics, Material science, Applied Thermodynamics, Engg. Metallurgy.
7.	Research guidance at	
	- Masters's level	: 07
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: 01
	- International Journals	: 04
	- National Conferences	: 01
	- International Conferences	: 01
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: Nil
12.	No. of books published with details	: Nil

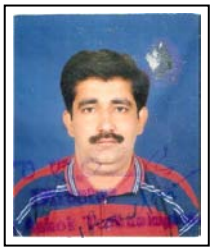
Signature

FACULTY PROFILE

1.	Name	: **Prashant N. Ulhe**.
2.	Date of Birth	: 09/ 03/1974
3.	Educational Qualification	: M. E. (M/c Design)
4.	Work Experience	:
	- Teaching	: 12Years
	- Research	: Nil
	- Industry	: 05
5.	Area of Specialization	: Machine Design
6.	Subject Taught at P.G. level	: Tribology, OTD
	Subject Taught at U.G. level	: Engg. Graphics, Strength of Material, Mechanical Vibration, Machine Design-II.
7.	Research guidance at	
	- Masters's level	: 07
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: 02
	- International Journals	: 08
	- National Conferences	: 08
	- International Conferences	: 03
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: Nil
12.	No. of books published with details	: Nil

Signature

FACULTY PROFILE



1.	Name	: **Mahesh Vedprakash Rawlani**
2.	Date of Birth	: 7th June1970
3.	Educational Qualification	: M.E. (Mech) (APS)
4.	Work Experience	:
	- Teaching	: 20Years
	- Research	: Nil
	- Industry	: Nil
5.	Area of Specialization	: Advance Production System
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	: Engg. Graphics, Engg. Thermodynamics, PBM, NACM, IE, OR.
7.	Research guidance at	
	- Masters's level	: 01
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: 00
	- International Journals	: 02
	- National Conferences	: 05
	- International Conferences	: 02
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: Nil
12.	No. of books published with details	: 12

Signature

FACULTY PROFILE

1.	Name	: **Pradeep M. Solanki**
2.	Date of Birth	: 06/10/81
3.	Educational Qualification	: M.E. Mechanical (CAD/CAM)
4.	Work Experience	:
	- Teaching	: 08Years
	- Research	: Nil
	- Industry	: Nil
5.	Area of Specialization	: CAD/CAM
6.	Subject Taught at P.G. level	: CMMD, Robotics
	Subject Taught at U.G. level	: EDEME, Engg. Thermodynamic, NACM, CAD/CAM, Robotics, Finite element Analysis, Mechatronics
7.	Research guidance at	
	- Masters's level	: 08
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: Nil
	- International Journals	: 06
	- National Conferences	: 05
	- International Conferences	: 07
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: Nil
12.	No. of books published with details	: Nil

Signature

FACULTY PROFILE

1.	Name	: **Dr. Prashant Pandit Bornare**
2.	Date of Birth	: 01/06/1979.
3.	Educational Qualification	: Ph.D (Management**)** B.E. Mech. MBA (Marketing & HRD), M.E.(Mechannical)
4.	Work Experience	:
	- Teaching	: 09Years
	- Research	: Nil
	- Industry	: 03 Years
5.	Area of Specialization	: Management, Mechanical
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	: Internal combustion Engine, MMM, PBM, Automobile Engineering, Industrial Engineering
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: 03
	- International Journals	: 03
	- National Conferences	: 03
	- International Conferences	: 03
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: 03
12.	No. of books published with details	: Nil

Signature

FACULTY PROFILE

1.	Name	: **Ajay. R. Bhardwaj**
2.	Date of Birth	: 05 / 07 / 1968
3.	Educational Qualification	: B.E. Production ME Mechanical (Machine Design)
4.	Work Experience	:
	- Teaching	: 09 Years
	- Research	: Nil
	- Industry	: 07 Years
5.	Area of Specialization	: Machine Design
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	: Manufacturing Engineering-I, Manufacturing Engineering-II.
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: 01
	- International Journals	: 07
	- National Conferences	: Nil
	- International Conferences	: 01
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: 09
12.	No. of books published with details	: Nil

Signature

FACULTY PROFILE

1.	Name	: **P. D. Patil**
2.	Date of Birth	: 30 / 04 / 1980.
3.	Educational Qualification	: M. E. Mechanical (CAD/CAM)
4.	Work Experience	:
	- Teaching	: 08Years
	- Research	: Nil
	- Industry	: 01
5.	Area of Specialization	: CAD/CAM
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	: Engg. Graphics, Engg. Thermodynamics, CAD/CAM, FEA, PPE, AT, EDEME
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: 03
	- International Journals	: 01
	- National Conferences	: 01
	- International Conferences	: 01
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: Nil
12.	No. of books published with details	: Nil

Signature

FACULTY PROFILE

1.	Name	: **Chandan Krishna Mukherjee**
2.	Date of Birth	: 09th. March, 1963.
3.	Educational Qualification	: B.Sc. Engg. (Mechanical Engineering) MBA (Finance & Industrial Management)
4.	Work Experience	:
	- Teaching	: 07Years
	- Research	: Nil
	- Industry	: 06 Years
5.	Area of Specialization	: Mechanical
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	: Engg. Thermodynamics, NACM, IE, PBM, MMM, Automobile, Robotics, Soft skill, Machine Drawing
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: Nil
	- International Journals	: 03
	- National Conferences	: 02
	- International Conferences	: Nil
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: Nil
12.	No. of books published with details	: Nil

Signature

FACULTY PROFILE

1.	Name	: **Mahesh V Kulkarni**
2.	Date of Birth	: 23/07/1979.
3.	Educational Qualification	: M.Tech. (Heat Power Engg)
4.	Work Experience	:
	- Teaching	: 07 Years
	- Research	: Nil
	- Industry	: 03 Years
5.	Area of Specialization	: Thermal
6.	Subject Taught at P.G. level	: Advance Thermal
	Subject Taught at U.G. level	: Engg. Thermodynamics, Applied Thermodynamics, Turbo machinery, RAC
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: Nil
	- International Journals	: 02
	- National Conferences	: Nil
	- International Conferences	: 05
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: Nil
12.	No. of books published with details	: Nil

Signature

FACULTY PROFILE

1.	Name	: Dipak Chandrakant Talele
2.	Date of Birth	: 19/06/1987.
3.	Educational Qualification	: M.Tech. (CAD/CAM)
4.	Work Experience	:
	- Teaching	: 02 years
	- Research	: Nil
	- Industry	: 09 month
5.	Area of Specialization	: CAD/CAM
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	: FEA&S, TOM-II
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: 00
	- International Journals	: 03
	- National Conferences	: 03
	- International Conferences	: 08
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: Nil
12.	No. of books published with details	: Nil

Signature

FACULTY PROFILE

1.	Name	: **Jagruti Ramesh Surange**
2.	Date of Birth	: 20/11/1982.
3.	Educational Qualification	: B.E. (Production s/w)
4.	Work Experience	:
	- Teaching	: 03 Year
	- Research	: Nil
	- Industry	: 01 Year
5.	Area of Specialization	: Production
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	: Manufacturing Engg.-I, Manufacturing Engg.-II.,MMM
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: 00
	- International Journals	: 02
	- National Conferences	: 04
	- International Conferences	: 02
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: Nil
12.	No. of books published with details	: Nil

Signature

FACULTY PROFILE

1.	Name	: **Akhilesh V. Rajput**
2.	Date of Birth	: 06/1/1989.
3.	Educational Qualification	: B.E (mechanical), ME (pursuing)
4.	Work Experience	:
	- Teaching	: 1.5Years
	- Research	: Nil
	- Industry	: 02Year
5.	Area of Specialization	: Machine Design
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	: EDEME, Computer Graphics
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: Nil
	- International Journals	: Nil
	- National Conferences	: 02
	- International Conferences	: Nil
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: Nil
12.	No. of books published with details	: Nil

Signature

FACULTY PROFILE

1.	Name	: **Swapnil A. Rajput**
2.	Date of Birth	: 17/02/1988.
3.	Educational Qualification	: B.E (mechanical), ME (pursing)
4.	Work Experience	:
	- Teaching	: 01Years
	- Research	: Nil
	- Industry	: 1.5Year
5.	Area of Specialization	: Machine Design
6.	Subject Taught at P.G. level	: Nil
	Subject Taught at U.G. level	Power Plant Engineering, AT
7.	Research guidance at	
	- Masters's level	: Nil
	- Ph.D. level	: Nil
	No. of papers published in	
	- National Journals	: 01
	- International Journals	: Nil
	- National Conferences	: Nil
	- International Conferences	: Nil
8.	Projects carried out	: Nil
9.	Patents	: Nil
10.	Technology Transfer	: Nil
11.	Research publications	: Nil
12.	No. of books published with details	: Nil

Signature

DEPARTMENT OF BUSINESS ADMINISTRATION (M.B.A)

FACULTY PROFILE

1. Name : Vishal S.Rana

2. Date of Birth: 15/12/1980

3. Educational Qualification: M.Com, M.B.A (Marketing), Ph.D (Mgmt Sci)

4. Work Experienced:

    1. Teaching : 9.11 Years
    2. Research : Nil
    3. Industry : 0.7 Months
    4. Other : Nil

5. Area of Specialization: Marketing

6. Subjects teaching at UG level: NIL

    Subjects teaching at PG level: Organizational Behavior-I & II, Global Marketing Management, Retail Management & Consumer Behavior, Cases in Marketing.

7 Research's Guidance Master's : Nil

Ph.D : Nil

No. Of paper published in a. National journal : 03

b. International journal : 16

c. National Conference : 13

d. International Conference: 05

8. Project carried out : Nil

9. Patents : Nil

10. Technology Transfer : Nil

11. Research publication : 11

12. No. of book published with detail: Nil

Signature

DEPARTMENT OF BUSINESS ADMINISTRATION (M.B.A)

FACULTY PROFILE

1. Name : Pankajkumar Ambadas Anawade

2. Date of Birth: 05/07/1982

3. Educational Qualification: B.E (Mech), M.B.A (Mktg)

4. Work Experienced:

    1. Teaching : 05 Years and 07 Months
    2. Research : Nil
    3. Industry : 2.5 Years
    4. Other : Nil

5. Area of Specialization: Marketing

6. Subjects teaching at UG level: NIL

    Subjects teaching at PG level: Introduction to Operation Management, Quantitative Techniques, Legal Aspects Of Business, Service Marketing, Indian Commercial Laws, Supply Chain Management, Service marketing.

7 Research's Guidance Master's : Nil

Ph.D : Nil

No. Of paper published in a. National journal : 07
b. International journal: 03
c. National Conference : 07
d. International Conference : 03

08. Project carried out : Nil
09. Patents : Nil
10. Technology Transfer : Nil
11. Research publication : 04
12.No. of book published with detail: Nil

Signature

DEPARTMENT OF BUSINESS ADMINISTRATION (M.B.A)

FACULTY PROFILE

1. Name : Harshal A.Salunkhe

2. Date of Birth: 28/07/1985

3. Educational Qualification: B.Sc (Chem), M.B.A (Fin)

4. Work Experienced:

    1. Teaching : 8 Year
    2. Research : Nil
    3. Industry : Nil
    4. Other : Nil

5. Area of Specialization: Finance

6. Subjects teaching at UG level: Financial Management, Financial Accounting, Management Science.

   Subjects teaching at PG level: Financial Management, Corporate Social Responsibility, Tax Management, Family Business Management, Financial Derivatives, Bank Management, International Financial Management

7 Research's Guidance Master's : Nil

Ph.D : Nil

No. Of paper published in a. National journal : 02
b. International journal: 10
c. National Conference : 12
d. International Conference: 04

08. Project carried out : Nil
09. Patents : Nil
10. Technology Transfer : Nil
11. Research publication : 14
12.No. of book published with detail: Nil

Signature

DEPARTMENT OF BUSINESS ADMINISTRATION (M.B.A)

FACULTY PROFILE

1. Name : Dr.Richa A.Modiyani

2. Date of Birth: 30/04/1987

3. Educational Qualification: B.B.S, M.B.A (Fin), PhD (Mgmt)

4. Work Experienced:

    1. Teaching : 07 Years
    2. Research : Nil
    3. Industry : Nil
    4. Other : Nil

5. Area of Specialization: Finance

6. Subjects teaching at UG level: NIL

    Subjects teaching at PG level: Financial Management, Business Accounting, Managerial Economics, Management Accounting, Strategic Management, Management Practices, Case Studies in Finance

7 Research's Guidance Master's : Nil

Ph.D : Nil

No. of paper published in a. National journal : Nil

b. Internal national journal: 01

c. Conference : 01

08. Project carried out : Nil

09. Patents : Nil

10. Technology Transfer : Nil

11. Research publication : Nil

12. No. of book published with detail: Nil

Signature

DEPARTMENT OF BUSINESS ADMINISTRATION (M.B.A)

FACULTY PROFILE

1. Name : Mukesh Bhaskar Ahirrao

2. Date of Birth : 24/06/1984

3. Educational Qualification : M.Com, M.B.A (Fin.), Ph.D Pursuing

4. Work Experienced:

    1. Teaching : 4 Years 6 Months
    2. Research : Nil
    3. Industry : 3 Years 4 Months
    4. Other : Nil

5. Area of Specialization : Finance & Marketing

6. Subjects teaching at UG level: Nil

Subjects teaching at PG level: Entrepreneurship & Project Management, Global Economic Scenario, Managerial Economics, Marketing Research & Business Analytics, Investment & Portfolio Management, Marketing Management, Case Studies in Financial Management, Product & Brand Management, Practical Aspect of Business.

7 Research's Guidance Master's : Nil
Ph.D : Nil

No. Of paper published in a. National journal : 03
b. International journal : 10
c. Conference : 03

12. Project carried out : Nil
13. Patents : Nil
14. Technology Transfer : Nil
15. Research publication : Nil
12. No. of book published with detail : Nil

Signature

DEPARTMENT OF BUSINESS ADMINISTRATION (M.B.A)

FACULTY PROFILE

1. Name: Faroza A. Kazi

2. Date of Birth: 16/02/1978

3. Educational Qualification: M.P.M, M.B.A (HRM)

4. Work Experienced:

    1. Teaching : 3 yrs & 6 months
    2. Research : Nil
    3. Industry : 2 yrs
    4. Other : 4 yrs Teaching as Lecturer in Engg.

5. Area of Specialization : HRM

6. Subjects teaching at UG level:

Industrial Mgmt (E&TC Engg.), Industrial Org. & Mgmt (Electrical Engg.), Industrial Mgmt & Economics (Comp/IT Engg.)

Subjects teaching at PG level:

Management Science, Business Research Methods, Information Technology for Managers, E-commerce, Industrial Relation & Trade Union, HR Legislations, Labour Welfare & Administration, Mgmt. Information System & ERP & Cases in HRM

7 Research's Guidance Master's : Nil

Ph.D : Nil

No. Of paper published in
- a. National journal : Nil
- b. International journal : 02
- c. National Conference : 03
- d. International Conference : 05

16. Project carried out : 24 (MBA)
17. Patents : Nil
18. Technology Transfer : Nil
19. Research publication : 08
12. No. of book published with detail: Nil

Signature

DEPARTMENT OF BUSINESS ADMINISTRATION (M.B.A)

FACULTY PROFILE

1. Name : Dr. Saroj B. Patil

2. Date of Birth: 28/05/1974

3. Educational Qualification: B.Sc.(computer), M.C.M, Ph.D

4. Work Experienced:

    1. Teaching : 10 months
    2. Research : Nil
    3. Industry : Nil
    4. Other : Nil

5. Area of Specialization: HRM

6. Subjects teaching at UG level: Nil

Subjects teaching at PG level: Human Resource Management, Information Technology for Manager, E-commerce and Excellence Management

7 Research's Guidance Master's : Nil

Ph.D : Nil

No. Of paper published in a. National journal : Nil

b. International journal : 04

c. National Conference : 02

d. International Conference: 01

20. Project carried out : Nil

21. Patents : Nil

22. Technology Transfer : Nil

23. Research publication : Nil

12. No. of book published with detail: Nil

Signature

DEPARTMENT OF BUSINESS ADMINISTRATION (M.B.A)

FACULTY PROFILE

1. Name : Ms.Sanjivani B.Lokhande

2. Date of Birth: 30/05/1987

3. Educational Qualification: B.Sc.(Bio-chem), M.B.A.(HR), Ph.D Pursuing

4. Work Experienced:

    1. Teaching : 2 year
    2. Research : 1 year
    3. Industry : Nil
    4. Other : Nil

5. Area of Specialization: HRM

6. Subjects teaching at UG level:Human Resource Management , Business Law ,Entrepreneurship & Project Management ,Communication Skills ,Organizational Behaviour ,Corporate Social Responsibility & Corporate Governance ,Managerial economics

Subjects teaching at PG level: Human Resource Management ,Strategic Human Resource Management ,Industrial Relation & Labour welfare ,Sales & Distribution ,Legal Aspects in Business

7.Research's Guidance Master's : Nil

Ph.D : Nil

No. Of paper published in a. National journal : Nil

b. International journal : Nil

c. National Conference : 01

d. International Conference: Nil

24. Project carried out : Nil

25. Patents : Nil

26. Technology Transfer : Nil

27. Research publication : Nil

12. No. of book published with detail: Nil Signature

VIII.FEE

A) Details of fee, as approved by Shikshan Shulka Samiti, for the instauration.

2015-16

Sr.No.	Branch	Tution fee
	UG Courses	
1	Chemical Engineering	RS.64036
2	Civil Engineering	RS.64036
3	Computer Engineering	Rs.64036
4	Mechanical Engineering	Rs.64036
5	Electrical Engineering	Rs.64036
6	Electronics and Tele-comm.Engineering	Rs.64036
7	Information Technology Engineering	Rs.64036
8	Bio – Technology	Rs.64036
	PG Courses	
1	ME Civil Engineering (Environmental)	Rs.64036
2	ME Mechanical Engineering (Machine Design)	Rs.64036
3	ME E & TC (digital)	Rs.64036
4	ME Computer Sci.Engineering	Rs.64036
5	M.B.A.	Rs.64036

B) Time schedule for payment of fee the entire programme.

As per Admission rule Government of Maharashtra all fees for the entire programme. Should be remitted at the time of admission.

C) No. of Fee Waivers granted with amount and name of students.

NA

D) Number of scholarship offered by the institute, duration and amount

NA

E) Criteria for fee waivers/scholarship.

NA

F) Estimated cost of Boarding and Lodging I Hostels .

Rs.27000/- For lodging and boarding both yearly.

IX. ADMISSION

A) Number of seats sanctioned with the year of approval.

Sr.	Branch	Year		
		2013-14	2014-15	2015-16
1	Chemical Engineering	30	30	30
2	Civil Engineering	120	120	120
3	Computer Engineering	120	120	120
4	Mechanical Engineering	120	120	120
5	Electrical Engg.	60	60	60
6	Electronics and Tele-comm. Engg.	120	120	120
7	Information Technology	60	60	60
8	Bio-Technology	30	30	30
	Total	**660**	**660**	**660**
	PG Courses			
01	ME Civil Engg. (Environmental)	18	18	18
02	ME Mechanical Engg. (Machine Design)	18	18	18
03	ME E&TC (Digital Electronics)	18	18	18
04	ME Computer Sci. & Engg.	18	18	18
05	ME Electrical (Electrical Power System)	18	18	18
	Total	**90**	**90**	**90**
06	M.B.A.	60	60	60
	Total	**60**	**60**	**60**

B) Number of students admitted under various categories each year in the last four years.

	UG									
Year	Open	SC	ST	NT1	NT2	NT3	VJ	OBC	SBC	Total
2013-14	210	54	13	15	25	05	26	296	21	665
2014-15	152	56	09	17	14	09	15	320	18	610
2015-16	138	45	14	14	15	09	13	306	18	572

	PG									
Year	Open	SC	ST	NT1	NT2	NT3	VJ	OBC	SBC	Total
2013-14	40	06	03	02	00	04	00	29	03	87
2014-15	105	02	00	01	01	00	02	35	00	146
2015-16	43	03	00	00	00	01	00	11	00	58

C) Number of applications received during last two years for admission under Management Quota and number admitted.

Sr.	Year	Application received	Admitted Number
1	2013-14	138	123
2	2014-15	175	98
3	2015-16	150	70

X. Admission Procedure (UG COURSES)

A) Mention the admission test being followed, name and address of the Test Agency and its URL (website).

Sr.	Admission Test	Name and Address of Test Agency	URL (Website)
1	MHT-CET	Director of Technical Education, Maharashtra State 3, Mahapalika Marg, Mumbai -1	www.dte.org.in
2	JEE	CBSE, New Delhi	

B) Number of seats allotted to different Test Qualified candidates separately [JEE/CET (State conducted test/University tests)/Association conducted test]

2015-2016

Sr.	MH-CET/JEE State Conducted test	AI(CET/JEE)	Management Quota(CET / JEE)
1	65% (429 Seats)	15% (99 Seats)	20% (132 Seats)

C) Calendar for admission against management/vacant seats 2015-16

Sr. No.	Particular	Institute level Seats
1.	Sale of Information Broacher	08/06/2015
2.	Last date for submission of application.	30/06/2015
3.	Admission counseling & conformation of admission	01/07/2015 to 05/07/2015

X. Admission Procedure (PG COURSES)

RULES & REGULATIONS FOR M.E. COURSE

1. The postgraduate degree in Engineering consisting of 2 years (4 semesters) shall be designated as Master of Engineering in prescribed branches
2. A candidate may be permitted to register him/er self for the M.E. degree under the faculty of Engineering & Technology of North Maharashtra University, Jalgaon only if the candidate holds a Bachelor's Degree in Engineering/Technology of North Maharashtra University, Jalgaon or its equivalent by AICTE, and North Maharashtra University, Jalgaon.
3. Preference will be given to graduates of North Maharashtra University, Jalgaon.
4. The students shall be admitted to second term of first year if his/her first term is granted.
5. The students shall be admitted to second year if his/her second term of first year is granted. However he/she will not be allowed to submit his/her thesis/ dissertation unless he/she has cleared all the Theory papers and has completed all the presentations of first term of second year.
6. Every students will be required to produce a record of laboratory work in the form of journal, duly certified for satisfactory completion of the Term Work by the concerned teacher and head of the department.
7. A student whose term is not granted on account of unsatisfactory attendance/ term work is required to repeat the semester.

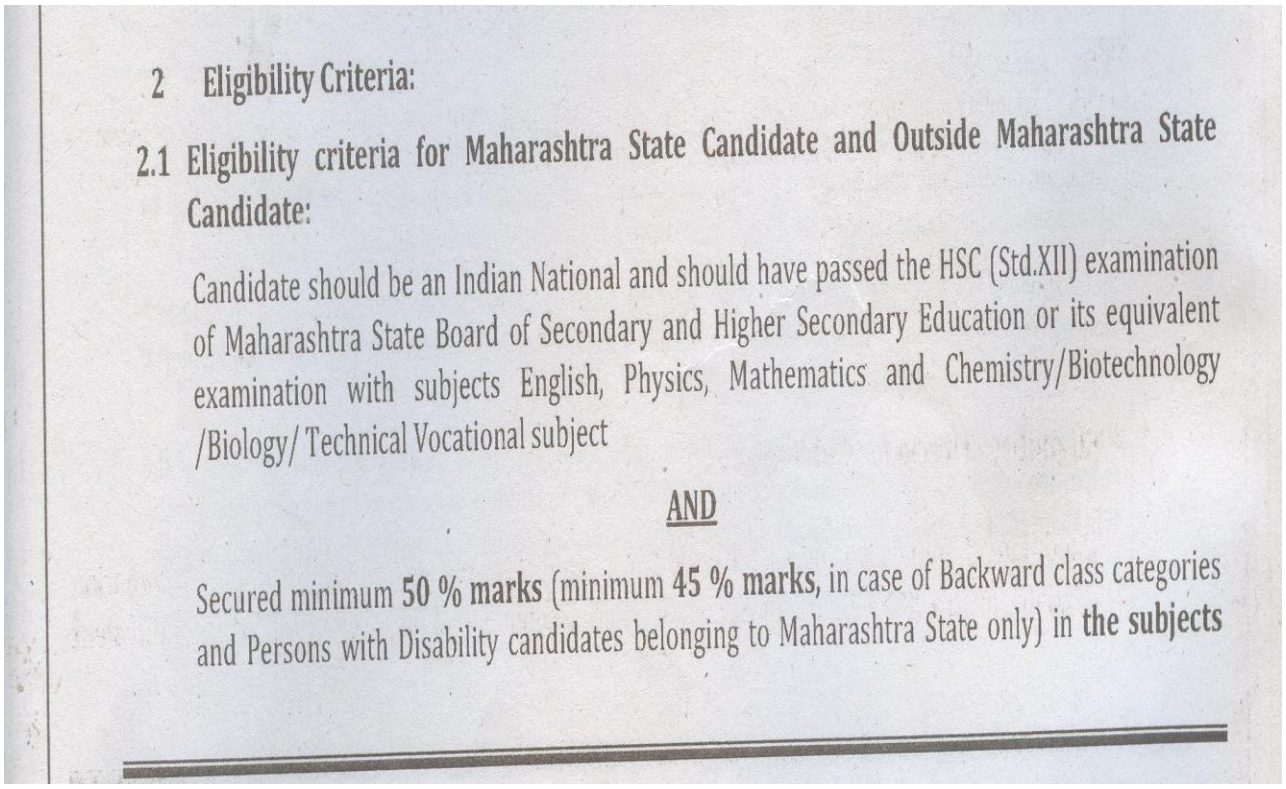
The policy of refund of the fee, in case of withdrawal, should be clearly notified.

The candidate who has been provisionally admitted may cancel admission by submitting as application in duplicate, in the prescribed pro forma – O and may request for refund of fees. The refund of fees as applicable shall be made in due course. It is made clear that such application for cancellation will be considered if and only if the admission is confirmed by paying the prescribed tuition fee and other fees in full and by submitting the original documents. Refund shall be made after deduction of the cancellation charges as shown below:

1. In the event of student/candidate withdrawing before the starting of the course, the waitlisted candidates should be given admissions against the vacant seat. The entire fee collected from the student, after a deduction of the processing fee of not more than Rs. 1000/- (Rupees one thousand only) shall be refunded and returned by the Institution/University to the student/candidate withdrawing from the programme.
2. Should a student leave after joining the course and if the seat consequently falling vacant has been filled by another candidate by the last date of admission, the Institution must return the fee collected with proportionate deductions of monthly fee and proportionate hostel rent, where applicable.

XI. CRITERIA AND WEIGHTAGES FOR ADMISSION

A) Each criteria with its respective weightages i.e. Gate examination marks & qualifying examination marks etc.



2 Eligibility Criteria:

2.1 Eligibility criteria for Maharashtra State Candidate and Outside Maharashtra State Candidate:

Candidate should be an Indian National and should have passed the HSC (Std.XII) examination of Maharashtra State Board of Secondary and Higher Secondary Education or its equivalent examination with subjects English, Physics, Mathematics and Chemistry/Biotechnology /Biology/ Technical Vocational subject

AND

Secured minimum **50 % marks** (minimum **45 % marks**, in case of Backward class categories and Persons with Disability candidates belonging to Maharashtra State only) in **the subjects**

Physics, Mathematics and Chemistry/Biotechnology/Biology/ Technical Vocational subject added together.

AND

Obtained a **positive Composite score*** i.e., marks obtained after adding 50% of JEE (Main)2014 (Paper 1) marks and 50% of normalized Standard XII (Board or Equivalent Examination) marks in Physics, Chemistry and Mathematics.

Note: -1) * - The details for calculating positive Composite score shall be notified separately.
2) Refer Rule No 2.11 regarding Rounding off of percentage of marks for deciding the eligibility, if applicable.

2.2 Eligibility Criteria for All India Candidates:

Candidate should be an Indian National and should have passed the HSC (Std.XII) examination of Maharashtra State Board of Secondary and Higher Secondary Education or its equivalent examination with subjects English, Physics, Mathematics and Chemistry/Biotechnology /Biology/ Technical Vocational subject

AND

Secured minimum **50 % marks** (minimum **45 % marks,** in case of Backward class categories and Persons with Disability candidates belonging to Maharashtra State only) in **the subjects Physics, Mathematics and Chemistry/Biotechnology/Biology/ Technical Vocational subject** added together.

AND

Obtained All India Rank in JEE (Main) 2014 (Paper 1) given by CBSE

Note: 1) Maharashtra Candidates eligible as per rule 2.1 and 2.2 shall submit single Application and Option form for the CAP for both Maharashtra State Seats and All India Seats. Such candidates will be given best single allotment through CAP as per inter-se-merit.
2) Refer Rule No 2.11 regarding Rounding off of percentage of marks for deciding the eligibility, if applicable

2.3 Eligibility Criteria for Foreign National/PIO/Children of Indian workers in the Gulf countries/ Children of NRI

Candidate should have passed the HSC (Std.XII) examination of Maharashtra State Board of Secondary and Higher Secondary Education or its equivalent examination with subjects English, Physics, Mathematics and Chemistry/Biotechnology/Biology/ Technical Vocational subject

AND

Secured minimum **50 % marks** in **the subjects Physics, Mathematics and Chemistry/Biotechnology/Biology/ Technical Vocational subject** added together.

Note :-

- The eligibility of the candidates passing the HSC (Std. XII) or equivalent examination from a school/college/Examination Board situated outside India shall be further decided by the University Authorities to which the candidate is admitted. Hence such candidates are advised to get their eligibility verified by the respective University Authorities before seeking admission to the Engineering courses in the State of Maharashtra.
- The candidate belonging to this type is not required to appear for the JEE Main 2014(Paper 1)
- Refer Rule No 2.11 regarding Rounding off of percentage of marks for deciding the eligibility, if applicable.

2.4 Eligibility criteria for GoI Nominees:

Candidate should be an Indian National and should have passed the HSC (Std.XII) examination of Maharashtra State Board of Secondary and Higher Secondary Education or its equivalent

examination with subjects English, Physics, Mathematics and Chemistry/Biotechnology /Biology/ Technical Vocational subject

AND

Secured minimum **50 % marks** (minimum **45 % marks,** in case of Backward class categories and Persons with Disability candidates of respective States) in **the subjects Physics, Mathematics and Chemistry/Biotechnology/Biology/ Technical Vocational subject** added together.

AND

Obtained All India Rank in JEE (Main) 2014 (Paper 1) given by CBSE

Note: -

Refer Rule No 2.11 regarding Rounding off of percentage of marks for deciding the eligibility, if applicable.
The candidate belonging to this type is required to appear for the JEE (Main) 2014 (Paper 1).

2.5 Eligibility criteria for J & K Migrant candidates:

Candidate should be an Indian National and should have passed the HSC (Std.XII) examination of Maharashtra State Board of Secondary and Higher Secondary Education or its equivalent examination with subjects English, Physics, Mathematics and Chemistry/Biotechnology /Biology/ Technical Vocational subject

AND

Secured minimum **50 % marks** in **the subjects Physics, Mathematics and Chemistry/Biotechnology/Biology/ Technical Vocational subject** added together.

AND

Obtained All India Rank in JEE (Main) 2014 (Paper 1) given by CBSE

Note: -

Refer Rule No 2.11 regarding Rounding off of percentage of marks for deciding the eligibility, if applicable.
The candidate belonging to this type is required to appear for the JEE (Main) 2014 (Paper 1).

2.6 Eligibility criteria for MKB candidates:

In addition to the basic eligibility criterion mentioned in rule no. 2.1, candidates belonging to the Maharashtra Karnataka Disputed Border Area are required to fulfill following additional eligibility criterions.

- Candidates should be from such villages/towns, from the Maharashtra Karnataka disputed border areas, on which Maharashtra puts its claim.
- The candidate should produce the certificate that his/her father/mother/candidate himself/herself is a domicile of Karnataka in the disputed border area as specified in the Proforma G1/G2. OR The candidate should produce the domicile certificate of his/her father/mother/candidate himself/herself stating that he/she is a resident of a village.
- The candidate should have passed SSC (or equivalent) and/or HSC (or equivalent) from an Institution situate in the disputed border area. The candidate must produce a certificate from the Principal/Head Master of the College/School stating that the candidate has passed SSC/HSC (or equivalent) Examination from that Institution.
- Mother tongue of the candidate must be Marathi. The candidate must produce a certificate from the Principal/Head Master of the School from which he/she has passed the SSC (or

equivalent) Examination, stating that the candidate's Mother tongue is Marathi as per the original School record.

- Candidate should have passed SSC or HSC (or equivalent) Examination with Marathi as one of the subject.
- **Composite Score of MKB Candidates shall be calculated in the manner similar as applied to Maharashtra state board students considering he /she has passed HSC from Maharashtra board.**
- **Composite Score of MKB Candidates shall be calculated by mapping his or her HSC performance with Maharashtra state board.**

2.7 Eligibility criteria for Candidates who are sons/daughters of Defence Service personnel:

In addition to the basic eligibility criterion mentioned in rule no.2.1, candidates who satisfying any one of the following criteria as are eligible to seek admission against seats for sons/daughters of defence service personnel.

- Candidate is a son/daughter of ex-service personnel who is domiciled in Maharashtra State (Def-1).
- Candidate is a son/daughter of active service personnel who is domiciled in Maharashtra State (Def-2).
- Candidate is a son/daughter of active service personnel (Def -3)
  - Who is transferred to Maharashtra State but is not domiciled in Maharashtra State
  - Who is not domiciled in Maharashtra State but his/her family is stationed in Maharashtra State under the provision of retention of family accommodation at the last duty station on the grounds of children's' education, provided further that, such candidate should have appeared and passed the HSC (Std.XII) examination of Maharashtra State Board of Secondary and Higher Secondary Education or its equivalent examination from a school/college situated in the State of Maharashtra.

Note: This provision is NOT available to the children of CIVILIAN STAFF who is working/ who has worked with the Indian Defence Services.

2.8 Eligibility criteria for Candidates who are Persons with Disability:

In addition to the basic qualification mentioned in rule no. 2.1, candidate who is suffering from any one of the following permanent disability is eligible to seek admission against seats for Persons with Disability candidates

- Candidate who is visually impaired (blind) candidate (type P1)
- Candidate who is speech & hearing impaired (deaf & dumb) candidate (type P2)
- Candidate who is with orthopedic disorders, learning disabilities, Dyslexia, Dyscalculia, Dysgraphica, Spastic (type P3)

Note: The certificate (Proforma F/F-1) should clearly state that the extent of disability is more than 40% and the disability is permanent in nature.

2.9 Other eligibility criteria for specialized branches of Engineering/Technology:

Candidates seeking admission to some special courses or under some special provisions have to fulfill the following additional eligibility criteria.

- **Admission to Mining Engineering course:**

Female candidates are not eligible for admission to Mining Engineering course.

2.10 Eligibility criteria of Candidates who have passed Diploma in Engineering/Technology and seeking admission to First Year of Engineering/Technology in Unaided Institutes:

Diploma holders should have passed the Diploma course in Engineering/Technology with minimum of 50% marks (45% marks in case of candidates of Backward class categories and Persons with Disability belonging only to Maharashtra State) and medium of instruction as English from the AICTE approved Diploma Institutes affiliated to State Boards of technical Education.

Note:

1. To resolve a tie i.e. more than one candidate securing equal aggregate marks in Final year of the Diploma examination, following order of preference shall be adopted: marks in Maths at SSC, Grand Total at SSC.
2. Eligible Diploma candidates (rule 2.10) shall be considered for Admission against the Institute level seats in **Unaided Private Institutes only**. The details of the admission process for filling seats are specified in Annexure-II.

2.11 Rounding off of percentage of marks for deciding eligibility for admission.

In case percentage, marks (converted out of 100) in the subjects **Physics, Mathematics and Chemistry/Biotechnology/Biology/ Technical Vocational subjects** added together at HSC (std.XII), comes in fraction then percentage of marks shall be rounded off as explained in the example for the purpose of deciding the eligibility of the candidate.

Example: - If the percentage of marks comes out to be 44.50% to 44.99% then it shall be rounded to 45% and if the percentage of marks comes out to be 44.01% to 44.49% shall be rounded to 44%.

General Notes:

1. In case the maximum marks in individual subject is other than 100, convert the marks out of 100 for individual subject but do not *round off* these marks. If the sum of the converted marks of three individual subjects without rounding off works out to be a figure with fraction then fraction up to two decimal places shall only be considered and the percentage of marks shall be calculated considering maximum marks as 300 and, If the percentage comes in fraction, rounding off shall be done as given in rule No. 2.11 to decide the eligibility.

   Example: If a candidate obtains 85 marks out of 200 in Physics, 76 marks out of 150 in Chemistry and 40 Marks out of 100 in Mathematics, then the sum of marks obtained works out to be 201 out of 450 marks. If it is converted out of 300, it works out to be 134.The % of marks comes out 44.6666 %.

   However if the marks in individual subjects are converted out of 100, then the marks are as 42.5 in Physics, 50.6666 in Chemistry and 40 in Mathematics. It means the sum of converted marks of individual subject is 133.1666, which is 133.16 up to two fractions. The % of marks comes out 44.38 % after rounding off it is 44%. Hence the candidate is not eligible for admission.

2. If **letter grades** are assigned instead of marks at SSC, HSC or its equivalent examination the candidate must obtain the certificate of conversion of letter of grades into marks from the competent authority where from the candidate has passed the examination. The candidate should produce such certificate at the time of submission of application form. The Eligibility shall be decided based on the equivalent marks submitted by such candidates.

Institute Level Seat and Vacant Seat.

1) Candidate passing the HSC (Std. XII) or its equivalent examination with subjects English, Physics, Chemistry and Mathematics and should have secured minimum 50% marks in General Category and reserve Category 45% marks in Physics, Chemistry and Mathematics added together.

2) Candidates passing Diploma in Engg. / Technology course from Maharashtra State:

Diploma holders who have passed the diploma course in Engineering/Technology with minimum of 50% marks and reserve Category 45% marks from the Polytechnics affiliated to MSBTE or AICTE approved autonomous Polytechnics in Maharashtra State.

B) Minimum level of acceptance, if any.

Eligibility criteria for Maharashtra State Candidate and Outside Maharashtra State Candidate-

Candidate should be an Indian National and should have passed the HSC (Std. XII) examination of Maharashtra State Board of Secondary and Higher Secondary Education or its equivalent examination with subjects English, Physics, Mathematics and Chemistry / Biotechnology / Biology / Technical Vocational subject

And

Secured minimum 50% marks (minimum 45% marks, in case of Backward class categories and Persons with Disability candidates belonging to Maharashtra State only) in the subjects

C) The cut-off levels of percentage & percentile scores of the candidates in the admission test for the last three years.

Sr.	Branch	2013-2014		2014-15		2015-16	
		CET	AIEEE	JEE (M.S. Seats)	JEE (AI Seat)	JEE (M.S. Seats)	JEE (AI Seat)
1	Civil	60	31	54	43	18	32
2	Chemical	52	53	49	25	15	32
3	Computer	42	45	39	26	15	24
4	Electrical	54	45	42	34	15	35
5	Electronics & Tele.	55	45	56	35	13	50
6	Information Technology	45	32	50	13	28	66
7	Mechanical	48	61	50	54	20	31
8	Bio-Tech.	45	13	46	08	08	44

Directorate of Technical Education, Maharashtra State

3, Mahapalika Marg, Post Box No.1967, Mumbai-400001

[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510408210] - Bio Technology

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 30

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	35183	444872	EN15109111	GAUD BHAGYESH PRADIPRAO	Male	Type A	OBC	Amravati	NA	NA	64.67	AI	15000	05/07/2015	05/07/2015	Round 1	No
2.	43532	541364	EN15205598	KOLI VRUNDAVANI KAILAS	Female	Type A	SBC	North Maharashtra	NA	NA	63.33	AI	9533	04/07/2015	04/07/2015	Round 1	No
3.	74546	40.7146	EN15102674	KUBADE SHUBHAM SHRIKRUSHNA	Male	Type A	OBC	Amravati	NA	NA	47.67	GOBCO	10000	03/07/2015	03/07/2015	Round 1	No
4.	49006	56.8249	EN15206308	JADHAV LAXMAN ANIL	Male	Type A	DT/VJ	North Maharashtra	NA	NA	81.00	GOPENH	4000	03/07/2015	03/07/2015	Round 1	No
5.	58574	50.8959	EN15116080	SHARMA RAHUL GANESH	Male	Type A	Open	North Maharashtra	NA	NA	52.33	GOPENH	20000	02/07/2015	02/07/2015	Round 1	No
6.	62080	48.7816	EN15205693	BHAVSAR NILESH VILAS	Male	Type A	OBC	North Maharashtra	NA	NA	53.33	GOPENH	15000	02/07/2015	02/07/2015	Round 1	No
7.	63164	48.0628	EN15202192	SARDAR DINESH SAHEBRAO	Male	Type A	SC	North Maharashtra	NA	NA	67.33	GOPENH	9533	02/07/2015	02/07/2015	Round 1	No
8.	81740	35.4854	EN15201399	DANDGE NIKHIL VASANTRAO	Male	Type A	SC	North Maharashtra	NA	NA	50.67	GSCH	9533	04/07/2015	04/07/2015	Round 1	No
9.	72067	42.3758	EN15206714	PATIL AASHWINI GOPAL	Female	Type A	OBC	North Maharashtra	NA	NA	56.00	LOBCH	10000	05/07/2015	05/07/2015	Round 1	No
10.	70059	43.6641	EN15117332	LANJUDKAR SHRIYA KAILAS	Female	Type A	OBC	Amravati	NA	NA	68.33	LOBCO	42995	03/07/2015	03/07/2015	Round 1	No
11.	47351	57.9075	EN15183571	DIKSHA ANOOP PATIL	Female	Type A	OBC	North Maharashtra	NA	NA	71.67	LOPENH	42995	03/07/2015	03/07/2015	Round 1	No
12.	51744	55.0543	EN15183614	ADAKMOL SNEHA RAVINDRA	Female	Type A	SC	North Maharashtra	NA	NA	73.00	LOPENH	9533	03/07/2015	03/07/2015	Round 1	No

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Directorate of Technical Education, Maharashtra State

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510408210] - Bio Technology

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 30

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
13.	41941	523429	EN15187831	PATIL KOMAL RAMKRUSHNA	Female	Type A	OBC	North Maharashtra	NA	NA	80.33	AI	23000	13/07/2015	13/07/2015	Round 2	No
14.	90061	27.872589565	EN15195174	RITESH VASUDEO CHAUDHARI	Male	Type A	OBC	North Maharashtra	NA	NA	46.33	GNT3H	30000	14/07/2015	14/07/2015	Round 2	No
15.	89457	28.509034085	EN15201073	DHANDE YOGESH ARUN	Male	Type A	OBC	North Maharashtra	NA	NA	45.33	GOBCH	35000	13/07/2015	13/07/2015	Round 2	No
16.	59948	50.05578341	EN15205576	MAHALE ASHWINI SHYAMKUMAR	Female	Type A	OBC	North Maharashtra	NA	NA	51.33	GOPENH	5000	11/07/2015	11/07/2015	Round 2	No
17.	97639	8.556110245	EN15205823	NANNAWARE VISHAL SAHEBRAO	Male	Type A	SBC	North Maharashtra	NA	NA	46.67	LNT1H	9533	12/07/2015	12/07/2015	Round 2	No
18.	80459	36.474234455	EN15184913	PATHAK MANISHA RAJESHWAR	Female	Type A	Open	North Maharashtra	NA	NA	52.00	LOPENO	20000	14/07/2015	14/07/2015	Round 2	No
19.	78669	37.887226055	EN15273994	PATIL HEMVANTA MADHUKAR	Female	Type A	OBC	Mumbai	NA	NA	56.33	GOPEN	1000	25/07/2015	25/07/2015	Counseling Round	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510408210] - Bio Technology

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Admitted Against CAP

Quota : 11

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	47	56.150000000	EN15721089	PATIL ASHWINI JITENDRA	Female	Type A	OBC	North Maharashtra	NA	NA	48.67	ACAP	20000	14/08/2015	16/08/2015	Institute Level	No
2.	52	49.380000000	EN15716909	BHANGALE JITESH SANJAY	Male	Type A	OBC	North Maharashtra	NA	NA	45.00	ACAP	20000	05/07/2015	16/08/2015	Institute Level	No
3.	60	69.080000000	EN15723518	THAKUR ROHIT RAJENDRA	Male	Type A	Open	North Maharashtra	NA	NA	64.83	ACAP	25000	14/08/2015	20/08/2015	Institute Level	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510408210] - Bio Technology

Summary of Admitted Candidates for the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Sr. No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP	30	19	0	19
2.	Against CAP		3	0	3
3.	Institute Level	0	0	0	0
4.	Minority	0	0	0	0
5.	J&K Migrant		0	0	0
6.	Others		0	0	0
	Total	**30**	**22**	**0**	**22**

Seat Type used for Institute Level Admissions : ACAP-Against CAP, IL-Institute Level, ILNRI-Institute Level NRI (5% of SI if AICTE Permission), MI-Minority, GoI-Government of India Nominee, NRI-NRI (15% of SI if AICTE Permission), PIO-PIO (15% of SI if AICTE Permission), FNS-FNS (15% of SI if AICTE Permission), CIWGC-Children's of Indian Workers in Gulf Countries (15% of SI if AICTE Permission), OAA-Over and Above

Cut-Off Date for Admission : 14/08/2015
Cut-Off Date for Uploading : 22/08/2015

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510408211T] - Bio Technology

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 2

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	17580	82.27132597	EN15195216	MARIYAM SHOEB LEHERI	Female	Type A	Open	North Maharashtra	NA	NA	70.67	GOPENO	9533	13/07/2015	13/07/2015	Round 2	No
2.	45794	58.9838747	EN15206109	NETKAR TEJAS LAXMAN	Male	Type A	SC	North Maharashtra	NA	NA	50.33	GOPENO	9533	14/07/2015	14/07/2015	Round 2	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510408211T] - Bio Technology

Summary of Admitted Candidates for the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Sr. No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP	2	2	0	2
2.	Against CAP		0	0	0
3.	Institute Level	0	0	0	0
4.	Minority	0	0	0	0
5.	J&K Migrant		0	0	0
6.	Others		0	0	0
	Total	**2**	**2**	**0**	**2**

Seat Type used for Institute Level Admissions : ACAP-Against CAP, IL-Institute Level, ILNRI-Institute Level NRI (5% of SI if AICTE Permission), MI-Minority, GoI-Government of India Nominee, NRI-NRI (15% of SI if AICTE Permission), PIO-PIO (15% of SI if AICTE Permission), FNS-FNS (15% of SI if AICTE Permission), CIWGC-Children's of Indian Workers in Gulf Countries (15% of SI if AICTE Permission), OAA-Over and Above

Cut-Off Date for Admission : 14/08/2015
Cut-Off Date for Uploading : 22/08/2015

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510450710] - Chemical Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 27

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	25361	326767	EN15205796	PATIL MAYURI YOGESH	Female	Type A	OBC	North Maharashtra	NA	NA	50.00	AI	42995	04/07/2015	04/07/2015	Round 1	No
2.	36418	459852	EN15164265	YELNE MAYURI VIJAYRAO	Female	Type A	OBC	Nagpur	NA	NA	82.67	AI	42995	02/07/2015	02/07/2015	Round 1	No
3.	36954	465534	EN15185092	BHAVSAR PRANITA RAJENDRA	Female	Type A	OBC	North Maharashtra	NA	NA	74.67	AI	15000	02/07/2015	02/07/2015	Round 1	No
4.	79127	37.4783	EN15201141	ROHAN VILAS PATIL	Male	Type A	OBC	North Maharashtra	NA	DEF1	56.00	DEFO	42995	04/07/2015	04/07/2015	Round 1	No
5.	45070	59.4501	EN15205918	PATIL MAHENDRA JAYRAM	Male	Type A	OBC	North Maharashtra	NA	NA	50.67	GOBCH	5000	04/07/2015	04/07/2015	Round 1	No
6.	45375	59.2556	EN15188156	BORSE RAHUL RAVINDRA	Male	Type A	OBC	North Maharashtra	NA	NA	74.83	GOBCH	20000	04/07/2015	04/07/2015	Round 1	No
7.	39846	63.0875	EN15181246	PATIL BHAVESH PRAMOD	Male	Type A	OBC	North Maharashtra	NA	NA	76.00	GOPENH	20000	04/07/2015	04/07/2015	Round 1	No
8.	42294	61.3417	EN15205766	CHAVAN JIVAN SURESH	Male	Type A	DT/VJ	North Maharashtra	NA	NA	64.00	GOPENH	4000	02/07/2015	02/07/2015	Round 1	No
9.	43079	60.8014	EN15192067	GIRASE ABHIJITSING DARBARSING	Male	Type A	Open	North Maharashtra	NA	NA	69.00	GOPENH	30000	04/07/2015	04/07/2015	Round 1	No
10.	63294	47.9959	EN15206726	KOLI BHAVANA BHARAT	Female	Type A	SBC	North Maharashtra	NA	NA	61.67	LOPENH	9533	02/07/2015	02/07/2015	Round 1	No
11.	94936	20.5932	EN15190422	RASIKA CHOUDHARI	Female	Type B	OBC	North Maharashtra	NA	NA	49.67	LOPENH	42995	03/07/2015	03/07/2015	Round 1	No
12.	40565	62.5856	EN15158861	CHOUHAN KAJAL ASHOK	Female	Type A	OBC	Nagpur	NA	NA	72.67	LOPENO	20000	04/07/2015	04/07/2015	Round 1	No

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Directorate of Technical Education, Maharashtra State

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510450710] - Chemical Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 27

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
13.	41802	522266	EN15192287	PATIL JAYESH PRADIP	Male	Type A	OBC	North Maharashtra	NA	NA	46.00	AI	10000	13/07/2015	13/07/2015	Round 2	No
14.	60119	49.956695095	EN15195026	SAPKAL SAGAR TULSIDAS	Male	Type A	NT-B	North Maharashtra	NA	NA	50.00	GNT1O	9533	11/07/2015	11/07/2015	Round 2	No
15.	50641	55.762637705	EN15184188	TAYADE ASHWIN VIJAY	Male	Type A	SBC	North Maharashtra	NA	NA	57.00	GOBCO	9533	13/07/2015	13/07/2015	Round 2	No
16.	40412	62.68987125	EN15202950	THAKARE KULDEEP SANJAY	Male	Type A	OBC	North Maharashtra	NA	NA	54.67	GOPENH	20000	13/07/2015	13/07/2015	Round 2	No
17.	35421	66.270358275	EN15100489	LANDGE VISHAL RAJU	Male	Type A	OBC	Amravati	NA	NA	66.33	GOPENO	20000	13/07/2015	13/07/2015	Round 2	No
18.	52073	54.88265045	EN15206687	PATIL SAGAR ARUN	Male	Type A	OBC	North Maharashtra	NA	NA	50.00	GSTO	15000	12/07/2015	12/07/2015	Round 2	No
19.	53617	53.89274903	EN15188182	SHRIKHANDE PRATHAMESH PRABHAKAR	Male	Type A	OBC	North Maharashtra	NA	NA	53.67	LNT2H	20000	14/07/2015	14/07/2015	Round 2	No
20.	60848	49.530384665	EN15192443	SABE PANKAJ SATISH	Male	Type A	OBC	North Maharashtra	NA	NA	54.33	LSTH	3000	15/07/2015	15/07/2015	Round 2	No
21.	59567	50.27944578	EN15188119	RAJPUT SANTOSH SHARADBHAI	Male	Type B	Open	North Maharashtra	NA	NA	58.00	PHCH	55456	12/07/2015	12/07/2015	Round 2	No
22.	81183	35.935468845	EN15206342	NEVE SARANG RAVINDRA	Male	Type A	OBC	North Maharashtra	NA	NA	47.83	GOPEN	10000	26/07/2015	26/07/2015	Counseling Round	No
23.	96785	15.095520540	EN15206258	PATIL DEEPAK VINAYAK	Male	Type A	OBC	North Maharashtra	NA	NA	53.00	GOPEN	5000	29/07/2015	29/07/2015	Counseling Round	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510450710] - Chemical Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Admitted Against CAP

Quota : 4

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	15	46.354230275	EN15719127	PATIL ANKIT RAJENDRA	Male	Type A	Open	North Maharashtra	NA	NA	57.67	ACAP	0	28/07/2015	16/08/2015	Institute Level	No
2.	57	67.329741970	EN15719047	MALANKIYA SHAILESH PREMJI BHAI	Male	OMS	Open	OHU	NA	NA	52.33	ACAP	10000	05/08/2015	16/08/2015	Institute Level	No
3.	44	64.150000000	EN15719102	PATIL NIVRUTTI SANTOSH	Male	Type A	OBC	North Maharashtra	NA	NA	62.33	ACAP	20000	26/07/2015	16/08/2015	Institute Level	No
4.	48	55.600000000	EN15719087	VARUN YADAV	Male	Type B	Open	North Maharashtra	NA	NA	57.67	ACAP	35000	08/08/2015	16/08/2015	Institute Level	No

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Directorate of Technical Education, Maharashtra State

3, Mahapalika Marg, Post Box No.1967, Mumbai-400001

[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510450710] - Chemical Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Institute Level Quota

Quota : 3

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	6	60.069943535	EN15718342	SAYYED TALEB SAYYED LAL	Male	Type A	Open	North Maharashtra	NA	NA	53.00	IL	35000	02/07/2015	16/08/2015	Institute Level	No
2.	17	45.356894455	EN15718147	SHAIKH WASIM SHAIKH NASIM	Male	Type A	Open	North Maharashtra	NA	NA	63.33	IL	38000	01/07/2015	16/08/2015	Institute Level	No
3.	46	58.000000000	EN15717845	AYAZ KHAN HASAN RAZA KHAN	Male	Type A	Open	North Maharashtra	NA	NA	58.33	IL	10000	06/08/2015	16/08/2015	Institute Level	No

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Directorate of Technical Education, Maharashtra State

3, Mahapalika Marg, Post Box No.1967, Mumbai-400001

[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510450710] - Chemical Engineering

Summary of Admitted Candidates for the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Sr. No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP	27	23	0	23
2.	Against CAP		4	0	4
3.	Institute Level	3	3	0	3
4.	Minority	0	0	0	0
5.	J&K Migrant		0	0	0
6.	Others		0	0	0
	Total	**30**	**30**	**0**	**30**

Seat Type used for Institute Level Admissions : ACAP-Against CAP, IL-Institute Level, ILNRI-Institute Level NRI (5% of SI if AICTE Permission), MI-Minority, GoI-Government of India Nominee, NRI-NRI (15% of SI if AICTE Permission), PIO-PIO (15% of SI if AICTE Permission), FNS-FNS (15% of SI if AICTE Permission), CIWGC-Children's of Indian Workers in Gulf Countries (15% of SI if AICTE Permission), OAA-Over and Above

Cut-Off Date for Admission : 14/08/2015
Cut-Off Date for Uploading : 22/08/2015

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510450711T] - Chemical Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 2

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	18411	81.4369	EN15185071	PATIL BHATU SUNIL	Male	Type A	OBC	North Maharashtra	NA	NA	82.67	GOPENO	9533	04/07/2015	04/07/2015	Round 1	No
2.	22668	77.1968	EN15192027	BHAIRAV CHETANKUMAR CHATUR	Male	Type A	OBC	North Maharashtra	NA	NA	72.33	GOPENO	9533	04/07/2015	04/07/2015	Round 1	No

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Directorate of Technical Education, Maharashtra State

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[5104050711T] - Chemical Engineering

Summary of Admitted Candidates for the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Sr. No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP	2	2	0	2
2.	Against CAP		0	0	0
3.	Institute Level	0	0	0	0
4.	Minority	0	0	0	0
5.	J&K Migrant		0	0	0
6.	Others		0	0	0
	Total	**2**	**2**	**0**	**2**

Seat Type used for Institute Level Admissions : ACAP-Against CAP, IL-Institute Level, ILNRI-Institute Level NRI (5% of SI if AICTE Permission), MI-Minority, GoI-Government of India Nominee, NRI-NRI (15% of SI if AICTE Permission), PIO-PIO (15% of SI if AICTE Permission), FNS-FNS (15% of SI if AICTE Permission), CIWGC-Children's of Indian Workers in Gulf Countries (15% of SI if AICTE Permission), OAA-Over and Above

Cut-Off Date for Admission : 14/08/2015
Cut-Off Date for Uploading : 22/08/2015

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510419110] - Civil Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 102

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	25221	324845	EN15188102	ATOLKAR NIKITA ARUN	Female	OMS	NA	OHU	NA	NA	94.00	AI	350000	04/07/2015	04/07/2015	Round 1	No
2.	26235	337754	EN15117579	SARDAR SHUBHAM SAHEBRAO	Male	Type A	OBC	Amravati	NA	NA	63.33	AI	42995	03/07/2015	03/07/2015	Round 1	No
3.	26866	345686	EN15205595	MORESHWAR HEMANT PATIL	Male	Type B	OBC	North Maharashtra	NA	NA	71.33	AI	25000	02/07/2015	02/07/2015	Round 1	No
4.	29193	374165	EN15184323	CHAUDHARI TRUPTI SANTOSH	Female	Type A	OBC	North Maharashtra	NA	NA	78.33	AI	40000	03/07/2015	03/07/2015	Round 1	No
5.	34213	433770	EN15205867	VANJARI MAYUR NAMDEV	Male	Type A	NT-D	North Maharashtra	NA	NA	77.33	AI	9533	03/07/2015	03/07/2015	Round 1	No
6.	37265	468919	EN15202899	DESALE YOGESH SARJERAO	Male	Type A	OBC	North Maharashtra	NA	NA	79.00	AI	20000	04/07/2015	04/07/2015	Round 1	No
7.	38938	488454	EN15188114	MAHALE HARSHAL ISHWAR	Male	Type A	OBC	North Maharashtra	NA	NA	54.33	AI	50000	05/07/2015	05/07/2015	Round 1	No
8.	48661	57.0329	EN15206289	MAHAJAN KAVITA BHAURAO	Female	Type A	OBC	North Maharashtra	NA	DEF1	74.67	DEFO	42995	05/07/2015	05/07/2015	Round 1	No
9.	45615	59.1018	EN15185488	GOSAVI MAYUR LOTAN	Male	Type A	NT-B	North Maharashtra	NA	NA	56.00	GNT1H	9533	05/07/2015	05/07/2015	Round 1	No
10.	57272	51.6917	EN15202028	BAVISKAR MAHESH HASARATH	Male	Type A	NT-C	North Maharashtra	NA	NA	60.67	GNT2H	9533	02/07/2015	02/07/2015	Round 1	No
11.	46244	58.7311	EN15185063	PATIL SAGAR JAYRAM	Male	Type A	OBC	North Maharashtra	NA	NA	83.33	GOBCH	20000	04/07/2015	04/07/2015	Round 1	No
12.	47272	57.972	EN15195178	LANDE SHREYAS VINAYAK	Male	Type A	OBC	North Maharashtra	NA	NA	50.33	GOBCH	42995	03/07/2015	03/07/2015	Round 1	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510419110] - Civil Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 102

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
13.	49188	56.7058	EN15184217	PATIL LALIT PRAMOD	Male	Type A	OBC	North Maharashtra	NA	NA	74.67	GOBCH	40000	05/07/2015	05/07/2015	Round 1	No
14.	49846	56.2718	EN15205659	BAVISKAR PRASHANT SUDHAKAR	Male	Type A	OBC	North Maharashtra	NA	NA	60.67	GOBCH	40000	02/07/2015	02/07/2015	Round 1	No
15.	50052	56.1416	EN15185361	PATIL ROHAN EKNATH	Male	Type A	OBC	North Maharashtra	NA	NA	56.00	GOBCH	42995	04/07/2015	04/07/2015	Round 1	No
16.	50223	56.025	EN15205902	PATIL SHUBHAM PRADIP	Male	Type A	OBC	North Maharashtra	NA	NA	46.33	GOBCH	10000	04/07/2015	04/07/2015	Round 1	No
17.	74292	40.9102	EN15195232	JAGTAP TUSHAR SANJAY	Male	Type A	OBC	B.A.M.U.	NA	NA	63.00	GOBCO	10000	02/07/2015	02/07/2015	Round 1	No
18.	31487	69.4057	EN15184216	PATIL AMOL JANARDAN	Male	Type A	OBC	North Maharashtra	NA	NA	71.67	GOPENH	42995	03/07/2015	03/07/2015	Round 1	No
19.	35918	65.9318	EN15205788	PATIL ASHITOSH ARUN	Male	Type A	OBC	North Maharashtra	NA	NA	61.17	GOPENH	40000	02/07/2015	02/07/2015	Round 1	No
20.	36342	65.6204	EN15201101	DHAKE VAIBHAV	Male	Type A	OBC	North Maharashtra	NA	NA	73.50	GOPENH	42995	04/07/2015	04/07/2015	Round 1	No
21.	38296	64.1619	EN15195038	PATIL MOHAN SHANTARAM	Male	Type A	OBC	North Maharashtra	NA	NA	80.00	GOPENH	42995	03/07/2015	03/07/2015	Round 1	No
22.	39831	63.0948	EN15201900	BHAMARE VIRAJ KISHOR	Male	Type A	OBC	North Maharashtra	NA	NA	57.00	GOPENH	50000	02/07/2015	02/07/2015	Round 1	No
23.	41481	61.9508	EN15201726	BHAMRE JITESH DEVANAND	Male	Type A	OBC	North Maharashtra	NA	NA	62.33	GOPENH	10000	03/07/2015	03/07/2015	Round 1	No
24.	42863	60.9421	EN15206206	PATIL GANESH MAROTI	Male	Type A	OBC	North Maharashtra	NA	NA	53.67	GOPENH	25000	04/07/2015	04/07/2015	Round 1	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510419110] - Civil Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 102

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
25.	42913	60.9244	EN15205787	TAMBAT HARSHAL KAILAS	Male	Type A	OBC	North Maharashtra	NA	NA	63.00	GOPENH	10000	04/07/2015	04/07/2015	Round 1	No
26.	43632	60.4316	EN15206355	BORASE VISHAL SHIVAJI	Male	Type A	OBC	North Maharashtra	NA	NA	59.67	GOPENH	20000	04/07/2015	04/07/2015	Round 1	No
27.	45544	59.1246	EN15195245	KSHATRIYA SHUBHAM VIJAY	Male	Type A	OBC	North Maharashtra	NA	NA	68.00	GOPENH	30000	03/07/2015	03/07/2015	Round 1	No
28.	42351	61.2985	EN15174949	TARALE VAIBHAV DILIP	Male	Type A	OBC	Gondwana	NA	NA	73.67	GOPENO	42995	02/07/2015	02/07/2015	Round 1	No
29.	47737	57.667	EN15117433	PADOL HIMANSHU KIRAN	Male	Type A	OBC	Amravati	NA	NA	70.00	GOPENO	40000	02/07/2015	02/07/2015	Round 1	No
30.	52687	54.4786	EN15114176	VAIRALKAR GOPAL ANIL	Male	Type A	NT-B	Amravati	NA	NA	54.67	GOPENO	9533	03/07/2015	03/07/2015	Round 1	No
31.	55734	52.5961	EN15117575	SURYAWANSHI CHETAN SUBHASH	Male	Type A	SC	Amravati	NA	NA	66.00	GOPENO	9000	04/07/2015	04/07/2015	Round 1	No
32.	62548	48.4449	EN15115559	AWACHAR PAVAN SHALIGRAM	Male	Type A	OBC	Amravati	NA	NA	56.67	GOPENO	19000	04/07/2015	04/07/2015	Round 1	No
33.	49537	56.4623	EN15187820	BRAMHE DIVYA BHAGWAN	Male	Type A	SC	North Maharashtra	NA	NA	49.67	GSCH	9533	03/07/2015	03/07/2015	Round 1	No
34.	75626	39.9604	EN15205986	WANKHEDE AKSHAY UTTAMRAO	Male	Type A	SC	North Maharashtra	NA	NA	56.00	GSCH	9533	03/07/2015	03/07/2015	Round 1	No
35.	76600	39.2989	EN15206081	KHANDALE SIDHARTH GAUTAM	Male	Type A	SC	North Maharashtra	NA	NA	44.67	GSCH	9533	03/07/2015	03/07/2015	Round 1	No
36.	80427	36.4835	EN15190419	TAYADE MINAL SHIVLAL	Female	Type A	SC	North Maharashtra	NA	NA	56.33	GSCH	9533	02/07/2015	02/07/2015	Round 1	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510419110] - Civil Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 102

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
37.	63545	47.8146	EN15206325	PATIL BHAGYASHRI SANJIV	Female	Type A	NT-D	North Maharashtra	NA	NA	55.67	LNT3H	9533	03/07/2015	03/07/2015	Round 1	No
38.	55438	52.7524	EN15192025	APURVA SANTOSH PATIL	Female	Type A	OBC	North Maharashtra	NA	NA	59.67	LOBCH	42995	03/07/2015	03/07/2015	Round 1	No
39.	36368	65.6095	EN15181235	SAVALE VAISHALI VINAYAK	Female	Type A	OBC	North Maharashtra	NA	NA	62.67	LOPENH	20000	05/07/2015	05/07/2015	Round 1	No
40.	39328	63.4857	EN15206385	MALCHE SHALINI UTTAM	Female	Type A	ST	North Maharashtra	NA	NA	62.33	LOPENH	9533	04/07/2015	04/07/2015	Round 1	No
41.	42026	61.531	EN15205861	BADGUJAR SHITAL SUNIL	Female	Type A	OBC	North Maharashtra	NA	NA	71.67	LOPENH	42995	03/07/2015	03/07/2015	Round 1	No
42.	42745	61.0455	EN15192360	DESHAMUKH DEVIYANI PRAVINSING	Female	Type A	Open	North Maharashtra	NA	NA	68.00	LOPENH	20000	02/07/2015	02/07/2015	Round 1	No
43.	45851	58.9737	EN15205036	KOTHARI MAHIMA SHARAD	Female	Type A	Open	North Maharashtra	NA	NA	62.33	LOPENH	33000	03/07/2015	03/07/2015	Round 1	No
44.	95793	18.5177	EN15188143	SHARYU KADUBA CHAVHAN	Female	Type A	ST	Amravati	NA	NA	48.83	LOPENO	9533	03/07/2015	03/07/2015	Round 1	No
45.	66368	46.0893	EN15205941	SASANE PRIYANKA KAILAS	Female	Type A	SC	North Maharashtra	NA	NA	48.00	LSCH	9533	02/07/2015	02/07/2015	Round 1	No
46.	68333	44.8323	EN15205833	LOKHANDE PRADNYA SURESH	Female	Type A	SC	North Maharashtra	NA	NA	61.33	LSCH	9533	02/07/2015	02/07/2015	Round 1	No
47.	80669	36.3134	EN15205521	PATIL YADNYIKA NANDU	Female	Type A	DT/VJ	North Maharashtra	NA	NA	55.33	LVJH	9533	02/07/2015	02/07/2015	Round 1	No
48.	28518	365862	EN15195007	PATIL NILESH YASHWANT	Male	Type A	OBC	North Maharashtra	NA	NA	92.00	AI	13000	13/07/2015	13/07/2015	Round 2	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510419110] - Civil Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 102

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
49.	36175	457087	EN15205164	RANE BHAGYESH KHUSHAL	Male	Type A	Open	North Maharashtra	NA	NA	75.33	AI	76456	12/07/2015	12/07/2015	Round 2	No
50.	36470	460421	EN15206044	JAISWAL SHUBHANGI BHAGWAT	Female	Type A	OBC	Amravati	NA	NA	65.00	AI	10000	15/07/2015	15/07/2015	Round 2	No
51.	41315	516867	EN15205560	BADGUJAR SHUBHAM RAJENDRA	Male	Type A	Open	North Maharashtra	NA	NA	58.33	AI	25000	13/07/2015	13/07/2015	Round 2	No
52.	42000	524048	EN15195040	SONAWANE HARSHAL HIRALAL	Male	Type A	SBC	North Maharashtra	NA	NA	44.67	AI	9533	15/07/2015	15/07/2015	Round 2	No
53.	42795	532845	EN15202318	DEORE KRANTI SANJAY	Female	Type A	OBC	North Maharashtra	NA	NA	66.33	AI	42995	12/07/2015	12/07/2015	Round 2	No
54.	89742	28.197508475	EN15206427	JAVARE SHUBHAM RAJU	Male	Type A	NT-B	North Maharashtra	NA	NA	55.67	GNT1O	9533	12/07/2015	12/07/2015	Round 2	No
55.	65295	46.749949205	EN15206649	DESHMUKH AMAR KAUTIK	Male	Type A	NT-C	North Maharashtra	NA	NA	51.67	GNT2H	5000	14/07/2015	14/07/2015	Round 2	No
56.	63059	48.12676985	EN15192447	PATIL KAMLESH PRAMOD	Male	Type A	OBC	North Maharashtra	NA	NA	61.00	GOBCH	20000	13/07/2015	13/07/2015	Round 2	No
57.	64774	47.1030115	EN15201573	PATIL ABHIJIT DILIP	Male	Type A	OBC	North Maharashtra	NA	NA	55.00	GOBCH	10000	13/07/2015	13/07/2015	Round 2	No
58.	65070	46.883264675	EN15195014	MAHAJAN AJAY JAGANNATH	Male	Type A	OBC	North Maharashtra	NA	NA	72.33	GOBCO	25000	12/07/2015	12/07/2015	Round 2	No
59.	74720	40.613156695	EN15113761	KINHIKAR GAURAV VITTHALRAO	Male	Type A	OBC	Amravati	NA	NA	47.17	GOBCO	20000	12/07/2015	12/07/2015	Round 2	No
60.	35877	65.950711035	EN15181757	THAKARE AVINASH ULUSHA	Male	Type A	ST	North Maharashtra	NA	NA	61.00	GOPENH	9533	14/07/2015	14/07/2015	Round 2	No

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[510419110] - Civil Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 102

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
61.	42650	61.089135595	EN15192316	PATIL SAGAR NAMDEO	Male	Type A	OBC	North Maharashtra	NA	NA	67.00	GOPENH	20000	12/07/2015	12/07/2015	Round 2	No
62.	52126	54.859082705	EN15205115	MALU GAURAV BHIKCHAND	Male	Type A	Open	North Maharashtra	NA	NA	53.00	GOPENH	25000	12/07/2015	12/07/2015	Round 2	No
63.	53279	54.119869045	EN15190409	PATIL PRASHANT SAMBHAJI	Male	Type A	OBC	North Maharashtra	NA	NA	73.33	GOPENH	42000	11/07/2015	11/07/2015	Round 2	No
64.	53651	53.86812257	EN15205097	SHAIKH MOHD DANISH MOHD FAROOQUE	Male	Type A	Open	North Maharashtra	NA	NA	69.67	GOPENH	14000	11/07/2015	11/07/2015	Round 2	No
65.	55030	53.027016815	EN15195208	BORASE RAHUL SANJAY	Male	Type A	OBC	North Maharashtra	NA	NA	75.33	GOPENH	42995	11/07/2015	11/07/2015	Round 2	No
66.	55402	52.784197035	EN15184251	MAHAJAN SACHIN PRAMOD	Male	Type A	OBC	North Maharashtra	NA	NA	71.33	GOPENH	15000	12/07/2015	12/07/2015	Round 2	No
67.	45241	59.368844395	EN15100774	GANGAWANE PRAVIN SANTOSH	Male	Type A	NT-D	Amravati	NA	NA	48.33	GOPENO	9533	12/07/2015	12/07/2015	Round 2	No
68.	71802	42.491928815	EN15175276	PARKHI ASHISH MAROTRAO	Male	Type A	OBC	Amravati	NA	NA	54.67	GOPENO	30000	12/07/2015	12/07/2015	Round 2	No
69.	64100	47.50065769	EN15205794	PATIL CHETAN MAHESH	Male	Type A	OBC	North Maharashtra	NA	NA	60.00	GSCH	15000	13/07/2015	13/07/2015	Round 2	No
70.	77363	38.74845829	EN15206152	SHINDE SUMIT SAHEBRAO	Male	Type A	SC	North Maharashtra	NA	NA	49.67	GSCH	9533	11/07/2015	11/07/2015	Round 2	No
71.	59218	50.495595555	EN15181460	PRAJAPATI BHAVESH RAVINDRA	Male	Type A	OBC	North Maharashtra	NA	NA	61.33	GSCO	42795	12/07/2015	12/07/2015	Round 2	No
72.	60192	49.91686571	EN15205927	KHATIK AZAHAR YUNUS	Male	Type A	OBC	North Maharashtra	NA	NA	72.00	GSCO	15000	15/07/2015	15/07/2015	Round 2	No

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[510419110] - Civil Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 102

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
73.	71207	42.95728839	EN15181770	GAVIT SHUBHAM TUKARAM	Male	Type A	ST	North Maharashtra	NA	NA	63.67	GSTH	9533	12/07/2015	12/07/2015	Round 2	No
74.	73879	41.172805895	EN15195219	NANNAWARE SAGAR BHAGIRATH	Male	Type A	SBC	North Maharashtra	NA	NA	45.67	GSTH	9533	13/07/2015	13/07/2015	Round 2	No
75.	85864	32.081722795	EN15202466	SHINDE ONKAR SANJAY	Male	Type A	SC	North Maharashtra	NA	NA	56.00	GSTH	9533	13/07/2015	13/07/2015	Round 2	No
76.	61065	49.402543915	EN15191918	PATIL SAGAR KANTILAL	Male	Type A	OBC	North Maharashtra	NA	NA	68.67	GSTO	25000	11/07/2015	11/07/2015	Round 2	No
77.	65191	46.80974906	EN15206290	RAJPUT ABHIJIT MANGALSING	Male	Type A	DT/VJ	North Maharashtra	NA	NA	53.67	GVJH	9000	13/07/2015	13/07/2015	Round 2	No
78.	77998	38.29437433	EN15187825	PATIL MAYUR RAJESH	Male	Type A	DT/VJ	North Maharashtra	NA	NA	59.00	GVJO	9533	11/07/2015	11/07/2015	Round 2	No
79.	88475	29.567804655	EN15205534	NEMADE TWINKLE DILIP	Female	Type A	OBC	North Maharashtra	NA	NA	49.83	LOBCH	25000	12/07/2015	12/07/2015	Round 2	No
80.	79997	36.779518775	EN15175273	UDAPURE KUNAL VIJAY	Male	Type A	OBC	Amravati	NA	NA	52.67	LOBCO	35000	12/07/2015	12/07/2015	Round 2	No
81.	47383	57.873776665	EN15205047	SAMREEN NAZ SHAIKH GAFFAR AADIL	Female	Type A	Open	North Maharashtra	NA	NA	71.67	LOPENH	5000	12/07/2015	12/07/2015	Round 2	No
82.	82135	35.248924665	EN15205221	BOHARA SHREYA PRAFULLAKUMAR	Female	Type A	Open	North Maharashtra	NA	NA	59.33	LOPENH	30000	11/07/2015	11/07/2015	Round 2	No
83.	76227	39.54157395	EN15123430	KAVALE SAVITA DNYANESHWAR	Female	Type A	NT-C	B.A.M.U.	NA	NA	45.67	LOPENO	9533	13/07/2015	13/07/2015	Round 2	No
84.	85434	32.53544593	EN15201651	BACHHAV SNEHAL SUDHIR	Female	Type A	NT-C	North Maharashtra	NA	DEF1	51.67	LOPENO	9533	12/07/2015	12/07/2015	Round 2	No

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List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 102

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
85.	61551	49.086808745	EN15205688	MALI NITIN GOKUL	Male	Type A	OBC	North Maharashtra	NA	NA	70.67	LSCO	20000	13/07/2015	13/07/2015	Round 2	No
86.	56361	52.22597388	EN15195050	PATIL ABHISHEK VILAS	Male	Type A	OBC	North Maharashtra	NA	NA	48.83	LSTH	42995	11/07/2015	11/07/2015	Round 2	No
87.	62366	48.580690825	EN15205641	PATIL AKSHAY SAHEBRAO	Male	Type A	OBC	North Maharashtra	NA	NA	78.33	LSTO	42995	12/07/2015	12/07/2015	Round 2	No
88.	65601	46.551245735	EN15201958	MAKADE SHUBHAM SHRIKANT	Male	Type A	OBC	North Maharashtra	NA	NA	54.00	PH2H	20000	14/07/2015	14/07/2015	Round 2	No
89.	66108	46.232419315	EN15206303	PATIL HARSHVARDHAN VISHWANATH	Male	Type A	OBC	North Maharashtra	NA	NA	60.33	PH3H	20000	14/07/2015	14/07/2015	Round 2	No
90.	35776	66.010162130	EN15202837	GAVIT AVINASH DIVANJI	Male	Type A	ST	North Maharashtra	NA	NA	55.00	GOPEN	9535	23/07/2015	23/07/2015	Counseling Round	No
91.	54927	53.081954245	EN15206421	SOMWANSHI PRASHANT NANDALAL	Male	Type A	SC	North Maharashtra	NA	NA	55.67	GOPEN	5000	27/07/2015	27/07/2015	Counseling Round	No
92.	55008	53.029596230	EN15206264	RATHOD SACHIN MADHAV	Male	Type A	DT/VJ	North Maharashtra	NA	NA	46.33	GOPEN	1000	26/07/2015	26/07/2015	Counseling Round	No
93.	68943	44.410985030	EN15205022	RANE SHUBHAM GAJANAN	Male	Type A	Open	North Maharashtra	NA	NA	55.33	GOPEN	20000	28/07/2015	28/07/2015	Counseling Round	No
94.	69212	44.215761810	EN15205926	PARDESHI DHIRAJ PRAKASHSING	Male	Type A	OBC	North Maharashtra	NA	NA	66.67	GOPEN	10000	30/07/2015	30/07/2015	Counseling Round	No
95.	74300	40.895316320	EN15117273	BHUPESH RAJKUMAR KAMRANI	Male	Type A	Open	Pune	NA	NA	64.33	GOPEN	40000	27/07/2015	27/07/2015	Counseling Round	No
96.	80476	36.450977375	EN15206688	GAYAKWAD CHETAN SURESH	Male	Type A	OBC	North Maharashtra	NA	NA	51.67	GOPEN	5000	26/07/2015	26/07/2015	Counseling Round	No

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List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 102

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
97.	80536	36.389113060	EN15205639	SARODE HIMANSHU KISORBHAI	Male	Type B	OBC	North Maharashtra	NA	NA	52.00	GOPEN	32995	27/07/2015	27/07/2015	Counseling Round	No
98.	81674	35.521219145	EN15206161	BHAVSAR GITANSHU ANIL	Male	Type A	Open	North Maharashtra	NA	NA	53.67	GOPEN	40000	27/07/2015	27/07/2015	Counseling Round	No
99.	83954	33.717164380	EN15190468	SABALE VRUSHABH BAPURAO	Male	Type A	NT-D	North Maharashtra	NA	NA	48.00	GOPEN	1000	26/07/2015	26/07/2015	Counseling Round	No

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[510419110] - Civil Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Admitted Against CAP

Quota : 3

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	57	71.690000000	EN15721078	BAWASKAR DNYANESHWAR KADUBA	Male	Type A	Open	North Maharashtra	NA	NA	74.00	ACAP	30000	11/08/2015	22/08/2015	Institute Level	No
2.	93	53.830000000	EN15716002	MANISH KUMAR	Male	OMS	Open	OHU	NA	NA	87.33	ACAP	40000	08/08/2015	18/08/2015	Institute Level	No

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List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Institute Level Quota

Quota : 18

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	7	61.398328210	EN15716348	PATEL LEEEK ANIS	Male	Type A	Open	North Maharashtra	NA	NA	68.67	IL	35000	05/07/2015	18/08/2015	Institute Level	No
2.	11	57.842290790	EN15716368	SHAIKH MOHD UMAR HAMID	Male	Type A	Open	North Maharashtra	NA	NA	67.67	IL	35000	05/07/2015	18/08/2015	Institute Level	No
3.	17	49.335948760	EN15716643	JANGID KAPIL GOPICHAND	Male	Type A	Open	Mumbai	NA	NA	57.00	IL	37000	03/08/2015	18/08/2015	Institute Level	No
4.	18	48.333413900	EN15716270	SHAIKH MOBIN AHEMAD SAEED AHEMAD	Male	Type A	Open	North Maharashtra	NA	NA	68.33	IL	35000	06/07/2015	18/08/2015	Institute Level	No
5.	27	44.268287280	EN15716389	BAYAS JAYESHKUMAR DINESHSINHA	Male	Type A	Open	North Maharashtra	NA	NA	54.67	IL	36000	04/07/2015	18/08/2015	Institute Level	No
6.	29	43.524091250	EN15716472	SHAIKH REHAN	Male	Type B	Open	North Maharashtra	NA	NA	70.00	IL	45000	04/07/2015	18/08/2015	Institute Level	No
7.	30	43.522063995	EN15716193	PATIL RUTURAJ SANJAY	Male	Type A	OBC	North Maharashtra	NA	NA	51.67	IL	37000	05/07/2015	18/08/2015	Institute Level	No
8.	32	39.857811550	EN15716250	SAYYED SAJID SAYYED FAROOQUE	Male	Type A	Open	North Maharashtra	NA	NA	56.33	IL	35000	06/07/2015	18/08/2015	Institute Level	No
9.	35	38.393640340	EN15716602	CHAVAN SHIVAM SANTOSH	Male	Type A	Open	North Maharashtra	NA	NA	54.33	IL	40000	01/07/2015	18/08/2015	Institute Level	No
10.	41	30.326126035	EN15716533	PATIL SHIVAM VISHWAS	Male	Type A	Open	North Maharashtra	NA	NA	54.00	IL	46000	01/07/2015	18/08/2015	Institute Level	No
11.	46	24.417026395	EN15716123	PATIL RAHUL PRAKASH	Male	Type A	Open	North Maharashtra	NA	NA	51.17	IL	37000	17/07/2015	18/08/2015	Institute Level	No
12.	49	23.007008220	EN15716222	PATIL KUNAL MANOHAR	Male	Type A	OBC	North Maharashtra	NA	NA	47.67	IL	36000	06/07/2015	18/08/2015	Institute Level	No

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[510419110] - Civil Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Institute Level Quota

Quota : 18

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
13.	76	64.569662470	EN15716317	APOORV CHOUHAN	Male	OMS	Open	OHU	NA	NA	66.33	IL	30000	05/07/2015	18/08/2015	Institute Level	No
14.	88	29.168617150	EN15716577	MILIND WAGHE	Male	OMS	Open	OHU	NA	NA	54.67	IL	36000	02/07/2015	18/08/2015	Institute Level	No
15.	63	58.770000000	EN15716046	GANGADEEPSINGH PREMSINGH	Male	Type A	Open	North Maharashtra	NA	NA	56.00	IL	76456	25/07/2015	18/08/2015	Institute Level	No
16.	68	55.540000000	EN15716418	MALI BHUSHAN SUNIL	Male	Type A	OBC	North Maharashtra	NA	NA	46.00	IL	36000	04/07/2015	18/08/2015	Institute Level	No
17.	73	44.170000000	EN15716094	BORLE SANKET PRADIP	Male	Type A	OBC	Amravati	NA	NA	49.33	IL	25000	05/07/2015	18/08/2015	Institute Level	No
18.	92	57.200000000	EN15716160	SHUBHAM JANGIR	Male	OMS	Open	OHU	NA	NA	50.67	IL	10000	18/06/2015	18/08/2015	Institute Level	No

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Summary of Admitted Candidates for the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Sr. No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP	102	99	0	99
2.	Against CAP		2	0	2
3.	Institute Level	18	18	0	18
4.	Minority	0	0	0	0
5.	J&K Migrant		0	0	0
6.	Others		0	0	0
	Total	**120**	**119**	**0**	**119**

Seat Type used for Institute Level Admissions : ACAP-Against CAP, IL-Institute Level, ILNRI-Institute Level NRI (5% of SI if AICTE Permission), MI-Minority, GoI-Government of India Nominee, NRI-NRI (15% of SI if AICTE Permission), PIO-PIO (15% of SI if AICTE Permission), FNS-FNS (15% of SI if AICTE Permission), CIWGC-Children's of Indian Workers in Gulf Countries (15% of SI if AICTE Permission), OAA-Over and Above

Cut-Off Date for Admission : 14/08/2015
Cut-Off Date for Uploading : 22/08/2015

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List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 6

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	13928	86.0554	EN15206168	SONAR SARIKA ARUN	Female	Type A	OBC	North Maharashtra	NA	NA	83.00	GOPENO	9533	03/07/2015	03/07/2015	Round 1	No
2.	19467	80.355	EN15181802	PATIL BHUSHAN PRAKASHBHAI	Male	Type B	OBC	North Maharashtra	NA	NA	59.00	GOPENO	9533	03/07/2015	03/07/2015	Round 1	No
3.	19665	80.1132	EN15187870	GIRASE DARSHANSING GAJENDRASING	Male	Type A	Open	North Maharashtra	NA	NA	77.00	GOPENO	9533	02/07/2015	02/07/2015	Round 1	No
4.	21113	78.6784	EN15188164	PATIL VISHAL DAULAT	Male	Type A	Open	North Maharashtra	NA	NA	73.67	GOPENO	5000	04/07/2015	04/07/2015	Round 1	No
5.	21159	78.6451	EN15206422	SONAR RAHUL RAVINDRA	Male	Type A	OBC	North Maharashtra	NA	NA	70.33	GOPENO	9533	05/07/2015	05/07/2015	Round 1	No
6.	16993	82.871083075	EN15205739	KHATIJA BANO SHAIKH RAHIM	Female	Type A	Open	North Maharashtra	PH3	NA	78.67	GOPENO	9533	11/07/2015	11/07/2015	Round 2	No

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Directorate of Technical Education, Maharashtra State

3, Mahapalika Marg, Post Box No.1967, Mumbai-400001

[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510419111T] - Civil Engineering

Summary of Admitted Candidates for the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Sr. No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP	6	6	0	6
2.	Against CAP		0	0	0
3.	Institute Level	0	0	0	0
4.	Minority	0	0	0	0
5.	J&K Migrant		0	0	0
6.	Others		0	0	0
	Total	**6**	**6**	**0**	**6**

Seat Type used for Institute Level Admissions : ACAP-Against CAP, IL-Institute Level, ILNRI-Institute Level NRI (5% of SI if AICTE Permission), MI-Minority, GoI-Government of India Nominee, NRI-NRI (15% of SI if AICTE Permission), PIO-PIO (15% of SI if AICTE Permission), FNS-FNS (15% of SI if AICTE Permission), CIWGC-Children's of Indian Workers in Gulf Countries (15% of SI if AICTE Permission), OAA-Over and Above

Cut-Off Date for Admission : 14/08/2015
Cut-Off Date for Uploading : 22/08/2015

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Directorate of Technical Education, Maharashtra State

3, Mahapalika Marg, Post Box No.1967, Mumbai-400001

[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424510] - Computer Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 112

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	18937	240546	EN15187850	PRAGATI BENDALE	Female	OMS	NA	OHU	NA	NA	93.00	AI	35000	03/07/2015	03/07/2015	Round 1	No
2.	23821	306019	EN15206228	LOHAR MAYURI KAILAS	Female	Type A	NT-B	North Maharashtra	NA	NA	91.33	AI	9533	03/07/2015	03/07/2015	Round 1	No
3.	34203	433620	EN15195211	KALPIT MADHUSUDAN VADNERKAR	Male	Type A	OBC	North Maharashtra	NA	NA	63.33	AI	10000	04/07/2015	04/07/2015	Round 1	No
4.	35340	447213	EN15188198	HARDEEP JETHWANI	Male	OMS	NA	OHU	NA	NA	67.33	AI	49000	05/07/2015	05/07/2015	Round 1	No
5.	36580	461491	EN15206358	VISPUTE VISHAKHA DEELIP	Female	Type A	OBC	North Maharashtra	NA	NA	66.67	AI	10000	04/07/2015	04/07/2015	Round 1	No
6.	37951	476354	EN15206049	PATIL HARSHALI KRISHNA	Female	Type A	OBC	North Maharashtra	NA	NA	65.83	AI	42995	02/07/2015	02/07/2015	Round 1	No
7.	39488	494978	EN15206064	SONAWANE ISHAWAR WAMAN	Male	Type A	OBC	North Maharashtra	NA	NA	65.67	AI	20000	04/07/2015	04/07/2015	Round 1	No
8.	40323	505401	EN15205007	PRIYANKA JAKHETE	Female	Type B	Open	North Maharashtra	NA	NA	84.33	AI	76456	02/07/2015	02/07/2015	Round 1	No
9.	40583	508138	EN15206040	SAWANT ASHWINI DILIP	Female	Type A	OBC	North Maharashtra	NA	NA	71.33	AI	15000	04/07/2015	04/07/2015	Round 1	No
10.	46321	571309	EN15205063	FAIZAN AHMED SALMAN AKHTAR KHAN	Male	Type A	Open	North Maharashtra	NA	NA	74.50	AI	35000	04/07/2015	04/07/2015	Round 1	No
11.	46508	573351	EN15183558	PATIL TOSHNA DATTATRAY	Female	Type A	OBC	North Maharashtra	NA	NA	59.67	AI	42995	03/07/2015	03/07/2015	Round 1	No
12.	43320	60.6111	EN15205735	MALI VARSHA PRAKASH	Female	Type A	OBC	North Maharashtra	NA	DEF1	71.83	DEFO	38995	02/07/2015	02/07/2015	Round 1	No

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Directorate of Technical Education, Maharashtra State

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424510] - Computer Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 112

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
13.	71756	42.5506	EN15190430	LAMBOLE MAMTA RAVINDRA	Female	Type A	NT-B	North Maharashtra	NA	NA	73.00	GNT1H	9533	02/07/2015	02/07/2015	Round 1	No
14.	64221	47.4021	EN15206389	MANORE NILESH BALU	Male	Type A	NT-C	North Maharashtra	NA	NA	61.00	GNT2H	9533	04/07/2015	04/07/2015	Round 1	No
15.	87693	30.3373	EN15187811	PANDHARE HIMANSHU GURUDATTA	Male	Type A	NT-C	North Maharashtra	NA	NA	52.67	GNT2H	9533	03/07/2015	03/07/2015	Round 1	No
16.	88678	29.305	EN15205978	PATIL ASHWINI SAMBHAJI	Female	Type A	NT-D	North Maharashtra	NA	NA	47.00	GNT3H	9533	03/07/2015	03/07/2015	Round 1	No
17.	63487	47.8498	EN15205644	MAHAJAN LALIT SAKHARAM	Male	Type A	OBC	North Maharashtra	NA	NA	53.00	GOBCH	42995	03/07/2015	03/07/2015	Round 1	No
18.	66580	45.9397	EN15201462	ZOPE HEMANT MADHUKAR	Male	Type A	OBC	North Maharashtra	NA	NA	70.00	GOBCH	20000	04/07/2015	04/07/2015	Round 1	No
19.	73116	41.6798	EN15188194	PATIL HITESH RANJIT	Male	Type A	OBC	North Maharashtra	NA	NA	63.67	GOBCH	20000	03/07/2015	03/07/2015	Round 1	No
20.	75055	40.3903	EN15195231	PATIL KOMAL RAJENDRA	Female	Type A	OBC	North Maharashtra	NA	NA	59.50	GOBCH	25000	03/07/2015	03/07/2015	Round 1	No
21.	76098	39.6535	EN15206026	PATIL KIRAN DEVIDAS	Male	Type A	OBC	North Maharashtra	NA	NA	48.50	GOBCH	20000	03/07/2015	03/07/2015	Round 1	No
22.	43795	60.3635	EN15205915	PATIL RUSHIKESH SANJAY	Male	Type A	OBC	North Maharashtra	NA	NA	69.67	GOPENH	35000	02/07/2015	02/07/2015	Round 1	No
23.	45490	59.1729	EN15206752	PATIL ASHUTOSH SANJAY	Male	Type A	OBC	North Maharashtra	NA	NA	50.00	GOPENH	10000	02/07/2015	02/07/2015	Round 1	No
24.	49792	56.2866	EN15194969	MAHAJAN DIGVIJAY BALKRISHNA	Male	Type A	OBC	North Maharashtra	NA	NA	58.33	GOPENH	42995	02/07/2015	02/07/2015	Round 1	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424510] - Computer Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 112

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
25.	55229	52.8711	EN15206005	KOLI MAYUR CHANDRAKANT	Male	Type A	SBC	North Maharashtra	NA	NA	62.00	GOPENH	9533	04/07/2015	04/07/2015	Round 1	No
26.	56694	52.0016	EN15206301	SHIMPI SNEHAL ASHOK	Female	Type A	OBC	North Maharashtra	NA	NA	67.00	GOPENH	25000	04/07/2015	04/07/2015	Round 1	No
27.	56890	51.9091	EN15192062	RAJPUT PRIYAKUMARI KAILASSING	Female	Type A	Open	North Maharashtra	NA	NA	68.33	GOPENH	25000	04/07/2015	04/07/2015	Round 1	No
28.	57292	51.6912	EN15205564	PAWAR JANHAVI SANJIV	Female	Type A	OBC	North Maharashtra	NA	NA	61.50	GOPENH	20000	02/07/2015	02/07/2015	Round 1	No
29.	59520	50.291	EN15202957	DARSHANA PATIL	Female	Type A	OBC	North Maharashtra	NA	NA	56.67	GOPENH	40000	03/07/2015	03/07/2015	Round 1	No
30.	59645	50.1988	EN15184917	PATIL PRITI ANIL	Female	Type A	Open	North Maharashtra	NA	NA	71.33	GOPENH	20000	04/07/2015	04/07/2015	Round 1	No
31.	60078	49.9917	EN15188146	SONAWANE DIPAK KAILAS	Male	Type A	SC	North Maharashtra	NA	NA	46.00	GOPENH	9533	04/07/2015	04/07/2015	Round 1	No
32.	61762	48.9513	EN15205572	BORSE ARCHANA AABA	Female	Type A	OBC	North Maharashtra	NA	NA	64.67	GOPENH	20000	02/07/2015	02/07/2015	Round 1	No
33.	69575	43.9851	EN15206684	CHAUDHARI YAKSHRAJ SATISH	Male	Type A	OBC	B.A.M.U.	NA	NA	57.67	GOPENO	20000	03/07/2015	03/07/2015	Round 1	No
34.	84954	32.8924	EN15136822	NAGARE SAGAR NANDU	Male	Type A	NT-D	S.R.T.M.U.	NA	NA	45.33	GOPENO	9533	02/07/2015	02/07/2015	Round 1	No
35.	90264	27.5913	EN15117716	RAHUL NARAYAN CHOPADE	Male	Type B	OBC	Amravati	NA	NA	54.33	GOPENO	41995	03/07/2015	03/07/2015	Round 1	No
36.	96755	15.1707	EN15195009	JADHAV PRASHANT BHANUDAS	Male	Type A	OBC	Pune	NA	NA	49.17	GOPENO	25000	02/07/2015	02/07/2015	Round 1	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424510] - Computer Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 112

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
37.	85458	32.4601	EN15201402	YOGESH ASHOK NIMBALKAR	Male	Type A	SC	North Maharashtra	NA	NA	54.00	GSCH	9533	02/07/2015	02/07/2015	Round 1	No
38.	90159	27.7161	EN15202961	AJAY PAWAR	Male	Type B	SC	North Maharashtra	NA	NA	61.00	GSCH	9533	02/07/2015	02/07/2015	Round 1	No
39.	94446	21.5409	EN15187832	AMBHORE NIRMALKUMAR SAMPAT	Male	Type A	SC	North Maharashtra	NA	NA	45.67	GSCH	9533	02/07/2015	02/07/2015	Round 1	No
40.	96246	17.1704	EN15195114	KOLI MAYUR JAGANNATH	Male	Type A	SBC	North Maharashtra	NA	NA	51.17	GSCH	76456	04/07/2015	04/07/2015	Round 1	No
41.	67047	45.6474	EN15201428	TADAVI ISAK YUSUF	Male	Type A	ST	North Maharashtra	NA	NA	57.83	GSTH	9533	03/07/2015	03/07/2015	Round 1	No
42.	67125	45.5386	EN15202615	MALCHE DEVENDRA SHAHIRAM	Male	Type A	ST	North Maharashtra	NA	NA	69.00	GSTH	9533	02/07/2015	02/07/2015	Round 1	No
43.	62179	48.7049	EN15206115	GHARATE TEJAL PRALHAD	Female	Type A	OBC	North Maharashtra	NA	NA	66.33	LOBCH	42995	03/07/2015	03/07/2015	Round 1	No
44.	63346	47.9535	EN15183553	MUMTAZ BI SHAIKH GULAB	Female	Type A	OBC	North Maharashtra	NA	NA	53.67	LOBCH	32000	04/07/2015	04/07/2015	Round 1	No
45.	71253	42.9227	EN15201444	BARKALE PRACHI ARUN	Female	Type A	OBC	North Maharashtra	NA	NA	58.67	LOBCH	41456	03/07/2015	03/07/2015	Round 1	No
46.	43614	60.4418	EN15205829	MAHAJAN ASHWINI VIJAY	Female	Type A	OBC	North Maharashtra	NA	NA	73.00	LOPENH	12000	03/07/2015	03/07/2015	Round 1	No
47.	52286	54.7224	EN15183534	DONGRE ANJALI PRABHAKAR	Female	Type A	Open	North Maharashtra	NA	NA	73.33	LOPENH	40000	03/07/2015	03/07/2015	Round 1	No
48.	53579	53.9071	EN15195218	BADGUJAR PRAJAKTA RAVINDRA	Female	Type A	OBC	North Maharashtra	NA	NA	58.33	LOPENH	40000	05/07/2015	05/07/2015	Round 1	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424510] - Computer Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 112

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
49.	53977	53.6744	EN15184286	RAJURKAR TEJASWINI PUNDALIK	Female	Type A	OBC	North Maharashtra	NA	NA	77.67	LOPENH	42995	02/07/2015	02/07/2015	Round 1	No
50.	54281	53.495	EN15185375	BHAWNA JAIN	Female	Type B	OBC	North Maharashtra	NA	NA	58.67	LOPENH	42995	04/07/2015	04/07/2015	Round 1	No
51.	54371	53.4467	EN15195170	PURVA KAILASHKUMAR DARA	Female	Type A	Open	North Maharashtra	NA	NA	51.00	LOPENH	30000	05/07/2015	05/07/2015	Round 1	No
52.	54466	53.3641	EN15201362	PRAJAPATI SUVARNA PRAMOD	Female	Type A	OBC	North Maharashtra	NA	NA	48.67	LOPENH	42995	04/07/2015	04/07/2015	Round 1	No
53.	45707	59.0525	EN15115668	DHAKE ARATI RAJENDRA	Female	Type A	OBC	Amravati	NA	NA	70.67	LOPENO	42995	02/07/2015	02/07/2015	Round 1	No
54.	82838	34.6606	EN15116059	SHIMBARE PRATIKSHA SUGADEV	Female	Type A	OBC	Amravati	NA	NA	53.83	LOPENO	42995	04/07/2015	04/07/2015	Round 1	No
55.	73338	41.5251	EN15206400	RATHOD HARSHALI KIRAN	Female	Type A	SC	North Maharashtra	NA	NA	56.00	LSCH	9533	03/07/2015	03/07/2015	Round 1	No
56.	67353	45.4311	EN15205703	RAJPUT RITIKA ANIL	Female	Type A	DT/VJ	North Maharashtra	NA	NA	62.00	LVJH	9533	02/07/2015	02/07/2015	Round 1	No
57.	34730	439927	EN15187854	NIKITA KATEKAR	Female	OMS	NA	OHU	NA	NA	81.67	AI	40000	14/07/2015	14/07/2015	Round 2	No
58.	37014	466208	EN15205728	RADHIKA RAMESH BANGAR	Female	Type A	OBC	North Maharashtra	NA	NA	56.00	AI	22000	15/07/2015	15/07/2015	Round 2	No
59.	44324	549372	EN15205606	SONAR SUKANYA KISHOR	Female	Type A	OBC	North Maharashtra	NA	NA	57.00	AI	42995	11/07/2015	11/07/2015	Round 2	No
60.	49549	606208	EN15206073	RANDHIRE MILIND MANOHAR	Male	Type A	OBC	North Maharashtra	NA	NA	45.17	AI	42995	13/07/2015	13/07/2015	Round 2	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424510] - Computer Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 112

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
61.	52162	633540	EN15201266	NAGRAJ PRANAV ANANT	Male	Type A	Open	North Maharashtra	NA	NA	67.17	AI	30000	12/07/2015	12/07/2015	Round 2	No
62.	83307	34.23168353	EN15184299	MAHAJAN SAURAV PRAMOD	Male	Type A	OBC	North Maharashtra	NA	NA	52.67	GNT2O	42995	13/07/2015	13/07/2015	Round 2	No
63.	84775	33.087305985	EN15195139	ZOPE RUPESH SANJAY	Male	Type A	OBC	North Maharashtra	NA	NA	48.33	GNT3O	15000	13/07/2015	13/07/2015	Round 2	No
64.	91794	25.72062817	EN15205064	KUKREJA KIRTI PRADEEPKUMAR	Female	Type A	Open	North Maharashtra	NA	NA	53.33	GOBCH	40000	11/07/2015	11/07/2015	Round 2	No
65.	96040	17.836449985	EN15205615	MALI KOMAL SUBHASH	Female	Type A	OBC	North Maharashtra	NA	NA	47.00	GOBCH	42995	11/07/2015	11/07/2015	Round 2	No
66.	77052	39.029956095	EN15201992	PATIL PIYUSH GOKUL	Male	Type A	OBC	North Maharashtra	NA	NA	46.67	GOBCO	76456	13/07/2015	13/07/2015	Round 2	No
67.	78190	38.15883924	EN15206158	PATIL KRUSHNA BABAN	Male	Type A	OBC	North Maharashtra	NA	NA	47.67	GOBCO	14000	14/07/2015	14/07/2015	Round 2	No
68.	81774	35.484523435	EN15187837	PATIL HARSHAL SUNIL	Male	Type A	OBC	North Maharashtra	NA	NA	48.33	GOBCO	15000	11/07/2015	11/07/2015	Round 2	No
69.	54053	53.61067198	EN15185085	GIRASE VIKRANT ROHIDAS	Male	Type A	Open	North Maharashtra	NA	NA	71.33	GOPENH	40000	12/07/2015	12/07/2015	Round 2	No
70.	56574	52.070037335	EN15184371	PATIL VASUNDHARA JAYANT	Female	Type A	OBC	North Maharashtra	NA	NA	80.33	GOPENH	15000	13/07/2015	13/07/2015	Round 2	No
71.	57447	51.54481595	EN15184453	CHAUDHARI RAJSHRI BHAGWAN	Female	Type A	OBC	North Maharashtra	NA	NA	68.00	GOPENH	30000	12/07/2015	12/07/2015	Round 2	No
72.	58190	51.1211024	EN15201238	MAHAJAN MADHURI VIKRAM	Female	Type A	OBC	North Maharashtra	NA	NA	60.17	GOPENH	42995	11/07/2015	11/07/2015	Round 2	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424510] - Computer Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 112

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
73.	60033	50.02089919	EN15201381	BARHATE POOJA KISHOR	Female	Type A	OBC	North Maharashtra	NA	NA	59.83	GOPENH	42995	11/07/2015	11/07/2015	Round 2	No
74.	64099	47.50065769	EN15201350	PATIL PRIYANKA SHANTARAM	Female	Type A	OBC	North Maharashtra	NA	NA	63.83	GOPENH	76456	11/07/2015	11/07/2015	Round 2	No
75.	70755	43.228791125	EN15190472	PATIL PRACHI VINOD	Female	Type A	OBC	North Maharashtra	NA	NA	60.00	GOPENH	20000	14/07/2015	14/07/2015	Round 2	No
76.	66562	45.945418655	EN15205017	PATIL SACHIN GANESH	Male	Type A	Open	North Maharashtra	NA	NA	53.00	GOPENO	30000	11/07/2015	11/07/2015	Round 2	No
77.	70056	43.667748915	EN15188128	SHAIKH KASHIF PARVEZ AHEMAD	Male	Type A	Open	North Maharashtra	NA	NA	63.33	GOPENO	5000	14/07/2015	14/07/2015	Round 2	No
78.	74388	40.846490875	EN15192070	SHISODIYA VISHAL RAVINDRASING	Male	Type A	Open	North Maharashtra	NA	NA	61.67	GOPENO	20000	15/07/2015	15/07/2015	Round 2	No
79.	79494	37.185115195	EN15292581	PAWAR KALPESH RAVINDRA	Male	Type A	OBC	Mumbai	NA	NA	50.67	GOPENO	42995	12/07/2015	12/07/2015	Round 2	No
80.	73352	41.502108085	EN15205959	AHIRE CHETAN SANJAY	Male	Type A	OBC	North Maharashtra	NA	NA	56.17	GSCH	15000	13/07/2015	13/07/2015	Round 2	No
81.	85091	32.76530838	EN15184132	CHAUDHARI YASH RAJENDRA	Male	Type A	OBC	North Maharashtra	NA	NA	54.33	GSCH	20000	11/07/2015	11/07/2015	Round 2	No
82.	85437	32.528017065	EN15201240	PATIL SAURABH KIRAN	Male	Type A	OBC	North Maharashtra	NA	NA	45.33	GSCO	42995	13/07/2015	13/07/2015	Round 2	No
83.	88473	29.567804655	EN15187818	AKSHAY ANIL KOLHE	Male	Type A	OBC	North Maharashtra	NA	NA	47.00	GSCO	30000	13/07/2015	13/07/2015	Round 2	No
84.	89470	28.509034085	EN15184242	PATIL JEEVAN MANOHAR	Male	Type A	OBC	North Maharashtra	NA	NA	52.17	GSCO	20000	13/07/2015	13/07/2015	Round 2	No

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Directorate of Technical Education, Maharashtra State

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424510] - Computer Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 112

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
85.	90631	27.15080735	EN15201305	WANI SAMIKSHA DEELIP	Female	Type A	OBC	North Maharashtra	NA	NA	54.17	GSTO	42995	13/07/2015	13/07/2015	Round 2	No
86.	91385	26.321635815	EN15205532	PATIL KOMAL RAWINDRA	Female	Type A	OBC	North Maharashtra	NA	NA	50.00	GVJH	42995	13/07/2015	13/07/2015	Round 2	No
87.	91807	25.709156625	EN15198480	ZOPE NIDHI KISHOR	Female	Type A	OBC	North Maharashtra	NA	NA	52.67	LNT1O	50000	12/07/2015	12/07/2015	Round 2	No
88.	95138A	20.10054053	EN15206380	PATIL PRANOTI VIJAY	Female	Type A	NT-C	North Maharashtra	NA	NA	45.00	LNT2H	9533	11/07/2015	11/07/2015	Round 2	No
89.	77034	39.033688235	EN15195196	SHRUTI SUDHIR INGALE	Female	Type A	OBC	North Maharashtra	NA	NA	59.17	LOBCH	42995	13/07/2015	13/07/2015	Round 2	No
90.	87584	30.41558905	EN15205958	KOLI GAYATRI SUNIL	Female	Type A	SBC	North Maharashtra	NA	NA	47.67	LOBCO	9533	13/07/2015	13/07/2015	Round 2	No
91.	46868	58.237151525	EN15183628	NAIK POOJA PRAVIN	Female	Type A	NT-D	North Maharashtra	NA	NA	68.67	LOPENH	9533	13/07/2015	13/07/2015	Round 2	No
92.	76074	39.674058035	EN15201009	NIKITA NITIN MISHRA	Female	Type A	Open	North Maharashtra	NA	NA	61.67	LOPENO	40000	12/07/2015	12/07/2015	Round 2	No
93.	75311	40.164649855	EN15206632	PATIL SAPANA MUKESH	Female	Type A	OBC	North Maharashtra	NA	NA	47.33	LSCH	42995	11/07/2015	11/07/2015	Round 2	No
94.	89922	27.96123407	EN15136916	RUNWAL SHARAYU SATISH	Female	Type A	Open	North Maharashtra	NA	NA	59.00	LSCH	76456	14/07/2015	14/07/2015	Round 2	No
95.	91877	25.583281	EN15206705	DNYANESH TUKARAM PATIL	Male	Type A	OBC	North Maharashtra	NA	NA	53.33	LSCO	42995	13/07/2015	13/07/2015	Round 2	No
96.	93490	23.26636719	EN15194967	PIMPARKAR REVATI CHANDRASHEKHAR	Female	Type A	OBC	North Maharashtra	NA	NA	46.00	LSTO	30000	13/07/2015	13/07/2015	Round 2	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424510] - Computer Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 112

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
97.	37625	64.673272540	EN15188180	CHAURASIYA MITALI SANGITA	Female	Type A	OBC	B.A.M.U.	NA	NA	66.33	GOPEN	1000	24/07/2015	24/07/2015	Counseling Round	No
98.	61501	49.124255775	EN15201407	ZOPE MAYUR GANESH	Male	Type A	OBC	North Maharashtra	NA	NA	67.00	GOPEN	20000	26/07/2015	26/07/2015	Counseling Round	No
99.	76760	39.203600725	EN15206425	NIKUM VISHAL PANDURANG	Male	Type A	NT-B	North Maharashtra	NA	NA	49.67	GOPEN	1000	29/07/2015	29/07/2015	Counseling Round	No
100.	90872	26.933236955	EN15187863	BUNDE JITENDRA SUBHASH	Male	Type A	OBC	North Maharashtra	NA	NA	52.83	GOPEN	32995	30/07/2015	30/07/2015	Counseling Round	No
101.	97315	12.027990380	EN15205028	MALIK AZHAN UMEAR AFTAB ANJUM	Male	Type A	Open	North Maharashtra	NA	NA	53.50	GOPEN	30000	28/07/2015	28/07/2015	Counseling Round	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424510] - Computer Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Admitted Against CAP

Quota : 11

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	8	60.476252795	EN15715254	SHAIKH AEROZ NOOR MOHD	Male	Type A	Open	North Maharashtra	NA	NA	63.33	ACAP	20000	26/07/2015	18/08/2015	Institute Level	No
2.	14	51.325080115	EN15715306	RAKDE SHRUTIKA SUNIL	Female	Type A	Open	B.A.M.U.	NA	NA	66.67	ACAP	0	22/07/2015	18/08/2015	Institute Level	No
3.	37	36.109625435	EN15715221	RISHABH JAYANT KOTHARI	Male	Type A	Open	North Maharashtra	NA	NA	53.17	ACAP	35000	25/07/2015	18/08/2015	Institute Level	No
4.	43	28.232243880	EN15715478	NIKITA MAHAJAN	Female	Type A	OBC	North Maharashtra	NA	NA	47.67	ACAP	10000	07/08/2015	18/08/2015	Institute Level	No
5.	45	27.221384675	EN15715400	AMAN SUNIL VERMA	Male	Type B	Open	North Maharashtra	NA	NA	60.00	ACAP	10000	29/07/2015	18/08/2015	Institute Level	No
6.	77	63.856339380	EN15715432	RITESH BHOJWANI	Male	OMS	Open	OHU	NA	NA	85.33	ACAP	15000	26/07/2015	18/08/2015	Institute Level	No
7.	60	67.080000000	EN15715332	BORASE SHUBHANGI MANOHAR	Female	Type A	OBC	North Maharashtra	NA	NA	63.33	ACAP	25000	20/07/2015	18/08/2015	Institute Level	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424510] - Computer Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Institute Level Quota

Quota : 8

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	4	81.278748895	EN15715796	KEJARIWAL SHUBHAM VIJAY	Male	Type A	Open	North Maharashtra	NA	NA	84.17	IL	35000	04/07/2015	18/08/2015	Institute Level	No
2.	10	57.860728545	EN15715832	PATIL ANIKET SANJAY	Male	Type A	Open	North Maharashtra	NA	NA	72.00	IL	35000	04/07/2015	18/08/2015	Institute Level	No
3.	31	40.373154520	EN15715863	SATAV VAIBHAV RAJENDRA	Male	Type A	Open	North Maharashtra	NA	NA	60.00	IL	40000	04/07/2015	18/08/2015	Institute Level	No
4.	48	23.039526055	EN15715674	AKOLE REVATI ATUL	Male	Type A	Open	North Maharashtra	NA	NA	50.33	IL	37000	15/07/2015	18/08/2015	Institute Level	No
5.	79	53.840035860	EN15715734	SHUBHAM THAKUR	Male	OMS	Open	OHU	NA	NA	54.67	IL	25000	05/07/2015	18/08/2015	Institute Level	No
6.	82	45.178840740	EN15715761	BHAGYASHREE PATIL	Female	OMS	Open	OHU	NA	NA	67.67	IL	30000	03/07/2015	18/08/2015	Institute Level	No
7.	91	58.800000000	EN15715699	SUMIT PATIL	Male	OMS	Open	OHU	NA	NA	51.33	IL	40000	06/07/2015	18/08/2015	Institute Level	No
8.	94	42.400000000	EN15715930	CHETAN WANKHEDEKAR	Male	OMS	Open	OHU	NA	NA	51.67	IL	25000	25/07/2015	18/08/2015	Institute Level	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424510] - Computer Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Government Of India Quota

Quota : 1

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	1	73.200000000	EN15715650	KRUNALI PATEL	Female	GoI	ST	OHU	NA	NA	70.33	GoI	10000	30/07/2015	16/08/2015	Institute Level	No

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Directorate of Technical Education, Maharashtra State

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424510] - Computer Engineering

Summary of Admitted Candidates for the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Sr. No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP	112	101	0	101
2.	Against CAP		7	0	7
3.	Institute Level	8	8	0	8
4.	Minority	0	0	0	0
5.	J&K Migrant		0	0	0
6.	Others		1	0	1
	Total	**120**	**117**	**0**	**117**

Seat Type used for Institute Level Admissions : ACAP-Against CAP, IL-Institute Level, ILNRI-Institute Level NRI (5% of SI if AICTE Permission), MI-Minority, GoI-Government of India Nominee, NRI-NRI (15% of SI if AICTE Permission), PIO-PIO (15% of SI if AICTE Permission), FNS-FNS (15% of SI if AICTE Permission), CIWGC-Children's of Indian Workers in Gulf Countries (15% of SI if AICTE Permission), OAA-Over and Above

Cut-Off Date for Admission : 14/08/2015
Cut-Off Date for Uploading : 22/08/2015

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424511T] - Computer Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 6

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	18235	81.6318	EN15205094	HEMNANI SANJAY NARESH	Male	Type A	Open	North Maharashtra	NA	NA	64.67	GOPENO	9533	02/07/2015	02/07/2015	Round 1	No
2.	21527	78.2841	EN15205086	BANGALI POOJA PRAMOD	Female	Type A	Open	North Maharashtra	NA	NA	69.50	GOPENO	9533	03/07/2015	03/07/2015	Round 1	No
3.	22054	77.7757	EN15205701	KAPSE PRERNA DIPAK	Female	Type A	OBC	North Maharashtra	NA	NA	68.67	GOPENO	9533	04/07/2015	04/07/2015	Round 1	No
4.	23371	76.5563	EN15190426	CHAUDHARI HARSHADA RAVINDRA	Female	Type A	OBC	North Maharashtra	NA	NA	63.67	GOPENO	19066	03/07/2015	03/07/2015	Round 1	No
5.	24113	75.8627	EN15205583	ANSARI KHALID FAISAL MOHD SHAHID	Male	Type A	OBC	North Maharashtra	NA	NA	82.67	GOPENO	9533	02/07/2015	02/07/2015	Round 1	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424511T] - Computer Engineering

Summary of Admitted Candidates for the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Sr. No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP	6	5	0	5
2.	Against CAP		0	0	0
3.	Institute Level	0	0	0	0
4.	Minority	0	0	0	0
5.	J&K Migrant		0	0	0
6.	Others		0	0	0
	Total	**6**	**5**	**0**	**5**

Seat Type used for Institute Level Admissions : ACAP-Against CAP, IL-Institute Level, ILNRI-Institute Level NRI (5% of SI if AICTE Permission), MI-Minority, GoI-Government of India Nominee, NRI-NRI (15% of SI if AICTE Permission), PIO-PIO (15% of SI if AICTE Permission), FNS-FNS (15% of SI if AICTE Permission), CIWGC-Children's of Indian Workers in Gulf Countries (15% of SI if AICTE Permission), OAA-Over and Above

Cut-Off Date for Admission : 14/08/2015
Cut-Off Date for Uploading : 22/08/2015

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510437210] - Electronics and Telecommunication Engg

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 120

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	40189	503557	EN15205883	AHIRRAO VAISHNAVI NILKANTH	Female	Type A	OBC	North Maharashtra	NA	NA	64.67	AI	24000	03/07/2015	03/07/2015	Round 1	No
2.	46848	577351	EN15206412	CHAUDHARI PRIYA PRADIP	Female	Type A	OBC	North Maharashtra	NA	NA	67.33	AI	38995	02/07/2015	02/07/2015	Round 1	No
3.	49285	603322	EN15115864	MOHAMMAD OWAIS SHAIKH SABIR QURESHI	Male	Type A	OBC	Amravati	NA	NA	80.33	AI	40000	02/07/2015	02/07/2015	Round 1	No
4.	56721	680138	EN15201002	KULKARNI SAMIDHA ARUN	Female	Type A	Open	North Maharashtra	NA	NA	70.67	AI	76456	02/07/2015	02/07/2015	Round 1	No
5.	59932	712878	EN15205544	PATIL PUSHPAK YOGIRAJ	Male	Type A	OBC	North Maharashtra	NA	NA	45.50	AI	33000	03/07/2015	03/07/2015	Round 1	No
6.	60817	721941	EN15205726	CHAUDHARI SHIVANI SANTOSH	Female	Type A	OBC	North Maharashtra	NA	NA	67.67	AI	42995	02/07/2015	02/07/2015	Round 1	No
7.	64735	763040	EN15184359	PATIL KARISHMA SUHAS	Female	Type A	OBC	North Maharashtra	NA	NA	52.67	AI	42995	04/07/2015	04/07/2015	Round 1	No
8.	66408	780903	EN15206716	PATIL CHETNA VINOD	Female	Type A	OBC	North Maharashtra	NA	NA	49.67	AI	10000	03/07/2015	03/07/2015	Round 1	No
9.	69665	813757	EN15206300	GADILOHAR UMA BHIKAN	Female	Type A	NT-B	North Maharashtra	NA	NA	71.00	AI	9533	02/07/2015	02/07/2015	Round 1	No
10.	72835	847049	EN15205740	CHAUDHARI MAHENDRA DILEEP	Male	Type A	OBC	North Maharashtra	NA	NA	50.00	AI	15000	03/07/2015	03/07/2015	Round 1	No
11.	70364	43.4637	EN15187855	PATIL CHETAN RAVINDRA	Male	Type A	OBC	North Maharashtra	NA	NA	58.00	GOPENH	42995	03/07/2015	03/07/2015	Round 1	No
12.	71740	42.5629	EN15195126	NIKUMBH ANIKET GOKUL	Male	Type A	OBC	North Maharashtra	NA	NA	50.00	GOPENH	42995	03/07/2015	03/07/2015	Round 1	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510437210] - Electronics and Telecommunication Engg

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 120

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
13.	74618	40.6752	EN15205797	PATIL MANISH SAMADHAN	Male	Type A	OBC	North Maharashtra	NA	NA	54.33	GOPENH	25000	02/07/2015	02/07/2015	Round 1	No
14.	82070	35.3315	EN15187815	THAKARE RUSHIKESH SURENDRASING	Male	Type A	Open	North Maharashtra	NA	NA	56.33	GOPENH	30000	03/07/2015	03/07/2015	Round 1	No
15.	84753	33.0895	EN15202290	MUSALE ROHAN RAJENDRA	Male	Type A	OBC	North Maharashtra	NA	NA	49.67	GOPENH	30000	04/07/2015	04/07/2015	Round 1	No
16.	92788	24.3544	EN15206367	SANDEEP BAPU SONAWANE	Male	Type B	ST	North Maharashtra	NA	NA	53.33	GOPENH	7000	02/07/2015	02/07/2015	Round 1	No
17.	96949	14.2633	EN15201483	PATIL VAIBHAV MADHUKAR	Male	Type A	OBC	North Maharashtra	NA	NA	49.00	GOPENH	42995	02/07/2015	02/07/2015	Round 1	No
18.	88803	29.169	EN15112204	GAIKWAD SAHIL VIJAY	Male	Type A	OBC	Amravati	NA	NA	52.33	GOPENO	20000	02/07/2015	02/07/2015	Round 1	No
19.	90677	27.0951	EN15206715	PATIL MADHURI RANJIT	Female	Type A	OBC	North Maharashtra	NA	NA	47.33	LOPENH	10000	05/07/2015	05/07/2015	Round 1	No
20.	91985	25.4404	EN15205580	BHANGALE BHAGYASHRI SANJAY	Female	Type A	OBC	North Maharashtra	NA	NA	49.50	LOPENH	24000	02/07/2015	02/07/2015	Round 1	No
21.	92200	25.1857	EN15205120	KAZI ARFEEN FEROZ	Female	Type A	Open	North Maharashtra	NA	NA	49.67	LOPENH	41256	02/07/2015	02/07/2015	Round 1	No
22.	88451	29.5873	EN15166077	SNEHAL RAJENDRA PATIL	Female	Type A	OBC	B.A.M.U.	NA	NA	50.50	LOPENO	15000	04/07/2015	04/07/2015	Round 1	No
23.	91739	25.7915	EN15166391	PRATIKSHA ASHOK GAIKWAD	Female	Type A	SC	Gondwana	NA	NA	54.33	LOPENO	9533	03/07/2015	03/07/2015	Round 1	No
24.	52091	632637	EN15201053	PRIYA DAYANAND MANDAL	Female	Type A	SC	North Maharashtra	NA	NA	64.67	AI	9533	11/07/2015	11/07/2015	Round 2	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510437210] - Electronics and Telecommunication Engg

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 120

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
25.	54134	653933	EN15116096	SURLAKAR ESHVAR MURLIDHAR	Male	Type A	SC	Amravati	NA	NA	57.00	AI	9533	13/07/2015	13/07/2015	Round 2	No
26.	79571	914489	EN15195024	WANI KRUNAL PRAVIN	Male	Type A	OBC	North Maharashtra	NA	NA	53.00	AI	20000	15/07/2015	15/07/2015	Round 2	No
27.	79804	916998	EN15206120	VISPUTE PRASHANT ANIL	Male	Type A	OBC	North Maharashtra	NA	NA	53.00	AI	20000	13/07/2015	13/07/2015	Round 2	No
28.	82042	940647	EN15190407	BADGUJAR RAKESH BAPURAO	Male	Type A	OBC	North Maharashtra	NA	NA	53.00	AI	10000	12/07/2015	12/07/2015	Round 2	No
29.	74410	40.82300892	EN15188106	DHANGAR DNYANESHWAR PRAKASH	Male	Type A	NT-C	North Maharashtra	NA	NA	49.33	GOPENH	9533	11/07/2015	11/07/2015	Round 2	No
30.	85337	32.599404025	EN15206173	PAWAR AJAY SANJAY	Male	Type A	OBC	North Maharashtra	NA	NA	52.00	GOPENH	14000	14/07/2015	14/07/2015	Round 2	No
31.	89348	28.650832895	EN15206434	PATIL NITIN RAJENDRA	Male	Type A	OBC	North Maharashtra	NA	NA	48.00	GOPENH	0	14/07/2015	14/07/2015	Round 2	No
32.	91183	26.48524409	EN15195025	RAYSINGE JITESH PRASHANT	Male	Type A	SBC	North Maharashtra	NA	NA	49.67	GOPENH	9533	14/07/2015	14/07/2015	Round 2	No
33.	97023	13.88793511	EN15187848	KOLI DIPTESH DIGAMBAR	Male	Type A	SBC	North Maharashtra	NA	NA	48.50	GOPENH	9533	13/07/2015	13/07/2015	Round 2	No
34.	85671	32.215673725	EN15221146	KUNAL PATIL	Male	Type A	OBC	Pune	NA	NA	46.00	GOPENO	42995	13/07/2015	13/07/2015	Round 2	No

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Directorate of Technical Education, Maharashtra State

3, Mahapalika Marg, Post Box No.1967, Mumbai-400001

[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510437210] - Electronics and Telecommunication Engg

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Admitted Against CAP

Quota : 86

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	9	54.608470845	EN15720956	SHOAIB SHAIKH YUSUF MANYAR	Male	Type A	Open	North Maharashtra	NA	NA	67.67	ACAP	30000	14/07/2015	16/08/2015	Institute Level	No
2.	28	30.350747005	EN15720911	METKAR GHANSHYAM DINKAR	Male	Type A	OBC	North Maharashtra	NA	NA	52.00	ACAP	18000	13/07/2015	16/08/2015	Institute Level	No
3.	40	78.310000000	EN15720934	CHAUDHARI SHIVANI SHIVDAS	Female	Type A	Open	North Maharashtra	NA	NA	80.67	ACAP	0	26/07/2015	16/08/2015	Institute Level	No
4.	41	73.800000000	EN15721007	CHETAN MANOJ SHARMA	Male	Type B	Open	North Maharashtra	NA	NA	66.00	ACAP	10000	16/07/2015	16/08/2015	Institute Level	No
5.	50	53.170000000	EN15721018	PATIL PRAMOD DEVRAM	Male	Type A	Open	North Maharashtra	NA	NA	52.67	ACAP	22000	29/07/2015	16/08/2015	Institute Level	No
6.	67	68.500000000	EN15721044	MONIKA PRIYA	Female	OMS	Open	OHU	NA	NA	62.67	ACAP	40000	08/08/2015	16/08/2015	Institute Level	No

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Directorate of Technical Education, Maharashtra State

3, Mahapalika Marg, Post Box No.1967, Mumbai-400001

[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510437210] - Electronics and Telecommunication Engg

Summary of Admitted Candidates for the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Sr. No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP	120	34	0	34
2.	Against CAP		6	0	6
3.	Institute Level	0	0	0	0
4.	Minority	0	0	0	0
5.	J&K Migrant		0	0	0
6.	Others		0	0	0
	Total	**120**	**40**	**0**	**40**

Seat Type used for Institute Level Admissions : ACAP-Against CAP, IL-Institute Level, ILNRI-Institute Level NRI (5% of SI if AICTE Permission), MI-Minority, GoI-Government of India Nominee, NRI-NRI (15% of SI if AICTE Permission), PIO-PIO (15% of SI if AICTE Permission), FNS-FNS (15% of SI if AICTE Permission), CIWGC-Children's of Indian Workers in Gulf Countries (15% of SI if AICTE Permission), OAA-Over and Above

Cut-Off Date for Admission : 14/08/2015
Cut-Off Date for Uploading : 22/08/2015

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510437211T] - Electronics and Telecommunication Engg

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 6

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	33432	67.8198	EN15205091	PHADNIS NIKHILESH NARESH	Male	Type A	Open	North Maharashtra	NA	NA	78.33	GOPENO	9533	02/07/2015	02/07/2015	Round 1	No
2.	36216	65.6587	EN15123939	DHAGE VIJAY SADASHIV	Male	Type A	Open	S.R.T.M.U.	NA	NA	61.50	GOPENO	9533	03/07/2015	03/07/2015	Round 1	No
3.	37635	64.6572	EN15205150	PATIL AKSHADA SANJAY	Female	Type A	Open	North Maharashtra	NA	NA	72.67	GOPENO	9533	03/07/2015	03/07/2015	Round 1	No
4.	38411	64.0918	EN15195005	CHAUDHARI ANAGHA LILADHAR	Female	Type A	OBC	North Maharashtra	NA	NA	63.50	GOPENO	9533	02/07/2015	02/07/2015	Round 1	No
5.	41421	61.9701	EN15205158	BHADADA PIYUSH DILIP	Male	Type A	Open	North Maharashtra	NA	NA	64.00	GOPENO	0	03/07/2015	03/07/2015	Round 1	No
6.	49296	56.59826547	EN15187886	KHANDALKAR MAMTA RAJENDRA	Female	Type A	Open	B.A.M.U.	NA	NA	69.00	GOPENO	9533	14/07/2015	14/07/2015	Round 2	No

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Directorate of Technical Education, Maharashtra State

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510437211T] - Electronics and Telecommunication Engg

Summary of Admitted Candidates for the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Sr. No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP	6	6	0	6
2.	Against CAP		0	0	0
3.	Institute Level	0	0	0	0
4.	Minority	0	0	0	0
5.	J&K Migrant		0	0	0
6.	Others		0	0	0
	Total	**6**	**6**	**0**	**6**

Seat Type used for Institute Level Admissions : ACAP-Against CAP, IL-Institute Level, ILNRI-Institute Level NRI (5% of SI if AICTE Permission), MI-Minority, GoI-Government of India Nominee, NRI-NRI (15% of SI if AICTE Permission), PIO-PIO (15% of SI if AICTE Permission), FNS-FNS (15% of SI if AICTE Permission), CIWGC-Children's of Indian Workers in Gulf Countries (15% of SI if AICTE Permission), OAA-Over and Above

Cut-Off Date for Admission : 14/08/2015
Cut-Off Date for Uploading : 22/08/2015

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510429310] - Electrical Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 58

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	27879	357664	EN15205575	MALI DIPAK BHAGWAN	Male	Type A	OBC	North Maharashtra	NA	NA	71.33	AI	25000	04/07/2015	04/07/2015	Round 1	No
2.	31811	404872	EN15205911	RAJPUT ASHISH PRATAP	Male	Type A	DT/VJ	North Maharashtra	NA	NA	74.33	AI	9533	02/07/2015	02/07/2015	Round 1	No
3.	37935	476285	EN15202585	SALUNKHE VAIBHAV PANDURANG	Male	Type A	OBC	North Maharashtra	NA	NA	74.00	AI	25000	04/07/2015	04/07/2015	Round 1	No
4.	39092	489930	EN15194994	BHOSALE SAKSHI KIRAN	Female	Type A	Open	North Maharashtra	NA	NA	61.50	AI	20000	02/07/2015	02/07/2015	Round 1	No
5.	42699	532309	EN15205663	CHINAWALE KALPESH MADHUKAR	Male	Type A	OBC	North Maharashtra	NA	NA	55.83	AI	20000	05/07/2015	05/07/2015	Round 1	No
6.	52862	54.3636	EN15205804	PATIL JAGDISH SUKLAL	Male	Type B	OBC	North Maharashtra	NA	NA	77.00	GOBCH	20000	04/07/2015	04/07/2015	Round 1	No
7.	57656	51.4278	EN15202030	PATI NILESH MANOJ	Male	Type A	OBC	North Maharashtra	NA	NA	64.67	GOBCH	20000	04/07/2015	04/07/2015	Round 1	No
8.	57705	51.4083	EN15205912	JADHAV VISHAL BHAGWAN	Male	Type A	OBC	North Maharashtra	NA	NA	67.50	GOBCH	20000	04/07/2015	04/07/2015	Round 1	No
9.	83419	34.1627	EN15168218	SONULE MILIND LAXMAN	Male	Type A	OBC	Gondwana	NA	NA	56.50	GOBCO	42995	02/07/2015	02/07/2015	Round 1	No
10.	31449	69.437	EN15201289	YASH SANJAY JAIN	Male	Type A	Open	North Maharashtra	NA	NA	65.33	GOPENH	10000	04/07/2015	04/07/2015	Round 1	No
11.	35782	66.0102	EN15191389	PATIL AVINASH GULABRAO	Male	Type A	OBC	North Maharashtra	NA	NA	55.00	GOPENH	10000	04/07/2015	04/07/2015	Round 1	No
12.	37300	64.8825	EN15184211	CHAUDHARI KUNDAN RAJENDRA	Male	Type A	OBC	North Maharashtra	NA	NA	78.00	GOPENH	42995	04/07/2015	04/07/2015	Round 1	No

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Directorate of Technical Education, Maharashtra State

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510429310] - Electrical Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 58

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
13.	46210	58.7462	EN15201164	ATTARDE TEJAS RAVINDRA	Male	Type A	OBC	North Maharashtra	NA	NA	73.67	GOPENH	25000	03/07/2015	03/07/2015	Round 1	No
14.	48211	57.3729	EN15202105	RANE ANIKET DILIP	Male	Type A	OBC	North Maharashtra	NA	NA	62.67	GOPENH	0	05/07/2015	05/07/2015	Round 1	No
15.	48304	57.2977	EN15201429	PATIL SHUBHAM PANDIT	Male	Type A	NT-C	North Maharashtra	NA	NA	46.67	GOPENH	9533	04/07/2015	04/07/2015	Round 1	No
16.	49232	56.6517	EN15205549	PATIL BIJLAL YASHWANT	Male	Type A	OBC	North Maharashtra	NA	NA	77.00	GOPENH	20000	03/07/2015	03/07/2015	Round 1	No
17.	50159	56.0451	EN15206373	PATIL AMOL RAMESH	Male	Type A	OBC	North Maharashtra	NA	NA	83.00	GOPENH	5000	04/07/2015	04/07/2015	Round 1	No
18.	62969	48.248	EN15114815	NIMJE RUPAM GOVINDRAO	Male	Type A	SBC	Amravati	NA	NA	64.50	GOPENO	9533	03/07/2015	03/07/2015	Round 1	No
19.	73524	41.3784	EN15201106	MANURE AJAY SURESH	Male	Type A	SC	North Maharashtra	NA	NA	59.33	GSCH	19066	03/07/2015	03/07/2015	Round 1	No
20.	85169	32.734	EN15205811	MORE PRAMOD FAKIRA	Male	Type A	SC	North Maharashtra	NA	NA	58.17	GSCH	9533	03/07/2015	03/07/2015	Round 1	No
21.	95946	18.117	EN15201388	SUMIT SURESH GAYAKWAD	Male	Type A	SC	North Maharashtra	NA	NA	46.33	GSCH	9533	03/07/2015	03/07/2015	Round 1	No
22.	93693	22.9755	EN15206195	KAMIL SALIM TADAVI	Male	Type A	ST	North Maharashtra	NA	NA	45.33	GSTH	9533	03/07/2015	03/07/2015	Round 1	No
23.	94538	21.3169	EN15205625	RAJPUT BHIMSING SANJAY	Male	Type A	DT/VJ	North Maharashtra	NA	NA	46.67	GVJH	35000	03/07/2015	03/07/2015	Round 1	No
24.	83799	33.8768	EN15186582	GAVADE VAIBHAV KAILAS	Male	Type A	NT-C	Pune	NA	NA	46.67	LNT2O	8000	02/07/2015	02/07/2015	Round 1	No

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Directorate of Technical Education, Maharashtra State

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510429310] - Electrical Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 58

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
25.	74695	40.6253	EN15206028	KHAIRKAR NIKITA GOVINDA	Female	Type A	OBC	North Maharashtra	NA	NA	47.00	LOBCH	2000	03/07/2015	03/07/2015	Round 1	No
26.	82699	34.734	EN15206102	PATIL DIPALI BALWANT	Female	Type A	OBC	North Maharashtra	NA	NA	49.00	LOBCH	5000	03/07/2015	03/07/2015	Round 1	No
27.	55455	52.749	EN15205893	PATIL RUCHIRA PRAVINKUMAR	Female	Type A	OBC	North Maharashtra	NA	NA	54.33	LOPENH	40000	03/07/2015	03/07/2015	Round 1	No
28.	62613	48.4137	EN15188192	JAMADAR VRUSHALI RAJENDRA	Female	Type A	DT/VJ	North Maharashtra	NA	NA	50.67	LOPENH	9533	04/07/2015	04/07/2015	Round 1	No
29.	65176	46.8229	EN15201291	KSHIRSAGAR GAURI DILIP	Female	Type A	Open	North Maharashtra	NA	NA	71.67	LOPENH	76456	02/07/2015	02/07/2015	Round 1	No
30.	65743	46.4799	EN15205082	KAPOOR NAMRATA SOHANSINGH	Female	Type A	Open	North Maharashtra	NA	NA	60.00	LOPENH	20000	03/07/2015	03/07/2015	Round 1	No
31.	80271	36.6283	EN15183551	BHALERAO PRITI PRAMOD	Female	Type A	SC	North Maharashtra	NA	NA	46.67	LSCH	9533	03/07/2015	03/07/2015	Round 1	No
32.	32803	417146	EN15205884	HITESH GOVIND BADGUJAR	Male	Type A	OBC	North Maharashtra	NA	DEF1	47.67	AI	42995	14/07/2015	14/07/2015	Round 2	No
33.	34057	431825	EN15206348	SONAR AJAY JITENDRA	Male	Type A	OBC	North Maharashtra	NA	NA	60.67	AI	25000	13/07/2015	13/07/2015	Round 2	No
34.	34551	437540	EN15187836	PATIL MAYUR KADU	Male	Type A	OBC	North Maharashtra	NA	NA	58.67	AI	15000	11/07/2015	11/07/2015	Round 2	No
35.	44411	550539	EN15205761	SURYAWANSHI CHETAN JAGANNATH	Male	Type A	SC	North Maharashtra	NA	NA	53.00	AI	9533	14/07/2015	14/07/2015	Round 2	No
36.	57632	51.441506045	EN15184154	LOHAR KUNAL MANOJ	Male	Type A	NT-B	North Maharashtra	NA	NA	73.67	GNT1H	9533	13/07/2015	13/07/2015	Round 2	No

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Directorate of Technical Education, Maharashtra State

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510429310] - Electrical Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 58

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
37.	63324	47.979560115	EN15187849	BHOI RAHUL DEELIP	Male	Type A	NT-B	North Maharashtra	NA	NA	61.17	GNT1O	5000	13/07/2015	13/07/2015	Round 2	No
38.	95672	18.88053355	EN15202907	KHAIRNAR MAYUR RAVINDRA	Male	Type A	NT-C	North Maharashtra	NA	NA	45.33	GNT2H	9533	11/07/2015	11/07/2015	Round 2	No
39.	57740	51.379849255	EN15181529	SAVALE ROHIT DILIP	Male	Type A	OBC	North Maharashtra	NA	NA	80.00	GNT3H	25000	13/07/2015	13/07/2015	Round 2	No
40.	54310	53.469231205	EN15202472	PATIL PRAFULLA ANIL	Male	Type A	OBC	North Maharashtra	NA	NA	71.33	GOBCH	40000	13/07/2015	13/07/2015	Round 2	No
41.	54723	53.23567303	EN15201341	TURKAR RISHABH GOKULPRASAD	Male	Type A	OBC	North Maharashtra	NA	NA	79.33	GOBCH	40000	12/07/2015	12/07/2015	Round 2	No
42.	58250	51.0947659	EN15201673	JAGTAP PIYUSH KAILAS	Male	Type A	OBC	North Maharashtra	NA	NA	59.33	GOBCO	20000	13/07/2015	13/07/2015	Round 2	No
43.	49307	56.59826547	EN15202553	HARAL DIPAK RAMDAS	Male	Type A	NT-B	North Maharashtra	NA	NA	71.33	GOPENH	9533	11/07/2015	11/07/2015	Round 2	No
44.	50462	55.89119918	EN15183588	PAWAR YOGRAJ YUVRAJ	Male	Type A	ST	North Maharashtra	NA	NA	58.00	GOPENH	9533	14/07/2015	14/07/2015	Round 2	No
45.	73189	41.653838275	EN15174993	TARALE ANIKET BALU	Male	Type A	OBC	Gondwana	NA	NA	60.17	GOPENO	42995	12/07/2015	12/07/2015	Round 2	No
46.	77286	38.802418765	EN15187279	PATIL YUVRAJ SHIVAJI	Male	Type A	OBC	Pune	NA	NA	60.00	GOPENO	42995	13/07/2015	13/07/2015	Round 2	No
47.	90166	27.68426832	EN15121852	GALANDE GOVIND VASANTRAO	Male	Type A	OBC	S.R.T.M.U.	NA	NA	47.33	GOPENO	42995	12/07/2015	12/07/2015	Round 2	No
48.	96783	15.110405235	EN15166232	SANKALP DHARAMPAL BHAGAT	Male	Type A	SC	Gondwana	NA	NA	50.67	GOPENO	9533	13/07/2015	13/07/2015	Round 2	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510429310] - Electrical Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 58

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
49.	60912	49.487503745	EN15205569	CHAUDHARI PUSHPAK VISHNU	Male	Type A	OBC	North Maharashtra	NA	NA	46.33	GSTO	42995	12/07/2015	12/07/2015	Round 2	No
50.	43905	60.25860053	EN15141705	JADHAV NAIMISHA SUDHAKAR	Female	Type A	SC	B.A.M.U.	NA	NA	57.67	LOPENO	9533	11/07/2015	11/07/2015	Round 2	No
51.	83126	34.45077159	EN15201781	CHAUDHARI SONAL BHIKAN	Female	Type A	OBC	North Maharashtra	NA	NA	55.00	LOPENO	10000	13/07/2015	13/07/2015	Round 2	No
52.	61913	48.8803051	EN15205816	PATIL PAWAN RAGHUNATH	Male	Type A	OBC	North Maharashtra	NA	NA	67.33	LSCO	15000	12/07/2015	12/07/2015	Round 2	No
53.	64708	47.152449045	EN15201072	BHANGALE GANESH NITEEN	Male	Type A	OBC	North Maharashtra	NA	NA	53.33	LSTH	36000	13/07/2015	13/07/2015	Round 2	No
54.	60947	49.44273531	EN15205106	MUJAHID SHAIKH ASIF BAGWAN	Male	Type A	Open	North Maharashtra	NA	NA	67.50	PHCH	20000	15/07/2015	15/07/2015	Round 2	No
55.	63942	47.618676215	EN15184414	SAPKAL SAGAR GAJANAN	Male	Type A	SBC	North Maharashtra	NA	NA	67.33	PHCH	9533	15/07/2015	15/07/2015	Round 2	No
56.	84980	32.850600915	EN15185358	ATHARVA ANIL VAIDYA	Male	Type A	OBC	North Maharashtra	NA	NA	59.33	GOPEN	12995	27/07/2015	27/07/2015	Counseling Round	No
57.	90459	27.389862135	EN15205951	DHANORE HARSHALKUMAR BALKRUSHNA	Male	Type A	SBC	North Maharashtra	NA	NA	52.83	GOPEN	1000	27/07/2015	27/07/2015	Counseling Round	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510429310] - Electrical Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Institute Level Quota

Quota : 2

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	39	15.774940820	EN15721405	YEOLE MAYURI RAJENDRA	Female	Type A	Open	North Maharashtra	NA	NA	56.83	IL	65000	02/07/2015	16/08/2015	Institute Level	No
2.	67	64.600000000	EN15716838	SURUBHI KASHYAP	Male	OMS	Open	OHU	NA	NA	63.67	IL	65000	04/06/2015	16/08/2015	Institute Level	No

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Directorate of Technical Education, Maharashtra State

3, Mahapalika Marg, Post Box No.1967, Mumbai-400001

[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510429310] - Electrical Engineering

Summary of Admitted Candidates for the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Sr. No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP	58	57	0	57
2.	Against CAP		0	0	0
3.	Institute Level	2	2	0	2
4.	Minority	0	0	0	0
5.	J&K Migrant		0	0	0
6.	Others		0	0	0
	Total	**60**	**59**	**0**	**59**

Seat Type used for Institute Level Admissions : ACAP-Against CAP, IL-Institute Level, ILNRI-Institute Level NRI (5% of SI if AICTE Permission), MI-Minority, GoI-Government of India Nominee, NRI-NRI (15% of SI if AICTE Permission), PIO-PIO (15% of SI if AICTE Permission), FNS-FNS (15% of SI if AICTE Permission), CIWGC-Children's of Indian Workers in Gulf Countries (15% of SI if AICTE Permission), OAA-Over and Above

Cut-Off Date for Admission : 14/08/2015
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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510429311T] - Electrical Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 3

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	20824	78.958	EN15205529	CHAUDHARI ROHIT KAILAS	Male	Type A	OBC	North Maharashtra	NA	NA	81.00	GOPENO	9533	02/07/2015	02/07/2015	Round 1	No
2.	26414	73.7417	EN15201331	ZOPE ASHISH SUNIL	Male	Type A	OBC	North Maharashtra	NA	NA	74.17	GOPENO	6533	02/07/2015	02/07/2015	Round 1	No
3.	27401	72.8403	EN15185099	CHAUDHARI NARENDRA GOVIND	Male	Type A	OBC	North Maharashtra	NA	NA	78.33	GOPENO	9533	03/07/2015	03/07/2015	Round 1	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510429311T] - Electrical Engineering

Summary of Admitted Candidates for the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Sr. No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP	3	3	0	3
2.	Against CAP		0	0	0
3.	Institute Level	0	0	0	0
4.	Minority	0	0	0	0
5.	J&K Migrant		0	0	0
6.	Others		0	0	0
	Total	**3**	**3**	**0**	**3**

Seat Type used for Institute Level Admissions : ACAP-Against CAP, IL-Institute Level, ILNRI-Institute Level NRI (5% of SI if AICTE Permission), MI-Minority, GoI-Government of India Nominee, NRI-NRI (15% of SI if AICTE Permission), PIO-PIO (15% of SI if AICTE Permission), FNS-FNS (15% of SI if AICTE Permission), CIWGC-Children's of Indian Workers in Gulf Countries (15% of SI if AICTE Permission), OAA-Over and Above

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424610] - Information Technology

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 60

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	55484	667424	EN15187813	AAPTE LOKESH NARENDRA	Male	OMS	NA	OHU	NA	NA	56.00	AI	2000	05/07/2015	05/07/2015	Round 1	No
2.	56374	677206	EN15206406	JADHAV YAMINI SUNIL	Female	Type A	OBC	North Maharashtra	NA	NA	48.00	AI	38395	02/07/2015	02/07/2015	Round 1	No
3.	61713	731926	EN15201223	PATIL NITIN PRALHAD	Male	Type A	NT-C	North Maharashtra	NA	NA	53.67	AI	9533	04/07/2015	04/07/2015	Round 1	No
4.	63652	751754	EN15195075	PATIL MANDAR SAHEBRAO	Male	Type A	OBC	North Maharashtra	NA	NA	65.67	AI	43000	03/07/2015	03/07/2015	Round 1	No
5.	71138	829847	EN15195000	MARATHE BHAVINI RAJENDRA	Female	Type A	Open	North Maharashtra	NA	DEF1	53.33	AI	25000	04/07/2015	04/07/2015	Round 1	No
6.	71518	833872	EN15206326	MALKAR ANIKET VIJAY	Male	Type A	OBC	North Maharashtra	NA	NA	46.33	AI	15000	03/07/2015	03/07/2015	Round 1	No
7.	71884	42.4569	EN15206146	WAGH PRATHAMESH KISHOR	Male	Type A	OBC	North Maharashtra	NA	NA	50.00	GOPENH	22000	04/07/2015	04/07/2015	Round 1	No
8.	86023	31.9964	EN15195128	NEMADE MANALI PRAMOD	Female	Type A	OBC	North Maharashtra	NA	NA	57.67	GOPENH	42995	03/07/2015	03/07/2015	Round 1	No
9.	88094	29.8657	EN15191318	BORSE NANDINI GOKUL	Female	Type A	OBC	North Maharashtra	NA	NA	52.33	GOPENH	25000	03/07/2015	03/07/2015	Round 1	No
10.	89593	28.3751	EN15181766	PADVI PANKAJ GANGADHAR	Male	Type A	ST	North Maharashtra	NA	NA	59.00	GOPENH	9533	04/07/2015	04/07/2015	Round 1	No
11.	90381	27.5092	EN15195129	CHAUDHARI PAYAL PRABHAKAR	Female	Type A	OBC	North Maharashtra	NA	NA	44.83	GOPENH	42995	04/07/2015	04/07/2015	Round 1	No
12.	61599	49.0728	EN15185499	SHARMA SHRUTI RAJESH	Female	Type A	Open	North Maharashtra	NA	NA	73.67	LOPENH	30000	04/07/2015	04/07/2015	Round 1	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424610] - Information Technology

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 60

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
13.	69655	43.948	EN15206429	MORE JYOTSNA YUVRAJ	Female	Type A	SC	North Maharashtra	NA	NA	58.00	LOPENH	9533	02/07/2015	02/07/2015	Round 1	No
14.	82757	34.7239	EN15201404	CHAUDHARI PUJA YUVARAJ	Female	Type A	OBC	North Maharashtra	NA	NA	48.33	LOPENH	42995	02/07/2015	02/07/2015	Round 1	No
15.	85595	32.2722	EN15205680	KHACHANE UTKARSHA ANANT	Female	Type A	OBC	North Maharashtra	NA	NA	50.33	LOPENH	11000	02/07/2015	02/07/2015	Round 1	No
16.	54764	660026	EN15168521	PATIL ROMA ARUN	Female	Type B	OBC	Gondwana	NA	NA	52.33	AI	40000	14/07/2015	14/07/2015	Round 2	No
17.	62124	736130	EN15191321	BORSE AKASH RAVINDRA	Male	Type A	OBC	North Maharashtra	NA	NA	66.00	AI	25000	13/07/2015	13/07/2015	Round 2	No
18.	63289	748229	EN15205155	SHARMA SOURABH BRAJESH	Male	Type A	Open	North Maharashtra	NA	NA	61.67	AI	9000	11/07/2015	11/07/2015	Round 2	No
19.	89701	28.23949753	EN15195246	SONAR SHUBHAM DATTATRAY	Male	Type A	OBC	North Maharashtra	NA	NA	50.33	GOBCH	26756	12/07/2015	12/07/2015	Round 2	No
20.	66586	45.931490935	EN15205156	BHAVNANI VICKY PITAMBAR	Male	Type A	Open	North Maharashtra	NA	NA	66.50	GOPENH	9000	11/07/2015	11/07/2015	Round 2	No
21.	70647	43.281053555	EN15181538	KALAL DHANSHREE SANJAYSA	Female	Type A	OBC	North Maharashtra	NA	NA	67.00	GOPENH	25000	13/07/2015	13/07/2015	Round 2	No
22.	71620	42.630446215	EN15201249	JAISWAL SHUBHAM GANESH	Male	Type A	OBC	North Maharashtra	NA	NA	60.67	GOPENH	15000	14/07/2015	14/07/2015	Round 2	No
23.	72171	42.31688787	EN15183627	PATIL MAHENDRA MADHUKAR	Male	Type A	NT-C	North Maharashtra	NA	NA	63.83	GOPENH	4000	15/07/2015	15/07/2015	Round 2	No
24.	87310	30.76250846	EN15205800	MAHAJAN MAHENDRA PRAKASH	Male	Type A	OBC	North Maharashtra	NA	NA	56.67	GOPENH	22000	14/07/2015	14/07/2015	Round 2	No

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Directorate of Technical Education, Maharashtra State

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424610] - Information Technology

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 60

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
25.	80598	36.35177204	EN15162446	RAMTEKE ACHAL RAJU	Male	Type A	SC	Nagpur	NA	NA	52.50	GOPENO	9533	15/07/2015	15/07/2015	Round 2	No
26.	30727	70.038183580	EN15181865	JAISWAL BHAVIKA CHIMANLAL	Female	Type A	Open	North Maharashtra	NA	NA	70.33	GOPEN	1000	23/07/2015	23/07/2015	Counseling Round	No
27.	64565	47.201272320	EN15206700	GAUD SALONI SANTOSH	Female	Type A	Open	North Maharashtra	NA	NA	54.00	GOPEN	20000	26/07/2015	26/07/2015	Counseling Round	No

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Directorate of Technical Education, Maharashtra State

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424610] - Information Technology

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Admitted Against CAP

Quota : 33

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	2	82.126096000	EN15719185	KABRA RAMANUJ RANGNATH	Male	Type A	Open	North Maharashtra	NA	NA	75.17	ACAP	58000	12/08/2015	16/08/2015	Institute Level	No
2.	18	45.203930175	EN15716882	PATIL KAUSTUBH RAJENDRA	Male	Type A	Open	North Maharashtra	NA	NA	64.00	ACAP	30000	18/07/2015	16/08/2015	Institute Level	No
3.	60	44.302286135	EN15716866	PIYUSH PATIL	Male	OMS	Open	OHU	NA	NA	53.67	ACAP	40000	27/07/2015	16/08/2015	Institute Level	No

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Directorate of Technical Education, Maharashtra State

3, Mahapalika Marg, Post Box No.1967, Mumbai-400001

[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424610] - Information Technology

Summary of Admitted Candidates for the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Sr. No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP	60	27	0	27
2.	Against CAP		3	0	3
3.	Institute Level	0	0	0	0
4.	Minority	0	0	0	0
5.	J&K Migrant		0	0	0
6.	Others		0	0	0
	Total	**60**	**30**	**0**	**30**

Seat Type used for Institute Level Admissions : ACAP-Against CAP, IL-Institute Level, ILNRI-Institute Level NRI (5% of SI if AICTE Permission), MI-Minority, GoI-Government of India Nominee, NRI-NRI (15% of SI if AICTE Permission), PIO-PIO (15% of SI if AICTE Permission), FNS-FNS (15% of SI if AICTE Permission), CIWGC-Children's of Indian Workers in Gulf Countries (15% of SI if AICTE Permission), OAA-Over and Above

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424611T] - Information Technology

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 3

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	29154	71.349	EN15188112	JAWALE HIMANSHU NARENDRA	Male	Type A	OBC	North Maharashtra	NA	NA	62.00	GOPENO	9533	04/07/2015	04/07/2015	Round 1	No
2.	40359	62.7198	EN15190434	ANIKET LAMBAT	Male	Type A	OBC	North Maharashtra	NA	NA	74.33	GOPENO	9533	02/07/2015	02/07/2015	Round 1	No
3.	37486	64.75784694	EN15202670	CHAVAN KIRTI SANJAY	Female	Type A	OBC	North Maharashtra	NA	NA	67.67	GOPENO	9533	13/07/2015	13/07/2015	Round 2	No

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3, Mahapalika Marg, Post Box No.1967, Mumbai-400001

[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424611T] - Information Technology

Summary of Admitted Candidates for the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Sr. No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP	3	3	0	3
2.	Against CAP		0	0	0
3.	Institute Level	0	0	0	0
4.	Minority	0	0	0	0
5.	J&K Migrant		0	0	0
6.	Others		0	0	0
	Total	**3**	**3**	**0**	**3**

Seat Type used for Institute Level Admissions : ACAP-Against CAP, IL-Institute Level, ILNRI-Institute Level NRI (5% of SI if AICTE Permission), MI-Minority, GoI-Government of India Nominee, NRI-NRI (15% of SI if AICTE Permission), PIO-PIO (15% of SI if AICTE Permission), FNS-FNS (15% of SI if AICTE Permission), CIWGC-Children's of Indian Workers in Gulf Countries (15% of SI if AICTE Permission), OAA-Over and Above

Cut-Off Date for Admission : 14/08/2015
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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510461210] - Mechanical Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 108

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	24569	316108	EN15206279	MOMIN ARBAZ SALIM	Male	Type A	OBC	Mumbai	NA	NA	80.67	AI	5000	05/07/2015	05/07/2015	Round 1	No
2.	25957	334206	EN15195147	PAWAR KAUSHAL SOPANDEO	Male	Type A	OBC	North Maharashtra	NA	NA	67.83	AI	42995	02/07/2015	02/07/2015	Round 1	No
3.	27872	357638	EN15205872	PATIL DHANESH DILIP	Male	Type A	OBC	North Maharashtra	NA	NA	78.00	AI	42995	04/07/2015	04/07/2015	Round 1	No
4.	28491	365529	EN15205212	MANDHWANI YASH KHIYALDAS	Male	Type A	Open	North Maharashtra	NA	NA	80.67	AI	5000	02/07/2015	02/07/2015	Round 1	No
5.	29391	376748	EN15205546	PATIL SHUBHAM SURESH	Male	Type A	OBC	North Maharashtra	NA	NA	68.67	AI	25000	03/07/2015	03/07/2015	Round 1	No
6.	29840	382478	EN15205628	NEMADE KHAGESH SUNIL	Male	Type A	OBC	North Maharashtra	NA	NA	73.00	AI	20000	03/07/2015	03/07/2015	Round 1	No
7.	32624	415053	EN15205054	SK MOHD SAMEER IBRAHIM	Male	Type A	Open	North Maharashtra	NA	NA	75.67	AI	20000	02/07/2015	02/07/2015	Round 1	No
8.	54150	53.5653	EN15188177	PATIL AJAY SAHEBRAO	Male	Type A	OBC	North Maharashtra	NA	DEF1	63.33	DEFO	42995	02/07/2015	02/07/2015	Round 1	No
9.	37202	64.9581	EN15206323	BHOI DNYANESHWAR INDAL	Male	Type A	NT-B	North Maharashtra	NA	NA	62.67	GNT1H	9533	04/07/2015	04/07/2015	Round 1	No
10.	41906	61.6329	EN15201672	KOKANDE PRAFUL KAILAS	Male	Type A	NT-C	North Maharashtra	NA	NA	59.00	GNT2H	9533	03/07/2015	03/07/2015	Round 1	No
11.	59706	50.1849	EN15204561	PENDHARKAR PRAMOD ASHOK	Male	Type A	NT-C	North Maharashtra	NA	NA	61.67	GNT2H	9533	02/07/2015	02/07/2015	Round 1	No
12.	77980	38.337	EN15206090	VARADE DIPAK SAMBHAJI	Male	Type A	NT-D	North Maharashtra	NA	NA	52.67	GNT3H	9533	05/07/2015	05/07/2015	Round 1	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510461210] - Mechanical Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 108

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
13.	36000	65.8484	EN15206611	TABISH AHEMAD ZAHEER AHEMAD KHAN	Male	Type A	OBC	North Maharashtra	NA	NA	66.33	GOBCH	15000	02/07/2015	02/07/2015	Round 1	No
14.	36328	65.6218	EN15206224	JAISWAL JAYESH ASHOK	Male	Type A	OBC	North Maharashtra	NA	NA	58.33	GOBCH	10995	03/07/2015	03/07/2015	Round 1	No
15.	37207	64.9581	EN15188174	PATIL JAYESH LADU	Male	Type A	OBC	North Maharashtra	NA	NA	62.67	GOBCH	76456	02/07/2015	02/07/2015	Round 1	No
16.	37274	64.9243	EN15205913	JADHAV MAHESH KAILAS	Male	Type A	OBC	North Maharashtra	NA	NA	78.83	GOBCH	20000	03/07/2015	03/07/2015	Round 1	No
17.	40762	62.4476	EN15183612	PATIL VISHAL ANANDA	Male	Type A	OBC	North Maharashtra	NA	NA	70.67	GOBCH	19000	02/07/2015	02/07/2015	Round 1	No
18.	40969	62.2679	EN15188129	MOHD TANVIR AHEMAD ISHRAT PINJARI	Male	Type A	OBC	North Maharashtra	NA	NA	69.00	GOBCH	2000	03/07/2015	03/07/2015	Round 1	No
19.	50153	56.0547	EN15175000	KHIRATKAR ANIKET KAILASH	Male	Type A	OBC	Gondwana	NA	NA	83.33	GOBCO	42995	04/07/2015	04/07/2015	Round 1	No
20.	25746	74.4042	EN15205870	PATIL VAIBHAV SATISH	Male	Type A	OBC	North Maharashtra	NA	NA	73.33	GOPENH	42995	03/07/2015	03/07/2015	Round 1	No
21.	26529	73.6354	EN15187810	PATIL PRATIK LOTAN	Male	Type A	OBC	North Maharashtra	NA	NA	74.50	GOPENH	42995	04/07/2015	04/07/2015	Round 1	No
22.	27561	72.7157	EN15188188	DANDAGE DIPAK SUNIL	Male	Type A	SC	North Maharashtra	NA	NA	60.67	GOPENH	9533	03/07/2015	03/07/2015	Round 1	No
23.	27577	72.6956	EN15205233	SHAIKH ATIF MOHAMMED AQEEL	Male	Type A	Open	North Maharashtra	NA	NA	62.67	GOPENH	40000	05/07/2015	05/07/2015	Round 1	No
24.	27995	72.3171	EN15206382	SAPKALE KIRAN ARUN	Male	Type A	SBC	North Maharashtra	NA	NA	80.00	GOPENH	5000	04/07/2015	04/07/2015	Round 1	No

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[510461210] - Mechanical Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

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Quota : 108

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
25.	28001	72.311	EN15187817	ADHAV MAYUR ANIL	Male	Type A	SBC	North Maharashtra	NA	NA	78.00	GOPENH	9533	02/07/2015	02/07/2015	Round 1	No
26.	31355	69.548	EN15192261	SONAWANE KAMLESH KRUSHNA	Male	Type A	SC	North Maharashtra	NA	NA	68.67	GOPENH	9533	02/07/2015	02/07/2015	Round 1	No
27.	31475	69.425	EN15188104	PATIL MAHENDRA VISHWANATH	Male	Type A	OBC	North Maharashtra	NA	NA	64.33	GOPENH	20000	03/07/2015	03/07/2015	Round 1	No
28.	32889	68.2431	EN15205611	PATIL VEDANT AJAY	Male	Type A	OBC	North Maharashtra	NA	NA	67.17	GOPENH	42995	02/07/2015	02/07/2015	Round 1	No
29.	33117	68.1002	EN15188173	MARATHE VIKAS TULSHIRAM	Male	Type A	OBC	North Maharashtra	NA	NA	60.33	GOPENH	76456	02/07/2015	02/07/2015	Round 1	No
30.	33464	67.7876	EN15188127	MOHD ZARIF SHAIKH JAFAR	Male	Type A	OBC	North Maharashtra	NA	NA	65.00	GOPENH	2000	03/07/2015	03/07/2015	Round 1	No
31.	33958	67.3995	EN15202780	KHAIRNAR RAHUL SANJAY	Male	Type A	OBC	North Maharashtra	NA	NA	67.67	GOPENH	5000	04/07/2015	04/07/2015	Round 1	No
32.	34291	67.1616	EN15184262	KOLI BHUSHAN NIMBADAS	Male	Type A	SBC	North Maharashtra	NA	NA	74.33	GOPENH	9533	03/07/2015	03/07/2015	Round 1	No
33.	35741	66.0419	EN15184328	PATIL TEJAS RAJENDRA	Male	Type A	OBC	North Maharashtra	NA	NA	65.67	GOPENH	15000	03/07/2015	03/07/2015	Round 1	No
34.	39272	63.4955	EN15206062	NIKAM LALIT VIJAY	Male	Type A	OBC	B.A.M.U.	NA	NA	64.33	GOPENO	20000	03/07/2015	03/07/2015	Round 1	No
35.	42085	61.505	EN15117570	KEDAR AJAY PANDURANG	Male	Type A	OBC	Amravati	NA	NA	70.67	GOPENO	20000	03/07/2015	03/07/2015	Round 1	No
36.	43476	60.5158	EN15117852	MARATHE ATUL PRADIPKUMAR	Male	Type A	Open	Amravati	NA	NA	53.00	GOPENO	20000	04/07/2015	04/07/2015	Round 1	No

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37.	43958	60.2124	EN15166155	MANTHAN KISHOR RAUT	Male	Type A	OBC	Nagpur	NA	NA	70.17	GOPENO	42995	04/07/2015	04/07/2015	Round 1	No
38.	51186	55.4195	EN15188105	KHADE RUPESH PRATAP	Male	Type A	SC	North Maharashtra	NA	NA	67.00	GSCH	9533	03/07/2015	03/07/2015	Round 1	No
39.	61547	49.0894	EN15201473	SAWALE ADESH ASHOK	Male	Type A	SC	North Maharashtra	NA	NA	68.00	GSCH	9533	04/07/2015	04/07/2015	Round 1	No
40.	62272	48.6185	EN15181815	PADVI RINKESH RAMSING	Male	Type A	ST	North Maharashtra	NA	NA	61.00	GSTH	9533	04/07/2015	04/07/2015	Round 1	No
41.	64313	47.3245	EN15206424	MORE LALKRUSHNA DURGADAS	Male	Type A	ST	North Maharashtra	NA	NA	56.33	GSTH	9533	04/07/2015	04/07/2015	Round 1	No
42.	75620	39.9754	EN15205809	THAKARE SAGAR NANA	Male	Type A	SBC	North Maharashtra	NA	NA	44.67	GSTH	9533	04/07/2015	04/07/2015	Round 1	No
43.	42730	61.0465	EN15205614	PATIL PIYUSH ULHASRAV	Male	Type A	OBC	North Maharashtra	NA	NA	53.33	LOBCH	20000	03/07/2015	03/07/2015	Round 1	No
44.	63256	48.0282	EN15201391	UTTARA B BARHATE	Female	Type A	OBC	North Maharashtra	NA	NA	66.33	LOPENH	5000	02/07/2015	02/07/2015	Round 1	No
45.	67540	45.3307	EN15206201	RATHOD MONIKA BABAN	Female	Type A	DT/VJ	North Maharashtra	NA	NA	71.33	LOPENH	9533	02/07/2015	02/07/2015	Round 1	No
46.	71156	42.9937	EN15206623	PRAJAKTA SHAMKANT PAWAR	Female	Type A	OBC	North Maharashtra	NA	NA	54.67	LOPENH	40000	02/07/2015	02/07/2015	Round 1	No
47.	72210	42.2611	EN15205553	RUSHALI YUVRAJ PAWAR	Female	Type A	OBC	North Maharashtra	NA	DEF1	66.83	LOPENH	42995	03/07/2015	03/07/2015	Round 1	No
48.	78676	37.8872	EN15188160	MAHAJAN RAJSHRI ANIL	Female	Type A	OBC	North Maharashtra	NA	NA	51.00	LOPENH	42995	02/07/2015	02/07/2015	Round 1	No

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49.	84026	33.6757	EN15205520	KAPADANE MRUDULA ANIL	Female	Type A	OBC	North Maharashtra	NA	NA	52.33	LOPENH	42995	02/07/2015	02/07/2015	Round 1	No
50.	85588	32.2722	EN15205743	BHARUDE PUNAM JAGADISH	Female	Type A	SC	North Maharashtra	NA	NA	50.33	LOPENH	9533	04/07/2015	04/07/2015	Round 1	No
51.	94868	20.6837	EN15206437	SURYAWANSHI PRATIK RAVINDRA	Male	Type A	SC	North Maharashtra	NA	NA	51.33	LSCH	9533	03/07/2015	03/07/2015	Round 1	No
52.	87782	30.3045	EN15187852	PATIL RUCHI JITENDRA	Female	Type A	DT/VJ	North Maharashtra	NA	NA	59.50	LVJH	9533	04/07/2015	04/07/2015	Round 1	No
53.	21304	272384	EN15185053	PATIL KIRAN ANKUSH	Male	Type A	OBC	North Maharashtra	NA	NA	54.00	AI	25000	13/07/2015	13/07/2015	Round 2	No
54.	23077	296331	EN15201286	SHAHID ASIF KHAN	Male	Type A	Open	North Maharashtra	NA	NA	80.00	AI	40000	13/07/2015	13/07/2015	Round 2	No
55.	30962	395621	EN15114143	MAHAJAN GAJANAN RAMCHANDRA	Male	Type A	OBC	Amravati	NA	NA	72.00	AI	25000	13/07/2015	13/07/2015	Round 2	No
56.	35940	454055	EN15188110	KHARAT MAYURI GORAKH	Female	Type A	SC	North Maharashtra	NA	NA	48.33	AI	9533	13/07/2015	13/07/2015	Round 2	No
57.	38416	482377	EN15206375	PATIL PAVAN GOVINDRAO	Male	Type A	OBC	North Maharashtra	NA	NA	47.00	AI	43000	12/07/2015	12/07/2015	Round 2	No
58.	38547	483710	EN15195027	WANI ROHAN SUNIL	Male	Type A	OBC	North Maharashtra	NA	NA	66.67	AI	10000	14/07/2015	14/07/2015	Round 2	No
59.	40046	501983	EN15205925	BHAVSAR TEJAS SANJAY	Male	Type A	OBC	North Maharashtra	NA	NA	72.67	AI	29000	11/07/2015	11/07/2015	Round 2	No
60.	42356	528004	EN15205148	PRASAD SWAPNIL KAMLESH	Male	Type A	Open	North Maharashtra	NA	NA	64.17	AI	40000	12/07/2015	12/07/2015	Round 2	No

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Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
61.	42925	534467	EN15201050	ADITYA DESHMUKH	Male	Type A	Open	North Maharashtra	NA	NA	78.83	AI	20000	13/07/2015	13/07/2015	Round 2	No
62.	73891	41.1711163	EN15291496	MARATHE TEJAS YASHVANT	Male	Type A	OBC	Mumbai	NA	NA	45.00	GNT2O	20000	12/07/2015	12/07/2015	Round 2	No
63.	42900	60.924449625	EN15205992	WAGH GANESH GAJANAN	Male	Type A	OBC	North Maharashtra	NA	NA	56.00	GOBCH	20000	14/07/2015	14/07/2015	Round 2	No
64.	48167	57.394911425	EN15181459	PATIL TUSHAR JAYAVANT	Male	Type A	OBC	North Maharashtra	NA	NA	73.00	GOBCO	40000	14/07/2015	14/07/2015	Round 2	No
65.	60193	49.91686571	EN15206438	WAGH NITIN SHRAVAN	Male	Type A	OBC	B.A.M.U.	NA	NA	67.33	GOBCO	10000	15/07/2015	15/07/2015	Round 2	No
66.	28649	71.801024825	EN15191387	MALI MAHESH JIJABRAO	Male	Type A	OBC	North Maharashtra	NA	NA	66.33	GOPENH	41995	15/07/2015	15/07/2015	Round 2	No
67.	36673	65.35167228	EN15202667	PATIL PRASHANT LILADHAR	Male	Type A	OBC	North Maharashtra	NA	NA	61.00	GOPENH	15000	12/07/2015	12/07/2015	Round 2	No
68.	39388	63.4405812	EN15202746	SONAWANE YOGESH CHUDAMAN	Male	Type A	Open	North Maharashtra	NA	NA	72.50	GOPENH	10000	12/07/2015	12/07/2015	Round 2	No
69.	40645	62.551551625	EN15198460	NIKHIL RAJU BHALKE	Male	Type A	NT-B	North Maharashtra	NA	NA	66.33	GOPENH	9533	13/07/2015	13/07/2015	Round 2	No
70.	47477	57.84229079	EN15141893	AWAD AJINKYA RAMCHANDRA	Male	Type A	Open	B.A.M.U.	NA	NA	62.67	GOPENO	25000	14/07/2015	14/07/2015	Round 2	No
71.	54239	53.502186145	EN15180569	PATIL MAHESH SATISH	Male	Type A	OBC	Pune	NA	NA	56.67	GOPENO	0	13/07/2015	13/07/2015	Round 2	No
72.	54707	53.24778594	EN15168236	ASHWIN YASHAWANT NIKURE	Male	Type A	OBC	Amravati	NA	NA	69.33	GOPENO	40000	13/07/2015	13/07/2015	Round 2	No

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Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
73.	51900	54.960875465	EN15182175	GADHE ARUN ARJUN	Male	Type A	SC	North Maharashtra	NA	NA	56.67	GSCH	0	15/07/2015	15/07/2015	Round 2	No
74.	59745	50.162689715	EN15184304	KARAWALE SHUBHAM JAGANNATH	Male	Type A	SC	North Maharashtra	NA	NA	66.33	GSCH	9533	12/07/2015	12/07/2015	Round 2	No
75.	63589	47.79484252	EN15205931	SURWADE SATYAM RAMESH	Male	Type A	SC	North Maharashtra	NA	NA	51.00	GSCH	3000	14/07/2015	14/07/2015	Round 2	No
76.	72039	42.379876985	EN15201390	GAYAKWAD VISHVAJIT BALU	Male	Type A	SC	North Maharashtra	NA	NA	46.67	GSCH	5000	11/07/2015	11/07/2015	Round 2	No
77.	66986	45.68268648	EN15123245	BHUTEKAR TUSHAR ASARAM	Male	Type A	SC	B.A.M.U.	NA	NA	46.50	GSCO	7000	14/07/2015	14/07/2015	Round 2	No
78.	72323	42.212492465	EN15172621	NAGRARE ROHIT	Male	Type A	SC	Nagpur	NA	NA	55.33	GSCO	9533	12/07/2015	12/07/2015	Round 2	No
79.	42751	61.045524645	EN15181809	VALVI DEVILAL MOGYA	Male	Type A	ST	North Maharashtra	NA	NA	66.00	GSTH	9533	13/07/2015	13/07/2015	Round 2	No
80.	86679	31.40681252	EN15175218	BATKI GITESH INDRADAS	Male	Type A	OBC	Gondwana	NA	NA	46.33	GVJO	42995	12/07/2015	12/07/2015	Round 2	No
81.	66038	46.298016595	EN15206322	GADILOHAR PAVAN PURUSHOTTAM	Male	Type A	NT-B	North Maharashtra	NA	NA	46.33	LNT1H	9533	12/07/2015	12/07/2015	Round 2	No
82.	45140	59.421856005	EN15206052	YOGESH GORAKH PATIL	Male	Type A	OBC	North Maharashtra	NA	NA	53.33	LNT3H	42995	11/07/2015	11/07/2015	Round 2	No
83.	44694	59.738753875	EN15184241	PATIL VAIBHAV PRAKASH	Male	Type A	OBC	North Maharashtra	NA	NA	65.00	LOBCH	15000	13/07/2015	13/07/2015	Round 2	No
84.	49676	56.373405425	EN15201135	KOKATE SHYAM SURESH	Male	Type A	OBC	North Maharashtra	NA	NA	57.33	LOBCO	2000	15/07/2015	15/07/2015	Round 2	No

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85.	66592	45.930210725	EN15168230	BOBDE TUSHAR SURESH	Male	Type A	OBC	Amravati	NA	NA	69.00	LOBCO	35000	13/07/2015	13/07/2015	Round 2	No
86.	70893	43.10784212	EN15192013	SONAWANE AACHAL RAGHUNATH	Female	Type A	OBC	North Maharashtra	NA	NA	56.67	LOPENH	42995	12/07/2015	12/07/2015	Round 2	No
87.	48409	57.241732675	EN15181142	MARATHE NAYAN VIDYADHAR	Male	Type A	Open	North Maharashtra	NA	NA	61.00	LOPENO	40000	13/07/2015	13/07/2015	Round 2	No
88.	49889	56.22888369	EN15181498	QURESHI MOHD SUFIYAN SAJID	Male	Type A	Open	North Maharashtra	NA	NA	68.33	LOPENO	15000	13/07/2015	13/07/2015	Round 2	No
89.	79054	37.565504845	EN15124325	RATHOD JAWAHAR UTTAMRAO	Male	Type A	Open	B.A.M.U.	NA	NA	63.33	LOPENO	0	15/07/2015	15/07/2015	Round 2	No
90.	95348	19.69838899	EN15125682	HARISH DAUD	Male	Type A	Open	B.A.M.U.	NA	NA	52.00	LOPENO	30000	13/07/2015	13/07/2015	Round 2	No
91.	87960	30.054383235	EN15202760	MAHIRE ROHAN PUNAJI	Male	Type A	SC	North Maharashtra	NA	NA	53.00	LSCH	9533	12/07/2015	12/07/2015	Round 2	No
92.	93834	22.63439356	EN15109007	BETWAL ABHIJIT PAWAN	Male	Type A	SBC	Amravati	NA	NA	50.50	LSCO	9533	12/07/2015	12/07/2015	Round 2	No
93.	46008	58.84365506	EN15206157	PATIL NIKHIL GANESH	Male	Type A	OBC	North Maharashtra	NA	NA	59.33	LSTH	19000	13/07/2015	13/07/2015	Round 2	No
94.	41123	62.202125305	EN15202713	GIRASE SHAM SAHEBRAO	Male	Type A	Open	North Maharashtra	NA	NA	65.67	PH1H	10000	14/07/2015	14/07/2015	Round 2	No
95.	42080	61.505012985	EN15191396	PATIL SAGAR DEELIPRAO	Male	Type A	Open	North Maharashtra	NA	NA	67.67	PH2H	40000	11/07/2015	11/07/2015	Round 2	No
96.	43326	60.611085805	EN15205011	NAKE PANKAJ SANJAY	Male	Type A	Open	North Maharashtra	NA	NA	67.33	PH3H	15000	14/07/2015	14/07/2015	Round 2	No

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97.	33568	67.727077175	EN15206077	WAGH BHUSHAN JAYAVANT	Male	Type A	OBC	North Maharashtra	NA	NA	69.00	GOPEN	10000	25/07/2015	25/07/2015	Counseling Round	No
98.	42643	61.089771870	EN15205140	DESHMUKH HARISH SHARAD	Male	Type A	Open	North Maharashtra	NA	NA	53.33	GOPEN	25000	27/07/2015	27/07/2015	Counseling Round	No
99.	49552	56.457206035	EN15184296	NEMADE SURAJ EKNATH	Male	Type A	OBC	North Maharashtra	NA	NA	50.33	GOPEN	17000	27/07/2015	27/07/2015	Counseling Round	No
100.	54573	53.298992710	EN15195082	ZOPE HITESH KIRAN	Male	Type A	OBC	North Maharashtra	NA	NA	71.67	GOPEN	12995	27/07/2015	27/07/2015	Counseling Round	No
101.	59690	50.188064415	EN15205579	PAWAR LABHESH NARENDRA	Male	Type A	OBC	North Maharashtra	NA	NA	68.67	GOPEN	10000	25/07/2015	25/07/2015	Counseling Round	No
102.	66144	46.225861025	EN15194957	CHAUDHARI AKSHAY BALKRUSHNA	Male	Type A	OBC	North Maharashtra	NA	NA	62.33	GOPEN	10000	26/07/2015	26/07/2015	Counseling Round	No
103.	72269	42.251533070	EN15205773	PATIL VAIBHAV SUDHAKAR	Male	Type A	OBC	North Maharashtra	NA	NA	55.00	GOPEN	5000	26/07/2015	26/07/2015	Counseling Round	No
104.	72980	41.780405920	EN15206668	CHAUDHARI PAVAN RAVINDRA	Male	Type A	OBC	North Maharashtra	NA	NA	46.00	GOPEN	32995	26/07/2015	26/07/2015	Counseling Round	No
105.	75173	40.286434580	EN15206249	TELI JAYESH ARJUN	Male	Type A	OBC	North Maharashtra	NA	NA	54.67	GOPEN	1000	28/07/2015	28/07/2015	Counseling Round	No
106.	75694	39.928696100	EN15195150	ZOPE AMIT ANIL	Male	Type A	OBC	North Maharashtra	NA	NA	59.83	GOPEN	32995	26/07/2015	26/07/2015	Counseling Round	No

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Directorate of Technical Education, Maharashtra State

3, Mahapalika Marg, Post Box No.1967, Mumbai-400001

[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510461210] - Mechanical Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Admitted Against CAP

Quota : 2

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	81	47.075465130	EN15720332	MOHD ANAS USMANI	Male	OMS	Open	OHU	NA	NA	75.67	ACAP	40000	26/07/2015	18/08/2015	Institute Level	No
2.	71	52.770000000	EN15719169	CHAUDHARI SHUBHAM DNYANESHWAR	Male	Type A	OBC	North Maharashtra	NA	NA	47.33	ACAP	20000	31/07/2015	18/08/2015	Institute Level	No

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Directorate of Technical Education, Maharashtra State

3, Mahapalika Marg, Post Box No.1967, Mumbai-400001

[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510461210] - Mechanical Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Institute Level Quota

Quota : 12

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	15	50.722871365	EN15720734	RAHUL CHAUDHARI	Male	Type B	Open	North Maharashtra	NA	NA	70.00	IL	45000	03/07/2015	18/08/2015	Institute Level	No
2.	20	47.039559145	EN15720519	MUDASSIR AHMED GULAM NABI	Male	Type A	Open	North Maharashtra	NA	NA	64.33	IL	35000	06/07/2015	18/08/2015	Institute Level	No
3.	23	45.862506505	EN15720819	CHAUDHARI NIKHIL NARAYAN	Male	Type A	Open	North Maharashtra	NA	NA	58.83	IL	35000	01/07/2015	18/08/2015	Institute Level	No
4.	28	43.602615230	EN15720379	JAWALE PARESH KISHOR	Male	Type A	Open	North Maharashtra	NA	NA	65.00	IL	37000	12/07/2015	18/08/2015	Institute Level	No
5.	36	36.597932370	EN15720795	FEGADE BHUSHAN SUNIL	Male	Type A	Open	North Maharashtra	NA	NA	51.33	IL	40000	04/07/2015	18/08/2015	Institute Level	No
6.	44	27.585598050	EN15719145	PATIL VAIBHAV SATISH	Male	Type A	OBC	North Maharashtra	NA	NA	48.33	IL	40000	11/08/2015	18/08/2015	Institute Level	No
7.	50	19.512166785	EN15720842	CHAUDHARI PRATIK POPAT	Male	Type A	Open	North Maharashtra	NA	NA	49.83	IL	40000	01/07/2015	18/08/2015	Institute Level	No
8.	51	16.076306875	EN15720769	PATIL HARSHAL NARENDRA	Male	Type A	Open	North Maharashtra	NA	NA	50.00	IL	40000	03/07/2015	18/08/2015	Institute Level	No
9.	78	55.443760975	EN15720608	SHOAIB KHAN	Male	OMS	Open	OHU	NA	NA	88.33	IL	44000	03/07/2015	18/08/2015	Institute Level	No
10.	84	41.984019010	EN15720282	KALE AKSHAY ABHAY	Male	OMS	Open	OHU	NA	NA	58.78	IL	30000	04/07/2015	18/08/2015	Institute Level	No
11.	85	40.861284750	EN15720641	PINJARA REHAN AHMED MOHAMMAD RAFIK	Male	OMS	Open	OHU	NA	NA	50.67	IL	30000	04/07/2015	18/08/2015	Institute Level	No
12.	86	40.082772005	EN15720575	SAGAR BAGUL	Male	OMS	Open	OHU	NA	NA	60.33	IL	40000	06/07/2015	18/08/2015	Institute Level	No

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Directorate of Technical Education, Maharashtra State

3, Mahapalika Marg, Post Box No.1967, Mumbai-400001

[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510461210] - Mechanical Engineering

Summary of Admitted Candidates for the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Sr. No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP	108	106	0	106
2.	Against CAP		2	0	2
3.	Institute Level	12	12	0	12
4.	Minority	0	0	0	0
5.	J&K Migrant		0	0	0
6.	Others		0	0	0
	Total	**120**	**120**	**0**	**120**

Seat Type used for Institute Level Admissions : ACAP-Against CAP, IL-Institute Level, ILNRI-Institute Level NRI (5% of SI if AICTE Permission), MI-Minority, GoI-Government of India Nominee, NRI-NRI (15% of SI if AICTE Permission), PIO-PIO (15% of SI if AICTE Permission), FNS-FNS (15% of SI if AICTE Permission), CIWGC-Children's of Indian Workers in Gulf Countries (15% of SI if AICTE Permission), OAA-Over and Above

Cut-Off Date for Admission : 14/08/2015
Cut-Off Date for Uploading : 22/08/2015

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510461211T] - Mechanical Engineering

List of Candidates Admitted to the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 6

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Defence Type	HSC Eligibility Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	12745	87.2161	EN15206231	WAGH CHETAN LAKSHMAN	Male	Type A	OBC	North Maharashtra	NA	NA	70.33	GOPENO	9533	02/07/2015	02/07/2015	Round 1	No
2.	20544	79.2689	EN15184170	RANE SUYASH AVINASH	Male	Type A	OBC	North Maharashtra	NA	NA	77.00	GOPENO	9533	03/07/2015	03/07/2015	Round 1	No
3.	21085	78.703	EN15205174	KADTE AMOL SANJAY	Male	Type A	Open	B.A.M.U.	NA	NA	67.33	GOPENO	9533	04/07/2015	04/07/2015	Round 1	No
4.	22121	77.7133	EN15184252	PATIL VIRENDRA BHAGWAT	Male	Type A	OBC	North Maharashtra	NA	NA	63.67	GOPENO	9533	03/07/2015	03/07/2015	Round 1	No
5.	22476	77.4017	EN15187862	SHAIKH JIBRAN SHAIKH BASHIR	Male	Type A	Open	North Maharashtra	NA	NA	67.33	GOPENO	9533	02/07/2015	02/07/2015	Round 1	No
6.	23045	76.8679	EN15201978	WAGH YASHPAL SANJAY	Male	Type A	OBC	North Maharashtra	NA	NA	62.67	GOPENO	9533	04/07/2015	04/07/2015	Round 1	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510461211T] - Mechanical Engineering

Summary of Admitted Candidates for the First Year of Four-Year Full-Time Degree Courses in Engineering / Technology for the Academic Year 2015-2016

Sr. No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP	6	6	0	6
2.	Against CAP		0	0	0
3.	Institute Level	0	0	0	0
4.	Minority	0	0	0	0
5.	J&K Migrant		0	0	0
6.	Others		0	0	0
	Total	**6**	**6**	**0**	**6**

Seat Type used for Institute Level Admissions : ACAP-Against CAP, IL-Institute Level, ILNRI-Institute Level NRI (5% of SI if AICTE Permission), MI-Minority, GoI-Government of India Nominee, NRI-NRI (15% of SI if AICTE Permission), PIO-PIO (15% of SI if AICTE Permission), FNS-FNS (15% of SI if AICTE Permission), CIWGC-Children's of Indian Workers in Gulf Countries (15% of SI if AICTE Permission), OAA-Over and Above

Cut-Off Date for Admission : 14/08/2015
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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510408210] - Bio Technology[First Shift]

Summary of Admitted Candidates for Direct Second Year Engineering / Technology 2015-2016

Summary

Sr No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP Seats+CAPMI Seats	28(28+0)	0	0	0
2.	Against CAP Seats		0	0	0
3.	Minority Seats	0	0	0	0
5.	Over And Above Seats	0	0	0	0
Total		28	0	0	0

Seat Type used for Institute Level Admissions : Against CAP, Minority Seat, Against Minority Seat,Over and Above

Cut-Off Date for Admission : 10/09/2015
Cut-Off Date for Uploading : 16/09/2015

Legends -
* : Admitted After Cut-off Date(10/09/2015) (For eg.11/09/2015 *)
# : Uploaded After Uploading Date(16/09/2015) (For eg.17/09/2015 #)
$: Non-Minority Candidates admitted against minority seat.Permission letters from authority to be attached.
- : Not Applicable

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510450710] - Chemical Engineering[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota(CAP Seats+CAPMI) : 15(15+0)

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1	44634	DSE15151098	MANKUMBARE YASHWANT MAHENDRA	M	Type A	OPEN	N.A./ N.A.	Diploma [Chemical Engineering]	65.76 %	GOPEN	5000/-	10/08/2015	10/08/2015 14:15:14	Round I	No
2	54611	DSE15158479	SHENDE PRANIL RAVINDRA	M	Type A	OBC-Wani	N.A./ N.A.	Diploma [Chemical Engineering]	62.47 %	GOBC	8270/-	09/08/2015	09/08/2015 17:02:41	Round I	No
3	60225	DSE15151752	HARNE WANI VISHAL ASHOK	M	Type A	OBC-Kathar wani	N.A./ N.A.	Diploma [Chemical Engineering]	60.42 %	GOBC	5000/-	10/08/2015	10/08/2015 14:12:33	Round I	No
4	63183	DSE15151939	PATIL PUJA VILAS	F	Type A	OBC-Leva Patidar	N.A./ N.A.	Diploma [Chemical Engineering]	59.18 %	LOPEN	18270/-	09/08/2015	09/08/2015 15:33:33	Round I	No
5	56106	DSE15151168	LATHI GAURAV MAHESH	M	Type A	OPEN	N.A./ N.A.	Diploma [Chemical Engineering]	61.94 %	GOPEN	76829/-	19/08/2015	19/08/2015 14:58:16	Round II	No
6	68247	DSE15146942	UKE MANGESH BANDUJI	M	Type A	SC-Mahar	N.A./ N.A.	Diploma [Chemical Engineering]	56.12 %	GSC	7994/-	19/08/2015	19/08/2015 14:55:25	Round II	No

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510450710] - Chemical Engineering[First Shift]

Summary of Admitted Candidates for Direct Second Year Engineering / Technology 2015-2016

Summary

Sr No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP Seats+CAPMI Seats	15(15+0)	6	0	6
2.	Against CAP Seats		0	0	0
3.	Minority Seats	0	0	0	0
5.	Over And Above Seats	0	0	0	0
Total		15	6	0	6

Seat Type used for Institute Level Admissions : Against CAP, Minority Seat, Against Minority Seat,Over and Above

Cut-Off Date for Admission : 10/09/2015
Cut-Off Date for Uploading : 16/09/2015

Legends -
* : Admitted After Cut-off Date(10/09/2015) (For eg.11/09/2015 *)
# : Uploaded After Uploading Date(16/09/2015) (For eg.17/09/2015 #)
$: Non-Minority Candidates admitted against minority seat.Permission letters from authority to be attached.
- : Not Applicable

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DIRECTORATE OF TECHNICAL EDUCATION, MAHARASHTRA STATE, MUMBAI

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510419110] - Civil Engineering[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota(CAP Seats+CAPMI) : 45(45+0)

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1	6278	DSE15151069	PATIL SHUBHAM SHESHRAO	M	Type A	OPEN	N.A./ N.A.	Diploma [Civil Engineering]	81.64 %	GOPEN	38270/-	09/08/2015	09/08/2015 16:13:12	Round I	No
2	6427	DSE15151367	PATIL DIMPAL ISHWAR	F	Type A	OBC-Dode Gujar	N.A./ N.A.	Diploma [Civil Engineering]	81.52 %	LOPEN	15000/-	10/08/2015	10/08/2015 15:58:28	Round I	No
3	7360	DSE15151383	SHIRPURKAR AAYESHA RAHIM	F	Type A	OBC-Momin	N.A./ N.A.	Diploma [Civil Engineering]	80.85 %	LOPEN	42412/-	08/08/2015	08/08/2015 16:34:48	Round I	No
4	8022	DSE15151480	PATIL SHUBHAM MADHUKAR	M	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Civil Engineering]	80.42 %	GOPEN	42412/-	08/08/2015	08/08/2015 16:23:11	Round I	No
5	8394	DSE15102857	SONONE ANIKET SUBHASH	M	Type A	OBC-Teli	N.A./ N.A.	Diploma [Civil Engineering]	80.18 %	GOPEN	25000/-	11/08/2015	11/08/2015 14:38:40	Round I	No
6	8492	DSE15151508	MALI LOKESH JAGANNATH	M	Type A	OBC-Phulmali	N.A./ N.A.	Diploma [Civil Engineering]	80.12 %	GOPEN	20000/-	08/08/2015	08/08/2015 14:14:10	Round I	No
7	8843	DSE15151657	PATIL GEETA GOPAL	F	Type A	OBC-Gujar	N.A./ N.A.	Diploma [Civil Engineering]	79.88 %	LOPEN	13270/-	09/08/2015	09/08/2015 12:18:20	Round I	No
8	9252	DSE15151753	RANE DIPESH SUNIL	M	Type A	OBC-Leva Patidar	N.A./ N.A.	Diploma [Civil Engineering]	79.64 %	GOPEN	42412/-	09/08/2015	09/08/2015 12:38:31	Round I	No
9	9546	DSE15151799	WANI HARSHAL RATNAKAR	M	Type A	OBC-Kathar wani	N.A./ N.A.	Diploma [Civil Engineering]	79.45 %	GOPEN	20000/-	10/08/2015	10/08/2015 16:25:13	Round I	No
10	9835	DSE15158952	THORAT YASH SHASHIKANT	M	Type A	OPEN	N.A./ N.A.	Diploma [Civil Engineering]	79.27 %	GOPEN	48000/-	08/08/2015	08/08/2015 13:39:10	Round I	No

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510419110] - Civil Engineering[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota : 45

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
11	11756	DSE15151558	PAWAR MOHINI NARENDRA	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Civil Engineering]	78.18 %	LOPEN	42412/-	08/08/2015	08/08/2015 16:07:54	Round I	No
12	11992	DSE15151641	PATIL CHETAN BHIKAN	M	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Civil Engineering]	78.06 %	GOPEN	44142/-	08/08/2015	08/08/2015 13:59:09	Round I	No
13	12678	DSE15151742	JADHAV SAURABH SANJAY	M	Type A	OBC-Sonar	N.A./ N.A.	Diploma [Civil Engineering]	77.70 %	GOPEN	42412/-	09/08/2015	09/08/2015 12:13:11	Round I	No
14	12992	DSE15158420	KHAMBAYATE ANKUSH RAVINDRA	M	Type A	OBC-Rangari	N.A./ N.A.	Diploma [Civil Engineering]	77.52 %	GOPEN	17000/-	10/08/2015	10/08/2015 15:01:34	Round I	No
15	13233	DSE15165133	HIVARKAR DARSHAN KAILASH	M	Type A	OBC-Kumbhara	N.A./ N.A.	Diploma [Civil Engineering]	77.39 %	GOPEN	44142/-	10/08/2015	10/08/2015 15:15:08	Round I	No
16	14051	DSE15158592	PATIL SANDIP RAVINDRA	M	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Civil Engineering]	76.97 %	GOPEN	7000/-	11/08/2015	11/08/2015 14:43:26	Round I	No
17	15809	DSE15151017	PATIL KANCHAN KIRANSING	F	Type A	OPEN	N.A./ N.A.	Diploma [Civil Engineering]	76.12 %	LOPEN	30000/-	10/08/2015	10/08/2015 13:59:45	Round I	No
18	15888	DSE15159876	GHUGARE GAYATRI NARAYAN	F	Type A	NT 1 (NT-B)-Gavali	N.A./ N.A.	Diploma [Civil Engineering]	76.06 %	LOPEN	0/-	09/08/2015	09/08/2015 12:45:19	Round I	No
19	17002	DSE15151744	KOSHTI DEEPAKKUMAR AVINASH	M	Type A	SBC-Koshti	N.A./ N.A.	Diploma [Civil Engineering]	75.58 %	GOBC	9724/-	10/08/2015	10/08/2015 12:17:19	Round I	No
20	18082	DSE15158421	PATIL MONIKA RAJENDRA	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Civil Engineering]	75.09 %	LOBC	20000/-	10/08/2015	10/08/2015 13:38:09	Round I	No

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510419110] - Civil Engineering[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota : 45

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
21	19236	DSE15158680	SONAWANE AKASH NANA	M	Type A	SC-Mahar	N.A./ N.A.	Diploma [Civil Engineering]	74.97 %	GSC	0/-	09/08/2015	09/08/2015 13:17:56	Round I	No
22	19392	DSE15158946	PATIL HARSHAL DILIP	M	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Civil Engineering]	74.97 %	GOBC	42412/-	10/08/2015	10/08/2015 13:15:41	Round I	No
23	19265	DSE15159767	JADHAV KAUSHAL UMAKANT	M	Type A	OBC-Dode Gujar	N.A./ N.A.	Diploma [Civil Engineering]	74.97 %	GOBC	40000/-	10/08/2015	10/08/2015 15:52:13	Round I	No
24	19312	DSE15159764	RATHOD DINESH LAXMAN	M	Type A	DT/VJ-Banjara	N.A./ N.A.	Diploma [Civil Engineering]	74.97 %	GVJDT	9724/-	10/08/2015	10/08/2015 16:11:47	Round I	No
25	19297	DSE15105805	WAWGE KANCHAN SAMADHAN	F	Type A	OBC-Mali	N.A./ N.A.	Diploma [Civil Engineering]	74.97 %	LOBC	15000/-	10/08/2015	10/08/2015 16:26:26	Round I	No
26	19812	DSE15151514	GUJAR OMPRAKASH SITARAM	M	Type A	OBC-Dode Gujar	N.A./ N.A.	Diploma [Civil Engineering]	74.36 %	GOBC	15000/-	10/08/2015	10/08/2015 16:23:48	Round I	No
27	21233	DSE15151635	SAPKALE MAMTA DILIP	F	Type A	SC-Mahar	N.A./ N.A.	Diploma [Civil Engineering]	73.76 %	LSC	9724/-	09/08/2015	10/08/2015 15:20:38	Round I	No
28	22095	DSE15152723	ABHIJEET RAUL	M	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Civil Engineering]	73.45 %	GOBC	20000/-	10/08/2015	10/08/2015 15:34:13	Round I	No
29	26209	DSE15151563	JAGTAP KOMAL VIKAS	F	Type A	OBC-Shimpi	N.A./ N.A.	Diploma [Civil Engineering]	71.94 %	LOBC	20000/-	08/08/2015	08/08/2015 14:22:35	Round I	No
30	30573	DSE15151644	BELDAR ASHWINI DATTATRAY	F	Type B	NT 1 (NT-B)-Beldar	N.A./ N.A.	Diploma [Civil Engineering]	70.36 %	LNTB	0/-	09/08/2015	09/08/2015 12:20:07	Round I	No

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DIRECTORATE OF TECHNICAL EDUCATION, MAHARASHTRA STATE, MUMBAI

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510419110] - Civil Engineering[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota : 45

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
31	32672	DSE15159080	BORASE SUVARNA SUNIL	F	Type A	SC-Mahar	N.A./ N.A.	Diploma [Civil Engineering]	69.70 %	LSC	0/-	09/08/2015	09/08/2015 16:04:20	Round I	No
32	34896	DSE15151637	SAPKALE SHUBHANGI RAJENDRA	F	Type A	SC-Mahar	N.A./ N.A.	Diploma [Civil Engineering]	68.91 %	GSC	9724/-	10/08/2015	10/08/2015 15:19:07	Round I	No
33	47656	DSE15158501	GAVIT SMITA VASANT	F	Type A	ST-Bhil	N.A./ N.A.	Diploma [Civil Engineering]	64.79 %	LST	9724/-	10/08/2015	10/08/2015 16:41:52	Round I	No
34	57433	DSE15165011	JADHAV KIRAN VIKRAM	F	Type A	SC-Mahar	N.A./ N.A.	Diploma [Civil Engineering]	61.46 %	GSC	9724/-	11/08/2015	11/08/2015 14:32:11	Round I	No
35	58916	DSE15165214	KALE ROHAN SURESH	M	Type A	SC-Mahar	N.A./ N.A.	Diploma [Civil Engineering]	60.91 %	GSC	9724/-	08/08/2015	08/08/2015 14:52:32	Round I	No
36	61890	DSE15160255	PAWARA BHAISING SITARAM	M	Type A	ST-Pawra	N.A./ N.A.	Diploma [Civil Engineering]	60.00 %	GST	0/-	11/08/2015	11/08/2015 16:37:52	Round I	No
37	68057	DSE15151829	NHALDE HARSHADA SUDHAKAR	F	Type A	NT 2 (NT-C)-Dhangar	N.A./ N.A.	Diploma [Civil Engineering]	56.28 %	GNTC	10000/-	11/08/2015	11/08/2015 12:51:00	Round I	No
38	4875	DSE15158562	SUTAR RUPALI DNYANESHWAR	F	Type A	OBC-Suthaar	N.A./ N.A.	Diploma [Civil Engineering]	82.79 %	GOPEN	42412/-	17/08/2015	17/08/2015 16:50:50	Round II	No
39	7841	DSE15151073	RAJPUT JAYESH JAGDISH	M	Type A	OPEN	N.A./ N.A.	Diploma [Civil Engineering]	80.55 %	GOPEN	76829/-	17/08/2015	17/08/2015 14:18:51	Round II	No
40	11940	DSE15105477	PATIL CHETAN SOPAN	M	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Civil Engineering]	78.06 %	GOBC	42412/-	17/08/2015	17/08/2015 16:05:09	Round II	No

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510419110] - Civil Engineering[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota : 45

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
41	15158	DSE15158676	CHAUDHARI BHARATI SITARAM	F	Type A	OBC-Mali	N.A./ N.A.	Diploma [Civil Engineering]	76.42 %	GNTD	42412/-	19/08/2015	19/08/2015 15:17:54	Round II	No
42	15827	DSE15107170	KHAN SHAFEEQUE ZABIULLAH	M	Type A	OPEN	N.A./ N.A.	Diploma [Civil Engineering]	76.12 %	PWDC	76829/-	18/08/2015	18/08/2015 14:50:33	Round II	No
43	19444	DSE15155088	TADAVI AMAN ITABAR	M	Type A	ST-Tadvi Bhil	N.A./ N.A.	Diploma [Civil Engineering]	74.97 %	GST	7994/-	17/08/2015	17/08/2015 14:43:20	Round II	No
44	19380	DSE15159149	SAPKAL LALIT RAVINDRA	M	Type A	OBC-Teli	N.A./ N.A.	Diploma [Civil Engineering]	74.97 %	PWDC	42412/-	20/08/2015	20/08/2015 14:30:41	Round II	No

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510419110] - Civil Engineering[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota : 1

Admitted Candidates List In Against CAP

Sr No.	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Reported Date	Round	Admitted/ Reported Late
1	DSE15404828	MD TAUFIQ MD FAROOQ	M	Type A	OPEN	N.A./ N.A.	Diploma [Civil Engineering]	63.45 %	ACAP	19360/-	10/09/2015	13/09/2015 14:44:05	Institute Level	**No**

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon
[510419110] - Civil Engineering[First Shift]
Summary of Admitted Candidates for Direct Second Year Engineering / Technology 2015-2016

Summary

Sr No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP Seats+CAPMI Seats	45(45+0)	44	0	44
2.	Against CAP Seats		1	0	1
3.	Minority Seats	0	0	0	0
5.	Over And Above Seats	0	0	0	0
Total		45	45	0	45

Seat Type used for Institute Level Admissions : Against CAP, Minority Seat, Against Minority Seat,Over and Above

Cut-Off Date for Admission : 10/09/2015
Cut-Off Date for Uploading : 16/09/2015

Legends -
* : Admitted After Cut-off Date(10/09/2015) (For eg.11/09/2015 *)
# : Uploaded After Uploading Date(16/09/2015) (For eg.17/09/2015 #)
$: Non-Minority Candidates admitted against minority seat.Permission letters from authority to be attached.
- : Not Applicable

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DIRECTORATE OF TECHNICAL EDUCATION, MAHARASHTRA STATE, MUMBAI

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424510] - Computer Engineering[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota(CAP Seats+CAPMI) : 45(45+0)

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1	4046	DSE15151344	PATIL RUPALI BHAUSAHEB	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Computer Engineering]	83.56 %	LOPEN	42412/-	08/08/2015	08/08/2015 16:10:01	Round I	No
2	5720	DSE15151270	PATIL NANDINI JALANDAR	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Computer Engineering]	82.06 %	LOPEN	25000/-	08/08/2015	08/08/2015 14:34:59	Round I	No
3	7263	DSE15151337	PATIL BHAGYASHRI SURESH	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Computer Engineering]	80.94 %	LOPEN	44142/-	08/08/2015	08/08/2015 14:30:23	Round I	No
4	7228	DSE15151566	PATIL UJJWALA PANDURANG	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Computer Engineering]	80.94 %	LOPEN	20000/-	08/08/2015	08/08/2015 14:50:07	Round I	No
5	7218	DSE15151917	KHODAPE MINAL SANJAY	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Information Technology]	80.94 %	LOPEN	23270/-	09/08/2015	09/08/2015 13:21:32	Round I	No
6	7547	DSE15151642	VANJARI BHAGYASHRI NAMDEO	F	Type A	NT 3 (NT-D)-Vanjari	N.A./ N.A.	Diploma [Computer Engineering]	80.75 %	LOPEN	9724/-	10/08/2015	10/08/2015 12:05:07	Round I	No
7	8009	DSE15151561	PATIL ASHWINI HIRALAL	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Computer Engineering]	80.44 %	GOPEN	20000/-	08/08/2015	08/08/2015 14:58:16	Round I	No
8	8436	DSE15151346	GAIKAWAD GAYATRI VILAS	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Computer Engineering]	80.13 %	GOPEN	41412/-	08/08/2015	08/08/2015 13:15:28	Round I	No
9	9276	DSE15151361	PATIL JYOTI ASHOK	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Computer Engineering]	79.63 %	GOPEN	42412/-	09/08/2015	09/08/2015 12:08:34	Round I	No
10	10174	DSE15151345	BARI ASHWINI GOPAL	F	Type A	OBC-Bari	N.A./ N.A.	Diploma [Computer Engineering]	79.06 %	GOPEN	9000/-	10/08/2015	10/08/2015 14:02:55	Round I	No

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424510] - Computer Engineering[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota : 45

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
11	10667	DSE15151720	DHOPEKAR SHIVANI SUSHILKUMAR	F	Type A	OBC-Bhavsar	N.A./ N.A.	Diploma [Information Technology]	78.76 %	GOPEN	41290/-	09/08/2015	09/08/2015 12:30:16	Round I	No
12	10937	DSE15151568	SHINDE NILU DILIP	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Computer Engineering]	78.63 %	GOPEN	8270/-	09/08/2015	09/08/2015 16:10:57	Round I	No
13	11138	DSE15151028	KOTKAR SHRADDHA VIJAY	F	Type A	OPEN	N.A./ N.A.	Diploma [Computer Engineering]	78.50 %	GOPEN	28270/-	09/08/2015	09/08/2015 15:38:10	Round I	No
14	11142	DSE15151343	WAGH SHUBHANGI JAGDISH	F	Type A	OBC-Navi or Nhavi	N.A./ N.A.	Diploma [Computer Engineering]	78.50 %	GOPEN	15000/-	10/08/2015	10/08/2015 15:09:13	Round I	No
15	11210	DSE15151723	NEHATE KOMAL RAVINDRA	F	Type A	OBC-Leva Patidar	N.A./ N.A.	Diploma [Information Technology]	78.47 %	GOPEN	42412/-	09/08/2015	09/08/2015 15:03:30	Round I	No
16	11467	DSE15152375	PATIL MADHURI PRAKASH	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Computer Engineering]	78.31 %	GOPEN	42412/-	09/08/2015	09/08/2015 16:51:18	Round I	No
17	11948	DSE15151396	PATIL ROHINI RAVINDRA	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Information Technology]	78.06 %	GOPEN	28270/-	10/08/2015	10/08/2015 13:17:58	Round I	No
18	12811	DSE15151577	CHAUDHARI BHAGYASHRI JAGADISH	F	Type A	OBC-Teli	N.A./ N.A.	Diploma [Computer Engineering]	77.63 %	GOPEN	20000/-	08/08/2015	08/08/2015 14:48:21	Round I	No
19	13254	DSE15119952	KHARE GAYATRI BABURAO	F	Type A	OBC-Gurav	N.A./ N.A.	Diploma [Computer Engineering]	77.38 %	GOPEN	15000/-	10/08/2015	10/08/2015 13:55:06	Round I	No
20	14504	DSE15151694	CHAUDHARI ROHINI RAJARAM	F	Type A	DT/VJ-Bhamata	N.A./ N.A.	Diploma [Computer Engineering]	76.75 %	GOPEN	0/-	08/08/2015	08/08/2015 16:17:31	Round I	No

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424510] - Computer Engineering[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota : 45

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
21	14983	DSE15151440	KHEWALKAR KALYANI DEELIP	F	Type A	OBC-Teli	N.A./ N.A.	Diploma [Computer Engineering]	76.50 %	LOBC	38270/-	11/08/2015	11/08/2015 12:16:39	Round I	No
22	15135	DSE15151495	PATIL MOHIT LALIT	M	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Computer Engineering]	76.44 %	GOBC	19432/-	09/08/2015	09/08/2015 14:47:44	Round I	No
23	15142	DSE15158816	PATIL MRUNALI MANOHAR	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Computer Engineering]	76.44 %	LOBC	30000/-	10/08/2015	10/08/2015 14:54:39	Round I	No
24	15426	DSE15151130	KINGER SAMIKSHA AVATRAM	F	Type A	OPEN	N.A./ N.A.	Diploma [Information Technology]	76.29 %	PWDC	38270/-	09/08/2015	09/08/2015 15:15:08	Round I	No
25	15656	DSE15151757	KATHALE BHARAT SURESH	M	Type A	NT 1 (NT-B)-Chitrakathi	N.A./ N.A.	Diploma [Computer Engineering]	76.19 %	GNTB	8270/-	09/08/2015	09/08/2015 15:23:11	Round I	No
26	15646	DSE15152376	PATIL MANISHA BHATU	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Computer Engineering]	76.19 %	GOBC	20000/-	10/08/2015	10/08/2015 16:10:04	Round I	No
27	17168	DSE15155171	BHANDARKAR SHUBHADA SANJAY	F	Type A	OBC-Shimpi	N.A./ N.A.	Diploma [Computer Engineering]	75.50 %	GOBC	44142/-	10/08/2015	10/08/2015 15:43:07	Round I	No
28	17703	DSE15151549	CHAUDHARI GUNJAN YUVRAJ	F	Type A	OBC-Teli	N.A./ N.A.	Diploma [Computer Engineering]	75.25 %	GOBC	42412/-	08/08/2015	08/08/2015 17:58:25	Round I	No
29	17964	DSE15107251	DOSE DIPALI VITTHAL	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Computer Engineering]	75.13 %	GOBC	18270/-	09/08/2015	09/08/2015 15:31:18	Round I	No
30	17980	DSE15151552	PATIL AISHWARYA GANESHRAO	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Computer Engineering]	75.13 %	GOBC	23270/-	09/08/2015	09/08/2015 15:35:45	Round I	No

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424510] - Computer Engineering[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota : 45

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
31	18324	DSE15151351	GAWANDE NAYANA GANESHRAO	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Information Technology]	75.00 %	GST	15000/-	11/08/2015	11/08/2015 14:36:39	Round I	No
32	19681	DSE15159790	KATVE DIPAK JAGANNATH	M	Type A	OBC-Kshatriy	N.A./ N.A.	Diploma [Computer Engineering]	74.44 %	GST	43142/-	11/08/2015	11/08/2015 15:11:33	Round I	No
33	25355	DSE15151362	LOHAR DIPALI MADHUKAR	F	Type A	NT 1 (NT-B)-Lohar	N.A./ N.A.	Diploma [Computer Engineering]	72.25 %	LNTB	0/-	09/08/2015	09/08/2015 12:05:23	Round I	No
34	26173	DSE15152325	AMBEKAR NAMRATA GOVIND	F	Type A	SBC-Sali	N.A./ N.A.	Diploma [Computer Engineering]	71.94 %	GSC	9724/-	10/08/2015	10/08/2015 14:58:05	Round I	No
35	26605	DSE15151309	WARADE POOJA YUVRAJ	F	Type A	NT 3 (NT-D)-Vanjari	N.A./ N.A.	Diploma [Computer Engineering]	71.81 %	GNTD	0/-	09/08/2015	09/08/2015 13:19:56	Round I	No
36	28769	DSE15151266	SONAWANE PRIYANKA HIRAMAN	F	Type A	SC-Chambhar	N.A./ N.A.	Diploma [Computer Engineering]	71.00 %	LSC	0/-	08/08/2015	08/08/2015 15:27:15	Round I	No
37	32505	DSE15151747	BORSE SUVARNA MURLIDHAR	F	Type A	SC-Chambhar	N.A./ N.A.	Diploma [Computer Engineering]	69.75 %	GSC	9724/-	10/08/2015	10/08/2015 14:10:07	Round I	No
38	35019	DSE15151476	MORE AKSHAY ASHOK	M	Type A	NT 1 (NT-B)-Bhoi	N.A./ N.A.	Diploma [Computer Engineering]	68.88 %	GVJDT	9724/-	10/08/2015	10/08/2015 14:44:14	Round I	No
39	47880	DSE15159714	THORAT KARTIK KISHOR	M	Type A	OBC-Sonar	Orthopedic Disorder - (P3 OD)/ N.A.	Diploma [Computer Engineering]	64.71 %	PWDC	44142/-	10/08/2015	10/08/2015 16:40:10	Round I	No
40	68905	DSE15151579	BIRHADE MILIND RAHUL	M	Type A	SC-Buddhist	N.A./ N.A.	Diploma [Information Technology]	55.50 %	GSC	9724/-	10/08/2015	10/08/2015 17:18:40	Round I	No

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424510] - Computer Engineering[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota : 45

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
41	5420	DSE15107220	TOMAR ANURADHA BAJRANGSINGH	F	Type A	OPEN	N.A./ N.A.	Diploma [Computer Engineering]	82.31 %	DEF	76829/-	20/08/2015	20/08/2015 14:25:19	Round II	No
42	21794	DSE15151437	PATIL DIPMALA VISHWANATH	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Computer Engineering]	73.56 %	LOBC	42412/-	19/08/2015	19/08/2015 12:24:18	Round II	No
43	22183	DSE15151378	JAWARE DIPALI SURESH	F	Type A	NT 1 (NT-B)-Bhoi	N.A./ N.A.	Diploma [Information Technology]	73.41 %	GSC	7994/-	19/08/2015	19/08/2015 15:47:35	Round II	No
44	22461	DSE15151439	KHEWALKAR VAISHNAVI DEELIP	F	Type A	OBC-Teli	N.A./ N.A.	Diploma [Computer Engineering]	73.31 %	LST	42412/-	17/08/2015	17/08/2015 12:07:50	Round II	No

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424510] - Computer Engineering[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota : 1

Admitted Candidates List In Against CAP

Sr No.	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Reported Date	Round	Admitted/ Reported Late
1	DSE15403247	PAWAR PRACHI KISHOR	F	Type A	OPEN	N.A./ N.A.	Diploma [Computer Engineering]	69.50 %	ACAP	49360/-	05/09/2015	08/09/2015 11:55:01	Institute Level	**No**

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424510] - Computer Engineering[First Shift]

Summary of Admitted Candidates for Direct Second Year Engineering / Technology 2015-2016

Summary

Sr No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP Seats+CAPMI Seats	45(45+0)	44	0	44
2.	Against CAP Seats		1	0	1
3.	Minority Seats	0	0	0	0
5.	Over And Above Seats	0	0	0	0
Total		45	45	0	45

Seat Type used for Institute Level Admissions : Against CAP, Minority Seat, Against Minority Seat,Over and Above

Cut-Off Date for Admission : 10/09/2015
Cut-Off Date for Uploading : 16/09/2015

Legends -
* : Admitted After Cut-off Date(10/09/2015) (For eg.11/09/2015 *)
# : Uploaded After Uploading Date(16/09/2015) (For eg.17/09/2015 #)
$: Non-Minority Candidates admitted against minority seat.Permission letters from authority to be attached.
- : Not Applicable

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DIRECTORATE OF TECHNICAL EDUCATION, MAHARASHTRA STATE, MUMBAI

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510437210] - Electronics and Telecommunication Engg[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota(CAP Seats+CAPMI) : 85(85+0)

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1	2879	DSE15151387	GADE DHANASHRI SHRIKRISHNA	F	Type A	OBC-Wani	N.A./ N.A.	Diploma [Electronics and Telecommunication]	84.82 %	LOPEN	23270/-	09/08/2015	09/08/2015 12:21:55	Round I	No
2	4375	DSE15105199	NIKAM HARSHADA RAVINDRA	F	Type A	OPEN	N.A./ N.A.	Diploma [Electronics and Communication Engineering]	83.24 %	LOPEN	48270/-	09/08/2015	09/08/2015 15:59:51	Round I	No
3	4623	DSE15151589	CHAUDHARI KIRTI MANOJ	F	Type A	OBC-Leva Patidar	N.A./ N.A.	Diploma [Electronics and Telecommunication]	83.00 %	LOPEN	20000/-	10/08/2015	10/08/2015 15:50:46	Round I	No
4	7114	DSE15151055	BHOSALE SHITAL CHANDRAKANT	F	Type A	OPEN	N.A./ N.A.	Diploma [Electronics and Telecommunication]	81.00 %	LOPEN	10000/-	11/08/2015	11/08/2015 15:40:26	Round I	No
5	7301	DSE15151699	DEVARE VARSHA UMAJI	F	Type A	OBC-Teli	N.A./ N.A.	Diploma [Electronics and Telecommunication]	80.88 %	LOPEN	23270/-	09/08/2015	09/08/2015 15:41:46	Round I	No
6	11407	DSE15151896	CHAUDHARI YOGESHWARI PRAMOD	F	Type A	OBC-Teli	N.A./ N.A.	Diploma [Electronics and Telecommunication]	78.35 %	LOPEN	8270/-	09/08/2015	09/08/2015 13:28:21	Round I	No
7	11900	DSE15105486	CHAUDHARI VISHAL MANOHAR	M	Type A	OBC-Teli	N.A./ N.A.	Diploma [Electronics and Telecommunication]	78.11 %	GOPEN	10000/-	10/08/2015	10/08/2015 13:49:24	Round I	No
8	12105	DSE15151289	SHIRSATH AMIT RAJENDRA	M	Type A	OBC-Navi or Nhavi	N.A./ N.A.	Diploma [Electronics and Communication Engineering]	78.00 %	GOPEN	25000/-	10/08/2015	10/08/2015 14:20:39	Round I	No
9	12331	DSE15151800	SONAWANE DIPALI DNYANESHWAR	F	Type A	SBC-Koli	N.A./ N.A.	Diploma [Electronics and Telecommunication]	77.88 %	LOPEN	14154/-	09/08/2015	09/08/2015 17:10:23	Round I	No
10	12544	DSE15151020	VATPAL BHUSHAN PRAKASHSING	M	Type A	OPEN	N.A./ N.A.	Diploma [Electronics and Telecommunication]	77.76 %	GOPEN	25000/-	08/08/2015	08/08/2015 14:39:30	Round I	No

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510437210] - Electronics and Telecommunication Engg[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota : 85

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
11	13176	DSE15151395	BHAVSAR KOMAL NARENDRA	F	Type A	OBC-Bhavsar	N.A./ N.A.	Diploma [Electronics and Telecommunication]	77.41 %	GOPEN	30000/-	10/08/2015	10/08/2015 14:18:14	Round I	No
12	13443	DSE15151385	MORKHADE PRATIKSHA VINOD	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Electronics and Telecommunication]	77.29 %	GOPEN	20000/-	10/08/2015	10/08/2015 14:27:09	Round I	No
13	14112	DSE15152707	VANI MAYURI DEVIDAS	F	Type A	OBC-Lad Shakhiy Wani	N.A./ N.A.	Diploma [Electronics and Telecommunication]	76.94 %	GOPEN	10000/-	11/08/2015	11/08/2015 13:13:23	Round I	No
14	14201	DSE15152383	PATIL CHETAN AJITRAO	M	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Electronics and Telecommunication]	76.88 %	GOPEN	15000/-	11/08/2015	11/08/2015 14:17:21	Round I	No
15	15479	DSE15151954	BADGUJAR NITESH RAJENDRA	M	Type A	OBC-Badgujar	N.A./ N.A.	Diploma [Industrial Electronics]	76.29 %	GOPEN	20000/-	08/08/2015	08/08/2015 14:56:29	Round I	No
16	16179	DSE15151513	KHARCHE PUJA RAJENDRA	F	Type A	OBC-Leva Patidar	N.A./ N.A.	Diploma [Electronics and Telecommunication]	75.94 %	GOPEN	42412/-	10/08/2015	10/08/2015 13:21:00	Round I	No
17	16383	DSE15130932	JOSHI DHANASHRI PADMAKAR	F	Type A	OPEN	N.A./ N.A.	Diploma [Electronics and Telecommunication]	75.83 %	GOPEN	5000/-	10/08/2015	10/08/2015 16:19:33	Round I	No
18	17592	DSE15151347	WANI AARATI NARENDRA	F	Type A	OBC-Kathar wani	N.A./ N.A.	Diploma [Electronics and Telecommunication]	75.29 %	GOPEN	42412/-	09/08/2015	09/08/2015 13:23:26	Round I	No
19	18036	DSE15152083	BADGUJAR HARSHA KAMALAKAR	F	Type A	OBC-Badgujar	N.A./ N.A.	Diploma [Electronics and Telecommunication]	75.12 %	GOPEN	48270/-	09/08/2015	09/08/2015 15:40:13	Round I	No
20	18909	DSE15151483	DEEPTI DNYANESHWAR BAVISKAR	F	Type A	SC-Chambhar	N.A./ N.A.	Diploma [Electronics and Telecommunication]	75.00 %	GOPEN	9724/-	08/08/2015	08/08/2015 13:43:33	Round I	No

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510437210] - Electronics and Telecommunication Engg[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota : 85

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
21	18585	DSE15158920	WAGH ASHWINI PANDURANG	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Electronics and Telecommunication]	75.00 %	GOPEN	28270/-	10/08/2015	10/08/2015 13:10:08	Round I	No
22	20858	DSE15151321	PATIL PRIYANKA SUBHASH	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Electronics and Telecommunication]	73.94 %	GOPEN	42412/-	11/08/2015	11/08/2015 16:40:46	Round I	No
23	20927	DSE15151734	PATIL KARISHMA BHASKAR	F	Type A	OBC-Leva Patidar	N.A./ N.A.	Diploma [Electronics and Telecommunication]	73.88 %	GOPEN	23270/-	09/08/2015	09/08/2015 15:43:30	Round I	No
24	21571	DSE15152581	BHAVSAR AKSHAY ARUN	M	Type A	OBC-Bhavsar	N.A./ N.A.	Diploma [Electronics and Telecommunication]	73.65 %	GOPEN	42412/-	08/08/2015	08/08/2015 16:31:29	Round I	No
25	22320	DSE15151736	PAYAL PATIL	F	Type A	OBC-Leva Patidar	N.A./ N.A.	Diploma [Electronics and Telecommunication]	73.35 %	GOPEN	28270/-	09/08/2015	09/08/2015 15:45:03	Round I	No
26	25570	DSE15151326	PATIL KOMAL RAJENDRA	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Electronics and Communication Engineering]	72.18 %	GOPEN	13270/-	09/08/2015	09/08/2015 16:57:28	Round I	No
27	26383	DSE15105297	PATIL BHARATI RAMKRUSHNA	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Electronics and Telecommunication]	71.88 %	GOPEN	10000/-	10/08/2015	10/08/2015 15:30:45	Round I	No
28	26392	DSE15151614	PATIL NUTAN NANASAHEB	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Electronics and Telecommunication]	71.88 %	GOPEN	15000/-	10/08/2015	10/08/2015 16:43:59	Round I	No
29	26948	DSE15151764	KAMALSKAR MEGHANA MANOHAR	F	Type A	OBC-Kantharwani	N.A./ N.A.	Diploma [Electronics and Telecommunication]	71.65 %	GOPEN	1000/-	09/08/2015	09/08/2015 14:49:25	Round I	No
30	27888	DSE15151053	MANDAL SWATI PARIMAL	F	Type A	OPEN	N.A./ N.A.	Diploma [Computer Engineering]	71.31 %	LVJDT	78559/-	10/08/2015	10/08/2015 15:03:58	Round I	No

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510437210] - Electronics and Telecommunication Engg[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota : 85

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
31	27970	DSE15157226	PAWAR GAURI BABULAL	F	Type A	OBC-Kunbi Maratha	N.A./ N.A.	Diploma [Electronics and Telecommunication]	71.29 %	GOPEN	8270/-	09/08/2015	09/08/2015 15:17:39	Round I	No
32	31150	DSE15159837	PATIL BHAVESH RAJENDRA	M	Type A	OBC-Mali	N.A./ Ex Service Personnel Defence Candidate - (Def-1)	Diploma [Electronics and Telecommunication]	70.18 %	DEF	24000/-	10/08/2015	10/08/2015 16:05:24	Round I	No
33	31274	DSE15158707	KASAR HARSHAL ANIL	M	Type A	OBC-Kasar	N.A./ N.A.	Diploma [Electronics and Communication Engineering]	70.12 %	GOBC	10000/-	10/08/2015	10/08/2015 14:31:42	Round I	No
34	31672	DSE15151327	SALI PRERANA PRAMOD	F	Type A	SBC-Sali	N.A./ N.A.	Diploma [Electronics and Telecommunication]	70.00 %	LOBC	0/-	08/08/2015	08/08/2015 15:34:50	Round I	No
35	31840	DSE15152437	KATHAR GANESH HARICHANDRA	M	Type A	OBC-Kathar wani	N.A./ N.A.	Diploma [Electronics and Telecommunication]	69.94 %	GOBC	5000/-	10/08/2015	10/08/2015 14:25:41	Round I	No
36	33096	DSE15151320	SURADKAR ANKITA CHANDRAKANT	F	Type A	SBC-Koli	N.A./ N.A.	Diploma [Electronics and Telecommunication]	69.53 %	LOBC	7994/-	11/08/2015	11/08/2015 12:13:51	Round I	No
37	33269	DSE15159778	PATIL SWAPNIL SAMADHAN	M	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Electronics and Communication Engineering]	69.47 %	GOBC	29000/-	11/08/2015	11/08/2015 15:46:16	Round I	No
38	33735	DSE15159137	MAHAJAN RAHUL VISHNU	M	Type A	OBC-Mali	N.A./ N.A.	Diploma [Industrial Electronics]	69.31 %	GOBC	10000/-	10/08/2015	10/08/2015 11:42:05	Round I	No
39	34168	DSE15152096	KUMBHAR KALYANI RAMESHWAR	F	Type A	OBC-Kumbhar or Kumhar	N.A./ N.A.	Diploma [Electronics and Telecommunication]	69.18 %	LOBC	10154/-	09/08/2015	09/08/2015 15:08:58	Round I	No
40	36511	DSE15151255	SONAWANE RUPALI SUNIL	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Electronics and Telecommunication]	68.41 %	LOBC	42412/-	08/08/2015	08/08/2015 12:54:42	Round I	No

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DIRECTORATE OF TECHNICAL EDUCATION, MAHARASHTRA STATE, MUMBAI

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510437210] - Electronics and Telecommunication Engg[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota : 85

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
41	37267	DSE15151286	SHUBHAM SUNIL SONAWANE	M	Type A	SBC-Koli	N.A./ N.A.	Diploma [Electronics and Communication Engineering]	68.18 %	GOBC	9724/-	10/08/2015	10/08/2015 16:49:51	Round I	No
42	37302	DSE15159769	KOLI RAJESH KISHOR	M	Type A	SBC-Koli	N.A./ N.A.	Diploma [Electronics and Telecommunication]	68.17 %	GOBC	7014/-	09/08/2015	09/08/2015 14:45:05	Round I	No
43	37496	DSE15151741	PATIL PRIYANKA ASHOK	F	Type A	OBC-Reve Gujar	N.A./ N.A.	Diploma [Electronics and Telecommunication]	68.06 %	LOBC	41432/-	09/08/2015	09/08/2015 14:54:59	Round I	No
44	37813	DSE15159900	LASHKARE NEHA RATILAL	F	Type A	NT 3 (NT-D)-Vanjari	N.A./ N.A.	Diploma [Electronics and Telecommunication]	68.00 %	GNTD	9724/-	11/08/2015	11/08/2015 14:00:32	Round I	No
45	38611	DSE15151185	PATIL RISHIKESH VIJAYSING	M	Type A	OPEN	N.A./ N.A.	Diploma [Electronics and Telecommunication]	67.71 %	GOPEN	30000/-	11/08/2015	11/08/2015 13:43:27	Round I	No
46	39279	DSE15159830	PATIL AISHVARYA DNYANESHWAR	F	Type A	OPEN	N.A./ N.A.	Diploma [Electronics and Communication Engineering]	67.47 %	LOPEN	5000/-	11/08/2015	11/08/2015 11:50:11	Round I	No
47	40575	DSE15152415	PAWAR NIKHIL RAJENDRA	M	Type A	OBC-Badgujar	N.A./ N.A.	Diploma [Electronics and Telecommunication]	67.06 %	GOBC	8270/-	09/08/2015	09/08/2015 17:36:35	Round I	No
48	42577	DSE15151006	JOSHI SAGAR SUNIL	M	Type A	OPEN	N.A./ N.A.	Diploma [Electronics and Communication Engineering]	66.41 %	LSC	10000/-	10/08/2015	10/08/2015 15:26:04	Round I	No
49	43700	DSE15151201	RAJPUT MONIKASING MAHENDRASING	F	Type A	OPEN	N.A./ N.A.	Diploma [Electronics and Telecommunication]	66.06 %	GST	25000/-	10/08/2015	10/08/2015 11:51:03	Round I	No
50	44647	DSE15151976	KHAMBAYAT NIKHIL NATTHU	M	Type A	OBC-Navi or Nhavi	N.A./ N.A.	Diploma [Electronics and Telecommunication]	65.76 %	GOBC	42412/-	08/08/2015	08/08/2015 16:27:15	Round I	No

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510437210] - Electronics and Telecommunication Engg[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota : 85

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
51	45318	DSE15151861	MANORE RENUKA DHANRAJ	F	Type A	NT 2 (NT-C)-Dhangar	N.A./ N.A.	Diploma [Electronics and Telecommunication]	65.53 %	LNTC	10000/-	08/08/2015	08/08/2015 14:36:36	Round I	No
52	49026	DSE15159090	KHALANE RAHUL SANJAY	M	Type A	OBC-Mali	N.A./ N.A.	Diploma [Electronics and Communication Engineering]	64.35 %	GOBC	10000/-	10/08/2015	10/08/2015 14:39:24	Round I	No
53	51538	DSE15151880	SHIRUDE VIVEK RAJENDRA	M	Type A	OBC-Wani	N.A./ N.A.	Diploma [Electronics and Telecommunication]	63.53 %	GSC	20000/-	10/08/2015	10/08/2015 14:33:23	Round I	No
54	52307	DSE15117102	SHINDE SATISAVITRI KAUTIKRAO	F	Type A	OPEN	N.A./ N.A.	Diploma [Electronics]	63.26 %	GST	33270/-	09/08/2015	09/08/2015 16:45:02	Round I	No
55	53913	DSE15152778	CHAUDHARI RAMESHWARI KAILAS	F	Type A	OBC-Dode Gujar	N.A./ N.A.	Diploma [Electronics and Telecommunication]	62.71 %	GSC	18270/-	09/08/2015	09/08/2015 16:26:00	Round I	No
56	54962	DSE15159768	GALA DIVY SANJAY	M	Type A	OPEN	N.A./ N.A.	Diploma [Electronics and Communication Engineering]	62.34 %	GST	28000/-	10/08/2015	10/08/2015 14:24:05	Round I	No
57	55754	DSE15165778	NIKAM SUWARNA SAHEBRAO	F	Type A	SC-Chambhar	N.A./ N.A.	Diploma [Electronics and Telecommunication]	62.06 %	LSC	500/-	10/08/2015	10/08/2015 13:50:58	Round I	No
58	58289	DSE15165281	PATIL RUPALI BHAGWAN	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Electronics and Telecommunication]	61.14 %	GSC	44142/-	10/08/2015	10/08/2015 15:17:15	Round I	No
59	58748	DSE15159811	PATKI NEEHAR SANJAY	M	Type A	OPEN	N.A./ N.A.	Diploma [Electronics and Telecommunication]	60.97 %	LST	25000/-	08/08/2015	08/08/2015 14:41:04	Round I	No
60	61761	DSE15151510	BARKALE VIPUL BHANUDAS	M	Type A	OBC-Kunbi Maratha	N.A./ N.A.	Diploma [Electronics and Telecommunication]	60.00 %	GSC	18270/-	08/08/2015	08/08/2015 15:24:46	Round I	No

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510437210] - Electronics and Telecommunication Engg[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota : 85

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
61	62583	DSE15159775	CHAUDHARI VINIT SANTOSH	M	Type A	OBC-Leva Patidar	N.A./ N.A.	Diploma [Electronics and Telecommunication]	59.60 %	GSC	44142/-	08/08/2015	08/08/2015 13:46:12	Round I	No
62	63519	DSE15107836	GORE PRASAD RAJKUMAR	M	Type A	NT 3 (NT-D)-Vanjari	N.A./ N.A.	Diploma [Electronics]	59.03 %	LSC	9724/-	10/08/2015	10/08/2015 17:21:11	Round I	No
63	66061	DSE15151246	SOMANI PRIYANKA SHANTILAL	F	Type A	OPEN	N.A./ N.A.	Diploma [Electronics and Telecommunication]	57.71 %	LST	10000/-	10/08/2015	10/08/2015 15:45:41	Round I	No
64	69125	DSE15151023	SOMANI HARSHAL PRADIP	M	Type A	OPEN	N.A./ N.A.	Diploma [Electronics and Telecommunication]	55.26 %	GVJDT	10000/-	08/08/2015	08/08/2015 14:06:23	Round I	No
65	7168	DSE15151290	MORE KOMAL BAPURAO	F	Type A	OBC-Kunbi Maratha	N.A./ N.A.	Diploma [Electronics and Telecommunication]	81.00 %	LOPEN	42412/-	17/08/2015	17/08/2015 15:29:19	Round II	No
66	9424	DSE15151314	TITARE NAYANA KRISHNA	F	Type A	NT 2 (NT-C)-Dhangar	N.A./ N.A.	Diploma [Electronics and Telecommunication]	79.53 %	LOPEN	7994/-	20/08/2015	20/08/2015 15:43:59	Round II	No
67	10094	DSE15153270	PALLAVI SANJAY PAWAR	F	Type A	OPEN	N.A./ N.A.	Diploma [Electronics and Telecommunication]	79.12 %	LOPEN	76829/-	17/08/2015	17/08/2015 15:08:17	Round II	No
68	11091	DSE15161064	SHIRSATH SONALI RAVINDRA	F	Type A	OBC-Nabhik	N.A./ N.A.	Diploma [Electronics and Telecommunication]	78.53 %	GOPEN	42412/-	17/08/2015	17/08/2015 14:57:24	Round II	No
69	18841	DSE15107025	MAHAJAN VISHAL SHIVAJI	M	Type A	OBC-Mali	N.A./ N.A.	Diploma [Electronics and Communication Engineering]	75.00 %	GOBC	42412/-	17/08/2015	17/08/2015 16:24:23	Round II	No
70	24868	DSE15151325	DEORE RAJASHREE SANJAY	F	Type A	OBC-Mali	N.A./ N.A.	Diploma [Electrical Engineering]	72.42 %	GVJDT	42412/-	17/08/2015	17/08/2015 17:52:49	Round II	No

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510437210] - Electronics and Telecommunication Engg[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota : 85

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
71	30155	DSE15101002	SABLE PAVANKUMAR GAJANAN	M	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Electronics]	70.53 %	GOBC	42412/-	19/08/2015	19/08/2015 15:51:51	Round II	No
72	32265	DSE15152322	YEOLE ANIL TUKARAM	M	Type A	OBC-Lad Shakhiy Wani	N.A./ N.A.	Diploma [Electronics and Telecommunication]	69.82 %	GOBC	42412/-	18/08/2015	18/08/2015 14:56:53	Round II	No
73	33105	DSE15158474	PATIL GIRISHRAO SURESH	M	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Electronics and Telecommunication]	69.53 %	GNTC	42412/-	18/08/2015	18/08/2015 12:56:14	Round II	No
74	33985	DSE15106245	WANKHADE RAVINDRA ASHOK	M	Type A	SC-Matang	N.A./ N.A.	Diploma [Electronics and Telecommunication]	69.24 %	GSC	0/-	19/08/2015	19/08/2015 13:13:28	Round II	No
75	37040	DSE15151332	PATIL PRIYANKA SANJAY	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Electronics and Telecommunication]	68.24 %	GSC	42412/-	17/08/2015	17/08/2015 16:01:33	Round II	No
76	52839	DSE15152611	KHATIK SHAIBAJ MOHAMMAD	M	Type A	OBC-Khatik	N.A./ N.A.	Diploma [Electronics and Telecommunication]	63.09 %	GSC	42412/-	18/08/2015	18/08/2015 14:17:40	Round II	No
77	56915	DSE15151882	CHAVAN SHUBHAM RAKESH	M	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Electronics and Telecommunication]	61.65 %	GOPEN	11000/-	28/08/2015	28/08/2015 12:22:08	Round III	No

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510437210] - Electronics and Telecommunication Engg[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota : 8

Admitted Candidates List In Against CAP

Sr No.	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Reported Date	Round	Admitted/ Reported Late
1	DSE15403267	AHIRE BHARATI DINKAR	F	Type A	OPEN	N.A./ N.A.	Diploma [Electronics and Communication Engineering]	63.09 %	ACAP	28360/-	26/08/2015	08/09/2015 12:10:33	Institute Level	**No**
2	DSE15403281	KASAR AISHWARYA DILIP	F	Type A	OPEN	N.A./ N.A.	Diploma [Electronics and Communication Engineering]	64.63 %	ACAP	22084/-	25/08/2015	08/09/2015 12:19:44	Institute Level	**No**
3	DSE15405215	KAPADNE BHUSHAN VANA	M	Type A	OPEN	N.A./ N.A.	Diploma [Electronics and Communication Engineering]	62.40 %	ACAP	20000/-	10/08/2015	16/09/2015 18:05:16	Institute Level	**No**

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510437210] - Electronics and Telecommunication Engg[First Shift]

Summary of Admitted Candidates for Direct Second Year Engineering / Technology 2015-2016

Summary

Sr No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP Seats+CAPMI Seats	85(85+0)	77	0	77
2.	Against CAP Seats		3	0	3
3.	Minority Seats	0	0	0	0
5.	Over And Above Seats	0	0	0	0
Total		85	80	0	80

Seat Type used for Institute Level Admissions : Against CAP, Minority Seat, Against Minority Seat,Over and Above

Cut-Off Date for Admission : 10/09/2015
Cut-Off Date for Uploading : 16/09/2015

Legends -
* : Admitted After Cut-off Date(10/09/2015) (For eg.11/09/2015 *)
# : Uploaded After Uploading Date(16/09/2015) (For eg.17/09/2015 #)
$: Non-Minority Candidates admitted against minority seat.Permission letters from authority to be attached.
- : Not Applicable

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DIRECTORATE OF TECHNICAL EDUCATION, MAHARASHTRA STATE, MUMBAI

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510429310] - Electrical Engineering[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota(CAP Seats+CAPMI) : 23(23+0)

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1	1611	DSE15151895	CHAUDHARI VIVEK MADHUKAR	M	Type A	OBC-Leva Patidar	N.A./ N.A.	Diploma [Electrical Engineering]	86.73 %	GOPEN	24000/-	08/08/2015	08/08/2015 14:11:16	Round I	No
2	3030	DSE15165054	RANE PUJA BHASKAR	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Electrical Engineering]	84.67 %	LOPEN	18270/-	09/08/2015	09/08/2015 13:29:46	Round I	No
3	3756	DSE15151070	PANAT CHAITRA NITIN	F	Type A	OPEN	N.A./ N.A.	Diploma [Electrical Engineering]	83.82 %	LOPEN	27290/-	09/08/2015	09/08/2015 15:01:13	Round I	No
4	5018	DSE15165053	RANE JAGRUTI SANJAY	F	Type A	OBC-Leva Patidar	N.A./ N.A.	Diploma [Electrical Engineering]	82.67 %	LOPEN	21270/-	09/08/2015	09/08/2015 12:58:20	Round I	No
5	5156	DSE15151323	ZOPE MRUNALI RAJESH	F	Type A	OBC-Leva Patidar	N.A./ N.A.	Diploma [Electrical Engineering]	82.55 %	GOPEN	44142/-	08/08/2015	08/08/2015 14:25:31	Round I	No
6	5450	DSE15134921	MADHAVAN BORA	M	Type A	OPEN	N.A./ N.A.	Diploma [Electrical Engineering]	82.30 %	GOPEN	30000/-	11/08/2015	11/08/2015 14:51:02	Round I	No
7	5968	DSE15159770	DESALE AKASH BHIKA	M	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Electrical Engineering]	81.88 %	GOPEN	42412/-	08/08/2015	08/08/2015 15:54:57	Round I	No
8	6750	DSE15158897	PATIL MANOHAR AMRUT	M	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Electrical Engineering]	81.27 %	GOPEN	25000/-	10/08/2015	10/08/2015 16:29:43	Round I	No
9	9316	DSE15155120	BHANDARKAR LALIT RAJENDRA	M	Type A	OBC-Shimpi	N.A./ N.A.	Diploma [Electrical Engineering]	79.59 %	GOPEN	13270/-	08/08/2015	08/08/2015 16:20:54	Round I	No
10	9340	DSE15151324	PATIL TRUPTI SATISH	F	Type A	OBC-Leva Patidar	N.A./ N.A.	Diploma [Electrical Engineering]	79.58 %	LOBC	42412/-	08/08/2015	08/08/2015 13:23:18	Round I	No

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510429310] - Electrical Engineering[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota : 23

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
11	9428	DSE15152016	WAKHARKAR HRUDAYA SUNIL	F	Type A	OBC-Sonar	N.A./ N.A.	Diploma [Electrical Engineering]	79.52 %	GOBC	44142/-	10/08/2015	10/08/2015 16:08:40	Round I	No
12	9923	DSE15151322	ISAI MAYURI GHANASHYAM	F	Type A	OBC-Shimpi	N.A./ N.A.	Diploma [Electrical Engineering]	79.21 %	GOBC	23270/-	08/08/2015	08/08/2015 13:05:04	Round I	No
13	11041	DSE15165186	PATIL MAYURI AVINASH	F	Type A	NT 2 (NT-C)-Hatkar	N.A./ N.A.	Diploma [Electrical Engineering]	78.55 %	GNTC	8270/-	09/08/2015	09/08/2015 13:16:16	Round I	No
14	19255	DSE15151992	BHOI YOGESH TULSHIRAM	M	Type A	NT 1 (NT-B)-Bhoi	N.A./ N.A.	Diploma [Electrical Engineering]	74.97 %	GNTB	0/-	08/08/2015	08/08/2015 13:29:04	Round I	No
15	21290	DSE15151740	AKHADE SANDESHKUMAR AMRUT	M	Type A	SC-Mahar	N.A./ N.A.	Diploma [Electrical Engineering]	73.76 %	GSC	9724/-	10/08/2015	10/08/2015 14:56:09	Round I	No
16	25043	DSE15151738	BATTISE SAGAR GOPICHAND	M	Type A	SC-Mahar	N.A./ N.A.	Diploma [Electrical Engineering]	72.36 %	GSC	9724/-	10/08/2015	10/08/2015 14:53:13	Round I	No
17	27678	DSE15111259	PAGARE AMOL SUKHDEV	M	Type A	SC-Mahar	N.A./ N.A.	Diploma [Electrical Engineering]	71.39 %	GST	9724/-	11/08/2015	11/08/2015 14:27:20	Round I	No
18	30380	DSE15151781	TAYADE BHARAT ASHOK	M	Type A	SC-Chambhar	N.A./ N.A.	Diploma [Electrical Engineering]	70.42 %	LST	9724/-	08/08/2015	08/08/2015 15:02:14	Round I	No
19	47794	DSE15152769	MAHAJAN HARISH RATAN	M	Type A	OBC-Mali	N.A./ Ex Service Personnel Defence Candidate - (Def-1)	Diploma [Electrical Engineering]	64.73 %	DEF	20270/-	09/08/2015	09/08/2015 15:25:26	Round I	No
20	12274	DSE15152523	PATIL HEMANT ANIIL	M	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Electrical Engineering]	77.88 %	GOBC	42412/-	17/08/2015	17/08/2015 15:00:02	Round II	No

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510429310] - Electrical Engineering[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota : 23

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
21	13219	DSE15151946	KOLHE JAGRUTI GOPAL	F	Type A	OBC-Leva Patidar	N.A./ N.A.	Diploma [Electrical Engineering]	77.39 %	PWDC	42412/-	17/08/2015	17/08/2015 17:50:21	Round II	No
22	13580	DSE15151583	YEOLE ROHINI PURUSHOTTAM	F	Type A	OBC-Leva Patidar	N.A./ N.A.	Diploma [Electrical Engineering]	77.21 %	GOPEN	42412/-	17/08/2015	17/08/2015 14:49:25	Round II	No
23	66068	DSE15105222	ZANKE NEHA PRAMOD	F	Type A	SC-Buddhist	N.A./ N.A.	Diploma [Electrical Engineering]	57.70 %	LSC	7994/-	20/08/2015	20/08/2015 15:54:16	Round II	No

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510429310] - Electrical Engineering[First Shift]

Summary of Admitted Candidates for Direct Second Year Engineering / Technology 2015-2016

Summary

Sr No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP Seats+CAPMI Seats	23(23+0)	23	0	23
2.	Against CAP Seats		0	0	0
3.	Minority Seats	0	0	0	0
5.	Over And Above Seats	0	0	0	0
Total		23	23	0	23

Seat Type used for Institute Level Admissions : Against CAP, Minority Seat, Against Minority Seat,Over and Above

Cut-Off Date for Admission : 10/09/2015
Cut-Off Date for Uploading : 16/09/2015

Legends -
* : Admitted After Cut-off Date(10/09/2015) (For eg.11/09/2015 *)
# : Uploaded After Uploading Date(16/09/2015) (For eg.17/09/2015 #)
$: Non-Minority Candidates admitted against minority seat.Permission letters from authority to be attached.
- : Not Applicable

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424610] - Information Technology[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota(CAP Seats+CAPMI) : 48(48+0)

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1	13858	DSE15151418	RANE TINKESH VASANT	M	Type A	OBC-Leva Patidar	N.A./ N.A.	Diploma [Information Technology]	77.06 %	GOPEN	44142/-	10/08/2015	10/08/2015 11:36:53	Round I	No
2	18893	DSE15159776	SAGAR AHIRE	M	Type A	SC-Mahar	N.A./ N.A.	Diploma [Information Technology]	75.00 %	GOPEN	9724/-	08/08/2015	08/08/2015 13:56:19	Round I	No
3	20810	DSE15151919	MAHAJAN ASHWINI SANDIP	F	Type A	OBC-Mali	N.A./ N.A.	Diploma [Information Technology]	73.94 %	LOPEN	42412/-	09/08/2015	09/08/2015 15:28:37	Round I	No
4	23797	DSE15151963	MAHAJAN MAYURI DINESH	F	Type A	DT/VJ-Rajput Bhamta	N.A./ N.A.	Diploma [Information Technology]	72.82 %	LOPEN	8724/-	08/08/2015	08/08/2015 13:33:26	Round I	No
5	26408	DSE15151457	SHIRODE UDAY VILAS	M	Type A	OBC-Lad Shakhiy Wani	N.A./ N.A.	Diploma [Computer Engineering]	71.88 %	GOPEN	20000/-	08/08/2015	08/08/2015 14:43:29	Round I	No
6	26728	DSE15159755	BHADANE KALYANI RAJENDRA	F	Type A	OBC-Lad Shakhiy Wani	N.A./ N.A.	Diploma [Computer Engineering]	71.75 %	LOPEN	23000/-	10/08/2015	10/08/2015 15:29:26	Round I	No
7	33266	DSE15151881	PATIL JAGRUTI SUNIL	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Information Technology]	69.47 %	GOPEN	44142/-	10/08/2015	10/08/2015 14:42:04	Round I	No
8	39660	DSE15151354	BORSE RAJASHREE KRUSHNA	F	Type A	SC-Mahar	N.A./ N.A.	Diploma [Information Technology]	67.35 %	GOPEN	9724/-	10/08/2015	10/08/2015 11:26:33	Round I	No
9	40065	DSE15159146	PATIL HARISH SANJIV	M	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Information Technology]	67.24 %	GOPEN	10000/-	08/08/2015	08/08/2015 17:19:02	Round I	No
10	42383	DSE15152642	PATIL PRATIKSHA DNYANESHWAR	F	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Information Technology]	66.47 %	GOPEN	21000/-	11/08/2015	11/08/2015 15:09:04	Round I	No

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424610] - Information Technology[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota : 48

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
11	46834	DSE15158773	PAWAR RAHUL HIMMATRAO	M	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Information Technology]	65.06 %	GOPEN	18000/-	10/08/2015	10/08/2015 15:57:07	Round I	No
12	47010	DSE15151778	TAYADE LALIT AJAY	M	Type A	SC-Mahar	N.A./ N.A.	Diploma [Information Technology]	65.00 %	GOPEN	2290/-	09/08/2015	09/08/2015 14:39:09	Round I	No
13	53226	DSE15151594	SONAWANE TRUPTI RAJENDRA	F	Type A	OBC-Shimpi	N.A./ N.A.	Diploma [Information Technology]	62.94 %	GOPEN	20000/-	10/08/2015	10/08/2015 14:35:47	Round I	No
14	60356	DSE15151099	PATIL MINAL SHIRISHBHAI	F	Type A	OPEN	N.A./ N.A.	Diploma [Information Technology]	60.38 %	GOPEN	76829/-	09/08/2015	09/08/2015 15:11:26	Round I	No
15	61470	DSE15155464	DUSANE BHAGYASHRI LAXMIKANT	F	Type A	OBC-Sonar	N.A./ N.A.	Diploma [Information Technology]	60.00 %	LOBC	20000/-	11/08/2015	11/08/2015 15:39:07	Round I	No
16	64710	DSE15151836	KARANDE NIKHIL RAVINDRA	M	Type A	OBC-Leva Patil	N.A./ N.A.	Diploma [Information Technology]	58.44 %	GOBC	41412/-	09/08/2015	09/08/2015 13:25:24	Round I	No
17	68605	DSE15151079	BARPANDE MAYUR KALIDAS	M	Type A	OPEN	N.A./ N.A.	Diploma [Information Technology]	55.81 %	GOPEN	75849/-	08/08/2015	08/08/2015 15:51:39	Round I	No
18	18554	DSE15151066	SAFIYA PATEL	F	Type A	OPEN	N.A./ N.A.	Diploma [Information Technology]	75.00 %	LOPEN	76829/-	17/08/2015	17/08/2015 12:53:26	Round II	No
19	18601	DSE15151703	MAHAJAN MAHESH RAMESH	M	Type A	OBC-Phulmali	N.A./ N.A.	Diploma [Computer Engineering]	75.00 %	GOPEN	42412/-	19/08/2015	19/08/2015 15:41:36	Round II	No
20	32513	DSE15151389	ARCHANA GANESH BADGUJAR	F	Type A	OBC-Badgujar	N.A./ N.A.	Diploma [Computer Engineering]	69.75 %	GOPEN	42412/-	17/08/2015	17/08/2015 11:39:04	Round II	No

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DIRECTORATE OF TECHNICAL EDUCATION, MAHARASHTRA STATE, MUMBAI

3, Mahapalika Marg, Elphinstone Technical Highschool Campus, Mumbai - 400001.

5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424610] - Information Technology[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota : 48

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
21	34828	DSE15151261	NAYANA SUNIL ZUNZARRAO	F	Type A	OBC-Navi or Nhavi	N.A./ N.A.	Diploma [Computer Engineering]	68.94 %	GOPEN	42412/-	17/08/2015	17/08/2015 14:40:05	Round II	No
22	45100	DSE15151117	SOHALE DARSHANA RAJESH	F	Type A	OPEN	N.A./ N.A.	Diploma [Computer Engineering]	65.63 %	GOPEN	76829/-	19/08/2015	19/08/2015 12:46:56	Round II	No

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DIRECTORATE OF TECHNICAL EDUCATION, MAHARASHTRA STATE, MUMBAI

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424610] - Information Technology[First Shift]

Summary of Admitted Candidates for Direct Second Year Engineering / Technology 2015-2016

Summary

Sr No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP Seats+CAPMI Seats	48(48+0)	22	0	22
2.	Against CAP Seats		0	0	0
3.	Minority Seats	0	0	0	0
5.	Over And Above Seats	0	0	0	0
Total		48	22	0	22

Seat Type used for Institute Level Admissions : Against CAP, Minority Seat, Against Minority Seat,Over and Above

Cut-Off Date for Admission : 10/09/2015
Cut-Off Date for Uploading : 16/09/2015

Legends -
* : Admitted After Cut-off Date(10/09/2015) (For eg.11/09/2015 *)
# : Uploaded After Uploading Date(16/09/2015) (For eg.17/09/2015 #)
$: Non-Minority Candidates admitted against minority seat.Permission letters from authority to be attached.
- : Not Applicable

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DIRECTORATE OF TECHNICAL EDUCATION, MAHARASHTRA STATE, MUMBAI

3, Mahapalika Marg, Elphinstone Technical Highschool Campus, Mumbai - 400001.

5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510461210] - Mechanical Engineering[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota(CAP Seats+CAPMI) : 24(24+0)

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1	2384	DSE15151097	DESHPANDE SHREYAS SUNIL	M	Type A	OPEN	N.A./ N.A.	Diploma [Mechanical Engineering]	85.47 %	GOPEN	78559/-	09/08/2015	10/08/2015 14:05:51	Round I	No
2	3403	DSE15155063	MAHAJAN PRASHANT RAMESH	M	Type A	OBC-Mali	N.A./ N.A.	Diploma [Mechanical Engineering]	84.24 %	GOPEN	44142/-	10/08/2015	10/08/2015 14:30:01	Round I	No
3	3464	DSE15152307	KOLI SAGAR KAILAS	M	Type A	SBC-Koli	N.A./ N.A.	Diploma [Mechanical Engineering]	84.13 %	GOPEN	8000/-	11/08/2015	11/08/2015 14:58:40	Round I	No
4	3537	DSE15151482	BUTE SHREYAS ASHOK	M	Type A	OBC-Sonar	N.A./ N.A.	Diploma [Mechanical Engineering]	84.06 %	GOPEN	13270/-	09/08/2015	09/08/2015 15:49:13	Round I	No
5	3587	DSE15151411	BAVISKAR MAYUR PRAKASH	M	Type A	SBC-Koli Suryawanshi	N.A./ N.A.	Diploma [Mechanical Engineering]	84.00 %	GOPEN	78559/-	10/08/2015	10/08/2015 14:04:29	Round I	No
6	4777	DSE15159895	BARI RAKESH RAGHUNATH	M	Type A	OBC-Bari	N.A./ N.A.	Diploma [Mechanical Engineering]	82.88 %	GOPEN	44142/-	10/08/2015	10/08/2015 17:23:48	Round I	No
7	5037	DSE15151403	POTDAR SWAPNIL ASHOK	M	Type A	OBC-Sonar	N.A./ N.A.	Diploma [Mechanical Engineering]	82.65 %	GOPEN	42270/-	09/08/2015	09/08/2015 12:11:13	Round I	No
8	5040	DSE15159706	CHAUDHARI RASHMI PRAMOD	F	Type A	OBC-Leva Patidar	N.A./ N.A.	Diploma [Mechanical Engineering]	82.65 %	LOPEN	42412/-	09/08/2015	09/08/2015 15:20:02	Round I	No
9	5390	DSE15107195	PATIL AKASH PRABHAKAR	M	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Mechanical Engineering]	82.35 %	GOBC	10000/-	11/08/2015	11/08/2015 14:33:34	Round I	No
10	5682	DSE15151862	PATIL HARSHAL BHAGWAN	M	Type A	OBC-Gujar	N.A./ N.A.	Diploma [Mechanical Engineering]	82.12 %	GOBC	24800/-	10/08/2015	10/08/2015 17:25:40	Round I	No

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DIRECTORATE OF TECHNICAL EDUCATION, MAHARASHTRA STATE, MUMBAI

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510461210] - Mechanical Engineering[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota : 24

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
11	7499	DSE15159795	PATIL PRAFUL JITENDRA	M	Type A	OBC-Kunabi	N.A./ N.A.	Diploma [Mechanical Engineering]	80.76 %	GOBC	18270/-	10/08/2015	10/08/2015 13:13:02	Round I	No
12	8580	DSE15162371	KOLI SAGAR ASHOK	M	Type A	SBC-Koli	N.A./ N.A.	Diploma [Mechanical Engineering]	80.06 %	GOBC	9724/-	10/08/2015	10/08/2015 15:06:37	Round I	No
13	9017	DSE15151228	MAHAJAN POOJA LILADHAR	F	Type A	OPEN	N.A./ N.A.	Diploma [Mechanical Engineering]	79.76 %	LOPEN	20000/-	10/08/2015	10/08/2015 16:07:12	Round I	No
14	9383	DSE15152028	KAPDANE CHETAN KAILAS	M	Type A	SC-Mahar	N.A./ N.A.	Diploma [Mechanical Engineering]	79.53 %	GSC	9724/-	10/08/2015	10/08/2015 15:24:10	Round I	No
15	13064	DSE15107252	INGLE PRAJAKTA NIMBAJI	F	Type A	OBC-Kumbhar or Kumhar	N.A./ N.A.	Diploma [Mechanical Engineering]	77.47 %	LOBC	38270/-	09/08/2015	09/08/2015 15:21:34	Round I	No
16	14957	DSE15151291	BHALERAO PRASHANT GULABRAO	M	Type A	NT 2 (NT-C)-Dhangar	N.A./ N.A.	Diploma [Mechanical Engineering]	76.53 %	GNTC	9724/-	10/08/2015	10/08/2015 14:28:30	Round I	No
17	15088	DSE15151336	BIRHADE PRANITA VINAYAK	F	Type A	SC-Mahar	N.A./ N.A.	Diploma [Mechanical Engineering]	76.47 %	LSC	9724/-	10/08/2015	10/08/2015 14:40:46	Round I	No
18	20739	DSE15151294	PATIL YOGESH YASHWANT	M	Type A	OBC-Leva Patidar	Blindness - (P1)/ N.A.	Diploma [Mechanical Engineering]	74.00 %	PWDC	35000/-	10/08/2015	10/08/2015 13:52:37	Round I	No
19	50856	DSE15151339	MORE HARSHADA VASUDEO	F	Type A	NT 1 (NT-B)-Bhoi	N.A./ N.A.	Diploma [Mechanical Engineering]	63.76 %	LNTB	0/-	09/08/2015	09/08/2015 15:46:58	Round I	No
20	67056	DSE15158368	NITIN SAINATH BAGUL	M	Type A	ST-Kokni	N.A./ N.A.	Diploma [Automobile Engineering]	57.04 %	LST	9724/-	08/08/2015	08/08/2015 13:49:28	Round I	No

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DIRECTORATE OF TECHNICAL EDUCATION, MAHARASHTRA STATE, MUMBAI

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510461210] - Mechanical Engineering[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota : 24

Admitted Candidates List In CAP Rounds

Sr No.	Merit No	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
21	7990	DSE15152405	HARSHAL SUBHASH BARI	M	Type A	OBC-Bari	N.A./ N.A.	Diploma [Mechanical Engineering]	80.44 %	GOPEN	76829/-	19/08/2015	19/08/2015 15:04:51	Round II	No
22	16696	DSE15159703	CHAUDHARI KIRAN HEMANTKUMAR	F	Type A	OBC-Teli	N.A./ N.A.	Diploma [Mechanical Engineering]	75.71 %	LOPEN	42412/-	17/08/2015	17/08/2015 13:01:18	Round II	No
23	24405	DSE15151426	AHIRE DINESH BAPU	M	Type A	SC-Chambhar	N.A./ N.A.	Diploma [Mechanical Engineering]	72.59 %	GSC	7994/-	17/08/2015	17/08/2015 13:04:58	Round II	No

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DIRECTORATE OF TECHNICAL EDUCATION, MAHARASHTRA STATE, MUMBAI

3, Mahapalika Marg, Elphinstone Technical Highschool Campus, Mumbai - 400001.

5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510461210] - Mechanical Engineering[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Quota : 1

Admitted Candidates List In Against CAP

Sr No.	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Reported Date	Round	Admitted/ Reported Late
1	DSE15403289	CHAUDHARI ROSHAN KADOBA	M	Type A	OPEN	N.A./ N.A.	Diploma [Mechanical Engineering]	63.94 %	ACAP	15360/-	28/08/2015	08/09/2015 12:28:25	Institute Level	**No**

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DIRECTORATE OF TECHNICAL EDUCATION, MAHARASHTRA STATE, MUMBAI

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5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510461210] - Mechanical Engineering[First Shift]

List of admitted candidates to Direct Second Year Engineering / Technology 2015-2016

Over And Above Admitted Candidates List

Sr No.	Application ID	Name	Gender	Cand Type	Category	PH/ DEF Type	Mode of Admission	Diploma/ B.Sc. %	Seat Type	Fees Paid (₹)	Admission Date	Uploaded Date	Round	Admitted/ Reported Late
1	DSE15403318	MOHSINODDIN MATINODDIN SHAIKH	M	Type B	OPEN	N.A./ N.A.	Diploma [Mechanical Engineering]	67.53 %	OAA	29360/-	31/08/2015	08/09/2015 12:48:33	Institute Level	**No**
2	DSE15404830	KHAN ABDUL AZIM ABDUL AZIZ	M	Type A	OPEN	N.A./ N.A.	Diploma [Mechanical Engineering]	62.12 %	OAA	19084/-	10/09/2015	13/09/2015 14:55:05	Institute Level	**No**

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DIRECTORATE OF TECHNICAL EDUCATION, MAHARASHTRA STATE, MUMBAI
3, Mahapalika Marg, Elphinstone Technical Highschool Campus, Mumbai - 400001.
5104 - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon
[510461210] - Mechanical Engineering[First Shift]
Summary of Admitted Candidates for Direct Second Year Engineering / Technology 2015-2016

Summary

Sr No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP Seats+CAPMI Seats	24(24+0)	23	0	23
2.	Against CAP Seats		1	0	1
3.	Minority Seats	0	0	0	0
5.	Over And Above Seats	2	2	0	2
Total		26	26	0	26

Seat Type used for Institute Level Admissions : Against CAP, Minority Seat, Against Minority Seat,Over and Above

Cut-Off Date for Admission : 10/09/2015
Cut-Off Date for Uploading : 16/09/2015

Legends -
* : Admitted After Cut-off Date(10/09/2015) (For eg.11/09/2015 *)
# : Uploaded After Uploading Date(16/09/2015) (For eg.17/09/2015 #)
$: Non-Minority Candidates admitted against minority seat.Permission letters from authority to be attached.
- : Not Applicable

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Directorate of Technical Education, Maharashtra State

3, Mahapalika Marg, Post Box No.1967, Mumbai-400001

[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510420110] - Environmental Engineering

List of Candidates Admitted to the First Year of Two-Year Full-Time Post Graduate Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 17

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	PH Type	Graduation Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late	Sponsored / Non Sponsored
1.	7223	7.60	ME15108847	THOSAR CHARUDATTA PRAKASH	Male	Type A	SC	NA	68.67	General	15000	03/08/2015	03/08/2015	Round 1	No	Non Sponsored
2.	7987	5.79	ME15109336	NARKHEDE KIRTIMALA LAXMAN	Female	Type A	OBC	NA	77.20	General	30000	03/08/2015	03/08/2015	Round 1	No	Non Sponsored

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Directorate of Technical Education, Maharashtra State

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510420110] - Environmental Engineering

List of Candidates Admitted to the First Year of Two-Year Full-Time Post Graduate Courses in Engineering / Technology for the Academic Year 2015-2016

Admitted Against CAP

Quota : 15

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	PH Type	Graduation Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late	Sponsored / Non Sponsored
1.	6	70.07	ME15700838	SINKAR VAISHALI RAGHUNATH	Female	Type A	Open	NA	70.07	ACAPNS	10000	08/08/2015	16/08/2015	Institute Level	No	Non Sponsored
2.	1	72.07	ME15700806	WANI PAWAN RAMKRISHANA	Male	Type A	Open	NA	72.07	ACAPNS	35000	05/08/2015	16/08/2015	Institute Level	No	Non Sponsored
3.	5	70.31	ME15700848	DESHMUKH CHETAN LILADHAR	Male	Outside Maharashtra - OMS	Open	NA	70.31	ACAPNS	25000	06/08/2015	16/08/2015	Institute Level	No	Non Sponsored
4.	7	69.13	ME15700828	GUJRATHI POOJA DEEPAK	Female	Type A	Open	NA	69.13	ACAPNS	10000	10/08/2015	16/08/2015	Institute Level	No	Non Sponsored
5.	18	65.20	ME15703669	YASHIRAO SWATI PURUSHOTTAM	Female	Type A	Open	NA	65.20	ACAPNS	20000	14/08/2015	16/08/2015	Institute Level	No	Non Sponsored
6.	21	64.27	ME15700816	SHAIKH MOHSIN IBRAHIM	Male	Type A	Open	NA	64.27	ACAPNS	20000	11/08/2015	16/08/2015	Institute Level	No	Non Sponsored
7.	22	64.20	ME15703667	KUWAR HEMANT AMRUTRAO	Male	Type A	OBC	NA	64.20	ACAPNS	23000	14/08/2015	16/08/2015	Institute Level	No	Non Sponsored
8.	23	63.56	ME15701072	SHUKLA ARVIND KUMAR	Male	Outside Maharashtra - OMS	Open	NA	63.56	ACAPNS	1000	01/07/2015	16/08/2015	Institute Level	No	Non Sponsored
9.	24	65.13	ME15704558	CHAUVAN GAURAV PRATAPSINGH	Male	Type A	Open	NA	65.13	ACAPNS	10000	20/08/2015	20/08/2015	Institute Level	No	Non Sponsored
10.	28	62.53	ME15700852	SWETA YUVRAJ WANI	Female	Type A	Open	NA	62.53	ACAPNS	25000	03/08/2015	16/08/2015	Institute Level	No	Non Sponsored
11.	31	61.07	ME15700824	ANSARI YAKUB ZAFARABID	Male	Type A	Open	NA	61.07	ACAPNS	15000	14/08/2015	16/08/2015	Institute Level	No	Non Sponsored
12.	45	60.40	ME15704591	BHERE RAJENDRA TUKARAM	Male	Type A	Open	NA	60.40	ACAPNS	22000	17/08/2015	20/08/2015	Institute Level	No	Non Sponsored

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Directorate of Technical Education, Maharashtra State

3, Mahapalika Marg, Post Box No.1967, Mumbai-400001

[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510420110] - Environmental Engineering

List of Candidates Admitted to the First Year of Two-Year Full-Time Post Graduate Courses in Engineering / Technology for the Academic Year 2015-2016

Institute Level Quota

Quota : 1

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	PH Type	Graduation Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late	Sponsored / Non Sponsored
1.	14	66.93	ME15700857	NEHATEPRIYANKA ASHOK	Female	Type A	Open	NA	66.93	ILNS	36000	07/07/2015	16/08/2015	Institute Level	No	Non Sponsored

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Directorate of Technical Education, Maharashtra State

3, Mahapalika Marg, Post Box No.1967, Mumbai-400001

[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510420110] - Environmental Engineering

Summary of Admitted Candidates for the First Year of Two-Year Full-Time Post Graduate Courses in Engineering / Technology for the Academic Year 2015-2016

Sr. No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP	17	2	0	2
2.	Against CAP		12	0	12
3.	Institute Level	1	1	0	1
4.	Minority	0	0	0	0
5.	J&K Migrant		0	0	0
6.	Others		0	0	0
	Total	**18**	**15**	**0**	**15**

Seat Type used for Institute Level Admissions : ACAP-Against CAP, IL-Institute Level, ILNRI-Institute Level NRI (5% of SI if AICTE Permission), MI-Minority, GoI-Government of India Nominee, NRI-NRI (15% of SI if AICTE Permission), PIO-PIO (15% of SI if AICTE Permission), FNS-FNS (15% of SI if AICTE Permission), CIWGC-Children's of Indian Workers in Gulf Countries (15% of SI if AICTE Permission), OAA-Over and Above

Cut-Off Date for Admission : 22/08/2015
Cut-Off Date for Uploading : 28/08/2015

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424210] - Computer Science and Engineering

List of Candidates Admitted to the First Year of Two-Year Full-Time Post Graduate Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 17

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	PH Type	Graduation Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late	Sponsored / Non Sponsored
1.	4399	15.27	ME15106761	LOKHANDE KALYANI BABURAO	Female	Type A	SC	NA	73.53	General	25000	02/08/2015	02/08/2015	Round 1	No	Non Sponsored
2.	4900	13.55	ME15106612	CHAVAN SHUBHANGI HIRALAL	Female	Type A	Open	NA	67.67	General	50000	02/08/2015	02/08/2015	Round 1	No	Non Sponsored
3.	6188	9.95	ME15101323	PATIL TEJASHRI ANIL	Female	Type A	OBC	NA	65.27	General	45000	03/08/2015	03/08/2015	Round 1	No	Non Sponsored
4.	6480	9.24	ME15103741	SANA PARVEEN MINHAJ DESHMUKH	Female	Type A	Open	NA	67.33	General	25000	02/08/2015	02/08/2015	Round 1	No	Non Sponsored
5.	3345	21.72	ME15100977	PATIL PRIYANKA LAXMANRAO	Female	Type A	OBC	NA	68.40	General	77556	08/08/2015	08/08/2015	Round 2	No	Non Sponsored

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Directorate of Technical Education, Maharashtra State

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424210] - Computer Science and Engineering

List of Candidates Admitted to the First Year of Two-Year Full-Time Post Graduate Courses in Engineering / Technology for the Academic Year 2015-2016

Admitted Against CAP

Quota : 12

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	PH Type	Graduation Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late	Sponsored / Non Sponsored
1.	2	81.36	ME15706728	BHOLE DARSHANA SHARAD	Female	Type A	OBC	NA	81.36	ACAPNS	40000	12/08/2015	07/09/2015	Institute Level	Yes	Non Sponsored
2.	11	68.33	ME15700866	PATIL PRIYANKA RAMRAO	Female	Type A	Open	NA	68.33	ACAPNS	40000	04/08/2015	16/08/2015	Institute Level	No	Non Sponsored
3.	17	66.53	ME15703707	MARATHE JAYASHRI ABHIMAN	Female	Type B	Open	NA	66.53	ACAPNS	5000	13/08/2015	16/08/2015	Institute Level	No	Non Sponsored
4.	25	63.13	ME15700868	PATIL RUPESHSING RAMESH	Male	Type A	Open	NA	63.13	ACAPNS	30000	03/08/2015	16/08/2015	Institute Level	No	Non Sponsored
5.	26	63.07	ME15700869	KOTHAWADE ASHWINI RAJENDRA	Female	Type A	Open	NA	63.07	ACAPNS	77556	02/08/2015	16/08/2015	Institute Level	No	Non Sponsored
6.	28	64.40	ME15706444	PATEL KAPIL MANGALDAS	Male	Type A	Open	NA	64.40	ACAPNS	2000	14/08/2015	28/08/2015	Institute Level	No	Non Sponsored
7.	32	63.93	ME15706458	RAJPUT SHEEITAL MADHUKAR	Female	Type A	Open	NA	63.93	ACAPNS	1000	14/08/2015	28/08/2015	Institute Level	No	Non Sponsored
8.	34	58.20	ME15700863	BHUTADA ABHIJIT KACHARADAS	Male	Type A	Open	NA	58.20	ACAPNS	30000	11/08/2015	16/08/2015	Institute Level	No	Non Sponsored
9.	48	60.73	ME15706687	SANA PARVEEN DAWOOD KHAN	Female	Type A	Open	NA	60.73	ACAPNS	20000	17/08/2015	28/08/2015	Institute Level	No	Non Sponsored

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424210] - Computer Science and Engineering

List of Candidates Admitted to the First Year of Two-Year Full-Time Post Graduate Courses in Engineering / Technology for the Academic Year 2015-2016

Institute Level Quota

Quota : 1

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	PH Type	Graduation Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late	Sponsored / Non Sponsored
1.	10	68.57	ME15701080	RAJPUT SHITAL PRATAPSING	Female	Type A	Open	NA	68.57	ILNS	46000	29/06/2015	16/08/2015	Institute Level	No	Non Sponsored

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Directorate of Technical Education, Maharashtra State

3, Mahapalika Marg, Post Box No.1967, Mumbai-400001

[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510424210] - Computer Science and Engineering

Summary of Admitted Candidates for the First Year of Two-Year Full-Time Post Graduate Courses in Engineering / Technology for the Academic Year 2015-2016

Sr. No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP	17	5	0	5
2.	Against CAP		8	1	9
3.	Institute Level	1	1	0	1
4.	Minority	0	0	0	0
5.	J&K Migrant		0	0	0
6.	Others		0	0	0
	Total	**18**	**14**	**1**	**15**

Seat Type used for Institute Level Admissions : ACAP-Against CAP, IL-Institute Level, ILNRI-Institute Level NRI (5% of SI if AICTE Permission), MI-Minority, GoI-Government of India Nominee, NRI-NRI (15% of SI if AICTE Permission), PIO-PIO (15% of SI if AICTE Permission), FNS-FNS (15% of SI if AICTE Permission), CIWGC-Children's of Indian Workers in Gulf Countries (15% of SI if AICTE Permission), OAA-Over and Above

Cut-Off Date for Admission : 22/08/2015
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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510429210] - Electrical Power System

List of Candidates Admitted to the First Year of Two-Year Full-Time Post Graduate Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 14

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	PH Type	Graduation Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late	Sponsored / Non Sponsored
1.	5862	10.79	ME15111210	VARADE NIKHIL SUNIL	Male	Type A	NT-D	NA	62.87	General	70000	03/08/2015	03/08/2015	Round 1	No	Non Sponsored
2.	6244	9.85	ME15104339	MAHAJAN JAYESH RAMESH	Male	Type A	OBC	NA	0.00	General	35000	03/08/2015	03/08/2015	Round 1	No	Non Sponsored
3.	7072	7.88	ME15109530	WAYCHOL SONAL CHANDRASHEKHAR	Female	Type A	OBC	NA	60.96	OBC	10000	03/08/2015	03/08/2015	Round 1	No	Non Sponsored

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510429210] - Electrical Power System

List of Candidates Admitted to the First Year of Two-Year Full-Time Post Graduate Courses in Engineering / Technology for the Academic Year 2015-2016

Admitted Against CAP

Quota : 11

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	PH Type	Graduation Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late	Sponsored / Non Sponsored
1.	2	71.40	ME15701000	BHOLE NEHA RAJENDRA	Female	Type A	Open	NA	71.40	ACAPNS	20000	03/08/2015	16/08/2015	Institute Level	No	Non Sponsored
2.	9	68.80	ME15700983	PATILPRIYANKA SADASHIV	Female	Type A	Open	NA	68.80	ACAPNS	40000	12/08/2015	16/08/2015	Institute Level	No	Non Sponsored
3.	12	67.60	ME15700997	BHOGE PRIYANKA GOPAL	Female	Type A	Open	NA	67.60	ACAPNS	25000	04/08/2015	16/08/2015	Institute Level	No	Non Sponsored
4.	13	67.47	ME15703706	ADNAN KHAN ASIF KHAN	Male	Type A	Open	NA	67.47	ACAPNS	10000	12/08/2015	16/08/2015	Institute Level	No	Non Sponsored
5.	28	64.00	ME15704212	CHAUDHARI SARANG PRADIP	Male	Type A	Open	NA	64.00	ACAPNS	20000	18/08/2015	18/08/2015	Institute Level	No	Non Sponsored
6.	29	62.93	ME15703710	PATIL RUSHIKESH EKNATH	Male	Type A	Open	NA	62.93	ACAPNS	10000	13/08/2015	16/08/2015	Institute Level	No	Non Sponsored
7.	30	61.33	ME15700976	PATIL SANDIP PRAKASH	Male	Type A	Open	NA	61.33	ACAPNS	25000	08/08/2015	16/08/2015	Institute Level	No	Non Sponsored

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510429210] - Electrical Power System

List of Candidates Admitted to the First Year of Two-Year Full-Time Post Graduate Courses in Engineering / Technology for the Academic Year 2015-2016

Institute Level Quota

Quota : 4

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	PH Type	Graduation Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late	Sponsored / Non Sponsored
1.	3	70.60	ME15701125	SAINDANE HARISH BHAGWAN	Male	Type A	Open	NA	70.60	ILNS	37000	06/07/2015	16/08/2015	Institute Level	No	Non Sponsored
2.	13	67.47	ME15701104	PAWAR NILESH BHAIDAS	Male	Type A	Open	NA	67.47	ILNS	36000	06/07/2015	16/08/2015	Institute Level	No	Non Sponsored
3.	19	64.87	ME15701117	MAHALE SHUBHAGI KAILAS	Female	Type A	Open	NA	64.87	ILNS	35000	05/07/2015	16/08/2015	Institute Level	No	Non Sponsored
4.	27	62.93	ME15701131	PATIL MAYUR KAILAS	Male	Type A	Open	NA	62.93	ILNS	0	22/06/2015	16/08/2015	Institute Level	No	Non Sponsored

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510429210] - Electrical Power System

Summary of Admitted Candidates for the First Year of Two-Year Full-Time Post Graduate Courses in Engineering / Technology for the Academic Year 2015-2016

Sr. No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP	14	3	0	3
2.	Against CAP		7	0	7
3.	Institute Level	4	4	0	4
4.	Minority	0	0	0	0
5.	J&K Migrant		0	0	0
6.	Others		0	0	0
	Total	**18**	**14**	**0**	**14**

Seat Type used for Institute Level Admissions : ACAP-Against CAP, IL-Institute Level, ILNRI-Institute Level NRI (5% of SI if AICTE Permission), MI-Minority, GoI-Government of India Nominee, NRI-NRI (15% of SI if AICTE Permission), PIO-PIO (15% of SI if AICTE Permission), FNS-FNS (15% of SI if AICTE Permission), CIWGC-Children's of Indian Workers in Gulf Countries (15% of SI if AICTE Permission), OAA-Over and Above

Cut-Off Date for Admission : 22/08/2015
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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510434310] - Digital Electronics

List of Candidates Admitted to the First Year of Two-Year Full-Time Post Graduate Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 17

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	PH Type	Graduation Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late	Sponsored / Non Sponsored
1.	6798	8.47	ME15113035	SOMANI GAURAVI SHANTILAL	Female	Type A	Open	NA	68.13	General	10000	03/08/2015	03/08/2015	Round 1	No	Non Sponsored
2.	9057	2.51	ME15100402	PATIL ASHLESHA AMRIT	Female	Type A	OBC	NA	0.00	General	40000	03/08/2015	03/08/2015	Round 1	No	Non Sponsored

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510434310] - Digital Electronics

List of Candidates Admitted to the First Year of Two-Year Full-Time Post Graduate Courses in Engineering / Technology for the Academic Year 2015-2016

Admitted Against CAP

Quota : 15

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	PH Type	Graduation Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late	Sponsored / Non Sponsored
1.	15	66.67	ME15701007	PAWAR HEMANTRAO DNYANESHWAR	Male	Type A	Open	NA	66.67	ACAPNS	30000	03/08/2015	16/08/2015	Institute Level	No	Non Sponsored
2.	29	61.93	ME15701027	INGALE SHEKHAR BABURAO	Male	Type A	Open	NA	61.93	ACAPNS	15000	06/08/2015	16/08/2015	Institute Level	No	Non Sponsored

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510434310] - Digital Electronics

List of Candidates Admitted to the First Year of Two-Year Full-Time Post Graduate Courses in Engineering / Technology for the Academic Year 2015-2016

Institute Level Quota

Quota : 1

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	PH Type	Graduation Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late	Sponsored / Non Sponsored
1.	20	64.87	ME15701089	SHINDE SNEHAL RANJIT	Female	Type A	Open	NA	64.87	ILNS	20000	11/06/2015	16/08/2015	Institute Level	No	Non Sponsored

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Directorate of Technical Education, Maharashtra State

3, Mahapalika Marg, Post Box No.1967, Mumbai-400001

[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510434310] - Digital Electronics

Summary of Admitted Candidates for the First Year of Two-Year Full-Time Post Graduate Courses in Engineering / Technology for the Academic Year 2015-2016

Sr. No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP	17	2	0	2
2.	Against CAP		2	0	2
3.	Institute Level	1	1	0	1
4.	Minority	0	0	0	0
5.	J&K Migrant		0	0	0
6.	Others		0	0	0
	Total	**18**	**5**	**0**	**5**

Seat Type used for Institute Level Admissions : ACAP-Against CAP, IL-Institute Level, ILNRI-Institute Level NRI (5% of SI if AICTE Permission), MI-Minority, GoI-Government of India Nominee, NRI-NRI (15% of SI if AICTE Permission), PIO-PIO (15% of SI if AICTE Permission), FNS-FNS (15% of SI if AICTE Permission), CIWGC-Children's of Indian Workers in Gulf Countries (15% of SI if AICTE Permission), OAA-Over and Above

Cut-Off Date for Admission : 22/08/2015
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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510461910] - Machine Design

List of Candidates Admitted to the First Year of Two-Year Full-Time Post Graduate Courses in Engineering / Technology for the Academic Year 2015-2016

CAP Round

Quota : 18

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	PH Type	Graduation Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late	Sponsored / Non Sponsored
1.	2934	258.00	ME15108627	THAKARE TUSHAR BHALCHANDRA	Male	Type A	SC	NA	64.80	General	7000	03/08/2015	03/08/2015	Round 1	No	Non Sponsored
2.	4195	16.25	ME15100116	DESHMUKH AMOL VAMAN	Male	Type A	OBC	NA	60.80	General	77556	03/08/2015	03/08/2015	Round 1	No	Non Sponsored
3.	7419	7.08	ME15106563	CHOPADE CHETANA SUNIL	Female	Type A	OBC	NA	73.87	General	40000	02/08/2015	02/08/2015	Round 1	No	Non Sponsored
4.	8409	4.62	ME15112649	CHAUDHARI TILOTTAMA ANIL	Female	Type A	OBC	NA	63.33	General	7000	02/08/2015	02/08/2015	Round 1	No	Non Sponsored

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510461910] - Machine Design

List of Candidates Admitted to the First Year of Two-Year Full-Time Post Graduate Courses in Engineering / Technology for the Academic Year 2015-2016

Admitted Against CAP

Quota : 14

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	PH Type	Graduation Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late	Sponsored / Non Sponsored
1.	4	70.60	ME15703663	PATIL PANKAJ RAJENDRA	Male	Type A	Open	NA	70.60	ACAPNS	1000	14/08/2015	16/08/2015	Institute Level	No	Non Sponsored
2.	13	67.80	ME15705238	SALI SAGAR MANOHAR	Male	Type A	Open	NA	67.80	ACAPNS	15000	20/08/2015	22/08/2015	Institute Level	No	Non Sponsored
3.	17	65.40	ME15701058	PATIL RAMKANT BHIMRAO	Male	Type A	Open	NA	65.40	ACAPNS	25000	07/08/2015	16/08/2015	Institute Level	No	Non Sponsored
4.	26	63.40	ME15701036	SABALE PANKAJ YASHWANT	Male	Type A	Open	NA	63.40	ACAPNS	35000	03/08/2015	16/08/2015	Institute Level	No	Non Sponsored
5.	32	60.93	ME15703661	RAJENDRASINGH RAJPUT	Male	Type A	Open	NA	60.93	ACAPNS	5000	14/08/2015	16/08/2015	Institute Level	No	Non Sponsored
6.	33	60.83	ME15701044	VITKAR DATTATRAY BHANUDAS	Male	Type A	Open	NA	60.83	ACAPNS	20000	07/08/2015	16/08/2015	Institute Level	No	Non Sponsored

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510461910] - Machine Design

Summary of Admitted Candidates for the First Year of Two-Year Full-Time Post Graduate Courses in Engineering / Technology for the Academic Year 2015-2016

Sr. No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP	18	4	0	4
2.	Against CAP		6	0	6
3.	Institute Level	0	0	0	0
4.	Minority	0	0	0	0
5.	J&K Migrant		0	0	0
6.	Others		0	0	0
	Total	**18**	**10**	**0**	**10**

Seat Type used for Institute Level Admissions : ACAP-Against CAP, IL-Institute Level, ILNRI-Institute Level NRI (5% of SI if AICTE Permission), MI-Minority, GoI-Government of India Nominee, NRI-NRI (15% of SI if AICTE Permission), PIO-PIO (15% of SI if AICTE Permission), FNS-FNS (15% of SI if AICTE Permission), CIWGC-Children's of Indian Workers in Gulf Countries (15% of SI if AICTE Permission), OAA-Over and Above

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510410110] - M. B. A.

List of Candidates Admitted to the First Year of Two-Year Full-Time Post Graduate Courses in Management viz. MBA/MMS/PGDBM for the Academic Year 2015-2016

CAP Round

Quota : 54

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Graduation Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	6403	62.519	MB15112912	SAWANDE ANKITA KISHOR	Female	Type A	OBC	North Maharashtra	NA	0.00	AI	19000	29/06/2015	29/06/2015	Round 1	No
2.	6424	62.125	MB15125106	MAYURI JAIN	Female	OMS	NA	OHU	NA	0.00	AI	0	30/06/2015	30/06/2015	Round 1	No
3.	10461	16.774	MB15121726	MEDHE GIRISH BHASKAR	Male	Type A	SC	North Maharashtra	NA	0.00	AI	8000	30/06/2015	30/06/2015	Round 1	No
4.	25087	9.226	MB15126913	PATIL MADHURI GULABRAO	Female	Type A	OBC	North Maharashtra	NA	53.00	GOBCH	10000	30/06/2015	30/06/2015	Round 1	No
5.	25181	9.226	MB15125295	PATIL SAMADHAN KAILAS	Male	Type A	OBC	North Maharashtra	NA	52.90	GOBCH	10000	01/07/2015	01/07/2015	Round 1	No
6.	25630	7.58	MB15108025	UMESH DINESH SONAWANE	Male	Type A	OBC	North Maharashtra	NA	0.00	GOBCH	10000	01/07/2015	01/07/2015	Round 1	No
7.	25873	6.69	MB15100548	BHARAMBE UTKARSHA NARAYAN	Female	Type A	OBC	North Maharashtra	NA	0.00	GOBCH	10000	29/06/2015	29/06/2015	Round 1	No
8.	27565	1.293	MB15105362	SUMIT	Male	Type A	OBC	North Maharashtra	NA	56.10	GOBCH	15000	30/06/2015	30/06/2015	Round 1	No
9.	15019	41.351	MB15124755	ANMOL PRAMOD AGRAWAL	Male	Type A	Open	North Maharashtra	NA	0.00	GOPENH	20000	29/06/2015	29/06/2015	Round 1	No
10.	16008	38.419	MB15156876	GHULE VINOD NAMDEO	Male	Type A	SC	North Maharashtra	NA	58.00	GOPENH	2000	30/06/2015	30/06/2015	Round 1	No
11.	18124	31.273	MB15170999	ABDUL KARIM ABDUL SHAFI	Male	Type A	Open	North Maharashtra	NA	70.40	GOPENH	5000	01/07/2015	01/07/2015	Round 1	No
12.	22616	16.996	MB15136626	RAJPUT PAVAN INDRASING	Male	Type A	Open	North Maharashtra	NA	0.00	GOPENH	2000	29/06/2015	29/06/2015	Round 1	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510410110] - M. B. A.

List of Candidates Admitted to the First Year of Two-Year Full-Time Post Graduate Courses in Management viz. MBA/MMS/PGDBM for the Academic Year 2015-2016

CAP Round

Quota : 54

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Graduation Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
13.	24607	10.616	MB15132145	MAHAJAN RAVINDRA VISHVANATH	Male	Type A	OBC	North Maharashtra	NA	0.00	GOPENH	10000	01/07/2015	01/07/2015	Round 1	No
14.	24734	10.569	MB15107428	PATIL ANITA BHAVSING	Female	Type A	DT/VJ	North Maharashtra	NA	65.40	GVJH	10000	01/07/2015	01/07/2015	Round 1	No
15.	10116	20.783	MB15139426	RAJPUT MANOJ SAHEBRAO	Male	Type A	Open	North Maharashtra	NA	59.25	AI	7000	11/07/2015	11/07/2015	Round 2	No
16.	11308	5.637	MB15109216	BARI PANKAJ BALIRAM	Male	Type A	OBC	North Maharashtra	NA	0.00	AI	10000	11/07/2015	11/07/2015	Round 2	No
17.	22946	15.435	MB15124855	PARAG SOPAN BHOLE	Male	Type A	OBC	North Maharashtra	NA	56.00	GNT1H	12000	09/07/2015	09/07/2015	Round 2	No
18.	22566	16.996	MB15134793	CHAUDHARI YOGESH VISHVANATH	Male	Type A	OBC	North Maharashtra	NA	62.00	GNT2H	5000	09/07/2015	09/07/2015	Round 2	No
19.	22457	17.109	MB15126664	SALUNKHE KAMINI RAVINDRA	Female	Type A	OBC	North Maharashtra	NA	57.50	GOBCH	10000	10/07/2015	10/07/2015	Round 2	No
20.	15761	38.911	MB15113911	KHADKE DIVYA NARENDRA	Female	Type A	OBC	North Maharashtra	NA	0.00	GOPENH	17000	09/07/2015	09/07/2015	Round 2	No
21.	15823	38.892	MB15139653	PATIL PANKAJ RAMESH	Male	Type A	Open	North Maharashtra	NA	0.00	GOPENH	19000	10/07/2015	10/07/2015	Round 2	No
22.	17995	31.273	MB15157390	CHAUDHARI RAKESH GOKUL	Male	Type A	OBC	North Maharashtra	NA	58.90	GOPENH	5000	09/07/2015	09/07/2015	Round 2	No
23.	18779	29.088	MB15159663	PATIL BHUPENDRA BHASKAR	Male	Type A	OBC	North Maharashtra	NA	58.60	GOPENH	1000	09/07/2015	09/07/2015	Round 2	No
24.	18805	29.088	MB15156659	AAKASH VILAS MAGAR	Male	Type A	OBC	North Maharashtra	NA	53.90	GOPENH	5000	09/07/2015	09/07/2015	Round 2	No

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Directorate of Technical Education, Maharashtra State

3, Mahapalika Marg, Post Box No.1967, Mumbai-400001

[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510410110] - M. B. A.

List of Candidates Admitted to the First Year of Two-Year Full-Time Post Graduate Courses in Management viz. MBA/MMS/PGDBM for the Academic Year 2015-2016

CAP Round

Quota : 54

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Graduation Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
25.	18826	28.817	MB15142524	CHAUDHARI ARCHANA RAGHUNATH	Female	Type A	OBC	North Maharashtra	NA	0.00	GOPENH	5000	10/07/2015	10/07/2015	Round 2	No
26.	21172	20.878	MB15112459	MAHAJAN VIVEKANAND VIJAY	Male	Type A	OBC	North Maharashtra	NA	0.00	GOPENH	5000	08/07/2015	08/07/2015	Round 2	No
27.	21937	18.782	MB15121768	PRAVIN PARDESHI	Male	Type A	OBC	North Maharashtra	NA	52.90	GOPENH	12000	09/07/2015	09/07/2015	Round 2	No
28.	22386	17.109	MB15124887	NEHA VIJAY CHAUDHARI	Female	Type A	OBC	North Maharashtra	NA	0.00	GOPENH	5000	08/07/2015	08/07/2015	Round 2	No
29.	24540	10.764	MB15140536	PAWAR UMESH VISHWAS	Male	Type A	Open	North Maharashtra	NA	0.00	GOPENO	5000	11/07/2015	11/07/2015	Round 2	No
30.	25555	7.767	MB15155752	IKARAR ALI KADAR ALI	Male	Type A	Open	North Maharashtra	NA	65.00	GOPENO	5000	11/07/2015	11/07/2015	Round 2	No
31.	23557	13.856	MB15125011	ASHWINI PRAKASH MAHALE	Female	Type A	OBC	North Maharashtra	NA	70.00	GSCH	5000	08/07/2015	08/07/2015	Round 2	No
32.	24156	12.27	MB15131286	SALUNKHE GAYATRI GUNAWANTRAO	Female	Type A	OBC	North Maharashtra	NA	0.00	GSCH	5000	11/07/2015	11/07/2015	Round 2	No
33.	24758	10.569	MB15107212	SUHAS SANJAY WANI	Male	Type A	OBC	North Maharashtra	NA	62.10	GSCH	5000	08/07/2015	08/07/2015	Round 2	No
34.	25279	8.544	MB15104900	PATIL MUKESH SANJAY	Male	Type A	OBC	North Maharashtra	NA	63.07	GSCH	16000	10/07/2015	10/07/2015	Round 2	No
35.	26232	5.637	MB15114245	PATIL DIKSHA VILAS	Female	Type A	OBC	North Maharashtra	NA	63.60	GSTH	5000	08/07/2015	08/07/2015	Round 2	No
36.	27580	1.293	MB15114743	KALPESH DILIP BHOLANE	Male	Type A	OBC	North Maharashtra	NA	60.00	GSTH	2000	08/07/2015	08/07/2015	Round 2	No

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Directorate of Technical Education, Maharashtra State

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[510410110] - M. B. A.

List of Candidates Admitted to the First Year of Two-Year Full-Time Post Graduate Courses in Management viz. MBA/MMS/PGDBM for the Academic Year 2015-2016

CAP Round

Quota : 54

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Graduation Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
37.	6623	73.551	MB15128212	BORSE DARSHAN RAMESH	Male	Type A	OBC	North Maharashtra	NA	61.27	GOPEN	5000	27/07/2015	27/07/2015	Counseling Round	No
38.	17122	34.396	MB15107902	AHIRRAO BHAGYASHREE ISHWARRAO	Female	Type A	Open	North Maharashtra	NA	60.07	GOPEN	2000	24/07/2015	24/07/2015	Counseling Round	No
39.	17305	33.968	MB15119806	SHARMA ABHISHEK MAHENDRA	Male	Type A	Open	North Maharashtra	NA	0.00	GOPEN	2000	24/07/2015	24/07/2015	Counseling Round	No
40.	17344	33.816	MB15150816	CHAUDHARI MAYURI PRATAP	Female	Type A	OBC	North Maharashtra	NA	0.00	GOPEN	2000	24/07/2015	24/07/2015	Counseling Round	No
41.	20061	24.709	MB15112488	PAWAR URMILA DIWAKAR	Female	Type A	OBC	North Maharashtra	NA	0.00	GOPEN	1000	24/07/2015	24/07/2015	Counseling Round	No
42.	20570	22.782	MB15133740	PATIL MOHAN SAMADHAN	Male	Type A	NT-C	North Maharashtra	NA	66.75	GOPEN	1538	24/07/2015	24/07/2015	Counseling Round	No
43.	21930	18.782	MB15131016	MAHAJAN DNYANESHWAR DHANRAJ	Male	Type A	OBC	North Maharashtra	NA	0.00	GOPEN	10000	24/07/2015	24/07/2015	Counseling Round	No

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[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510410110] - M. B. A.

List of Candidates Admitted to the First Year of Two-Year Full-Time Post Graduate Courses in Management viz. MBA/MMS/PGDBM for the Academic Year 2015-2016

Admitted Against CAP

Quota : 11

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Graduation Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	2	22.340	MB15709960	MOGARE SAGAR VASUDEO	Male	Type A	Open	North Maharashtra	NA	70.00	ACAP	5000	14/08/2015	16/08/2015	Institute Level	No
2.	3	18.782	MB15710709	PATIL AMOL JIJABRAO	Male	Type A	Open	North Maharashtra	NA	70.00	ACAP	20000	07/08/2015	16/08/2015	Institute Level	No
3.	4	80.460	MB15710684	GIRASE SAMADHAN RUPSING	Male	Type A	Open	North Maharashtra	NA	70.00	ACAP	8000	05/08/2015	16/08/2015	Institute Level	No
4.	5	80.460	MB15709690	PATIL RAHUL PRABHAKAR	Male	Type A	Open	North Maharashtra	NA	72.60	ACAP	20000	14/08/2015	16/08/2015	Institute Level	No
5.	7	72.410	MB15710141	HISWANKAR VIPUL MUKUNDRAO	Male	Type A	Open	B.A.M.U.	NA	66.80	ACAP	20000	09/08/2015	16/08/2015	Institute Level	No
6.	8	70.110	MB15710663	PATIL MANOJ ISHWAR	Male	Type A	Open	North Maharashtra	NA	70.00	ACAP	5000	04/08/2015	16/08/2015	Institute Level	No
7.	9	62.070	MB15710273	GAUR ROHINI RATANSING	Female	Type A	Open	Amravati	NA	70.00	ACAP	30000	03/08/2015	16/08/2015	Institute Level	No
8.	10	62.070	MB15709617	NARKHEDE ASHUTOSH ANIL	Male	Type A	Open	North Maharashtra	NA	68.87	ACAP	20000	14/08/2015	16/08/2015	Institute Level	No
9.	12	60.920	MB15709650	RANE NIKHIL SURESH	Male	Type A	Open	North Maharashtra	NA	72.13	ACAP	20000	14/08/2015	16/08/2015	Institute Level	No
10.	16	56.320	MB15709913	PATIL GAYATRI SUDHAM	Female	Type A	Open	North Maharashtra	NA	76.20	ACAP	20000	13/08/2015	16/08/2015	Institute Level	No
11.	17	45.980	MB15709759	CHAUDHARI BHUSHAN HIRALA	Male	Type A	Open	OHU	NA	66.67	ACAP	20000	11/08/2015	16/08/2015	Institute Level	No

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[510410110] - M. B. A.

List of Candidates Admitted to the First Year of Two-Year Full-Time Post Graduate Courses in Management viz. MBA/MMS/PGDBM for the Academic Year 2015-2016

Institute Level Quota

Quota : 6

Sr. No.	Merit No	Merit Marks	Application ID	Candidate Name	Gender	Candidature Type	Category	Home University	PH Type	Graduation Percentage	Seat Type	Fees Paid	Admission Date	Uploaded Date	CAP Round	Admitted / Uploaded Late
1.	1	35.945	MB15710633	LADDHA JAYESH RAKESH	Male	Type A	Open	North Maharashtra	NA	70.00	IL	5000	01/07/2015	16/08/2015	Institute Level	No
2.	6	73.560	MB15710646	NEMADE NIKHIL CHANDRAKANT	Male	Type A	Open	North Maharashtra	NA	66.74	IL	16000	26/06/2015	16/08/2015	Institute Level	No
3.	11	62.070	MB15710110	JAISWAL ABHILASH RAJENDRA	Male	Type A	Open	B.A.M.U.	NA	68.40	IL	20000	09/07/2015	16/08/2015	Institute Level	No
4.	13	60.000	MB15709803	MALA ANIL RANSING	Male	Type A	Open	North Maharashtra	NA	71.11	IL	3000	17/07/2015	16/08/2015	Institute Level	No
5.	14	57.470	MB15710697	PATIL SAGAR ASHOK	Male	Type A	Open	North Maharashtra	NA	70.00	IL	20000	06/07/2015	16/08/2015	Institute Level	No
6.	15	56.320	MB15709833	VARADE ASHISH VASANT	Male	Type A	Open	North Maharashtra	NA	68.20	IL	10000	01/07/2015	16/08/2015	Institute Level	No

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Directorate of Technical Education, Maharashtra State

3, Mahapalika Marg, Post Box No.1967, Mumbai-400001

[5104] - Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon

[510410110] - M. B. A.

Summary of Admitted Candidates for the First Year of Two-Year Full-Time Post Graduate Courses in Management viz. MBA/MMS/PGDBM for the Academic Year 2015-2016

Sr. No.	Admission Details	Intake	Admitted / Uploaded Before Cut Off Date	Admitted / Uploaded After Cut Off Date	Total Admitted
1.	CAP	54	43	0	43
2.	Against CAP		11	0	11
3.	Institute Level	6	6	0	6
4.	Minority	0	0	0	0
5.	J&K Migrant		0	0	0
6.	Others		0	0	0
	Total	**60**	**60**	**0**	**60**

Seat Type used for Institute Level Admissions : ACAP-Against CAP, IL-Institute Level, ILNRI-Institute Level NRI (5% of SI if AICTE Permission), MI-Minority, AMIL-Against Minority (Other Linguistic Minority), AMIR-Against Minority (Other Religious Minority), AMIN-Against Minority (Non-Minority), GoI-Government of India Nominee, NRI-NRI (15% of SI if AICTE Permission), PIO-PIO (15% of SI if AICTE Permission), FNS-FNS (15% of SI if AICTE Permission), CIWGC-Children's of Indian Workers in Gulf Countries (15% of SI if AICTE Permission), OAA-Over and Above

Cut-Off Date for Admission : 14/08/2015
Cut-Off Date for Uploading : 22/08/2015

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For Regional Office Use Only

Seal of the Regional Office **Signature of the Regional Officer**

Print

Application Form
for
(FE / Direct SE / First Year ME/ MBA)
Shram Sadhana Bombay Trust's
College of Engineering & Technology,
P.B.No.94, BAMBHORI, JALGAON 425 001
(Maharashtra State)

ISO 9001:2008

Affix Recent Passport size Photograph here

Website- www.sscoetjalgaon.ac.in
Email: sscoetjal@gmail.com
Phone No. (0257) 2258393
Fax No. (0257) 2258392

Note:- (a) To be filled in and signed by the candidate.
(b) Application submitted without required certificates shall not be considered.
(c) Score out which is not applicable

1) Details of student

Particular	Surname	First Name	Middle Name
Name of Student			
Father Name			
Mother Name			

2) Date of birth:- _____

3) Address for correspondence :- _____

_____

Address for permanent:- _____

Pin Code _____ State _____

Telephone No. _____ Mobile No.:- _____

Email Address:- _____ Admitted in College Hostel :- Yes/No

4) (a) State & District from which you have passed SSC (Std. X) :-_____
(b) State & District from which you have passed HSC (Std. XII) :-_____

5) SEX :- (Male/Female) _____

6) Occupation of the Earning member(s) of the family :- _____

7) Annual income of the family:- _____

8) Indicate the category to which you belong (Tick appropriate box)

a) Category :- ( ) Open ( ) SC ( ) ST ( ) VJNT ( ) NT1 ( ) NT2
( ) NT3 ( ) OBC ( ) SBC

b) Minority :- ( ) Yes ( ) No Religion:- _____ Caste:- _____

c) Physically Handicapped :- ( ) Yes ( ) No

I) <u>U.G. Programme</u>: I hereby apply for admission to First / Second year of degree course in the branches given below in order of preference

1)_____ 2) _____ 3) _____

4)_____ 5) _____ 6) _____

7)_____ 8) _____

A) For F.E. & Direct S.E. students

PCM Total out of 300		**EXAM.**	**MERIT NO.**	**SCORE**
Category		MH-CET		
Branch Allotted		University Merit No.		
Final Year Diploma Marks Obtained /Out of		AIEEE		
Percentage HSC		State Merit No.		
Percentage Diploma		Main Group Merit		

B) Details of qualification (For F.E. & Direct S.E.):-

Examination	Month & Year of passing	Name & Address of Institution	Name & Address of Board/ University	Passed from M.S. or O.M.S.
S.S.C.				
H.S.C.				
Diploma final year				

C) S.S.C. Marks

Sr. No.	Subjects	Marks out of	Marks Obtained	Total percentage	Remark result
1	Mathematics				

D) H.S.C. Marks

Sr. No.	Subjects	Marks out of	Marks Obtained	Total PCM & percentage	Remark result
1	Physics				
2	Chemistry				
3	Mathematics				
4	Biology				
5	English				

II) <u>P.G. Programme</u>:- I hereby apply for admission to First year P.G. Programme in Engineering & Technology/ Management for M.E. Civil (Environmental Engg.)/ Mechanical (Machine Design) / E.& TC. (Digital Electronics) / Computer Science & Engineering/ M.B.A.

A) Academic Programme

1) First Year M.E. Course

i) Detail Qualification

Course & Examination	College Attended	Month & Year of Passing	No. of attempts	University/Boards	Total Marks Obtained	Max. Marks (Out of)	Percen-tage
1	2	3	4	5	6	7	8
1st Year Engineering							
2nd Year Engineering							
3rd Year Engineering							
4th Year Engineering							

ii) GATE Score: Valid up to

iii) Sponsored: ( ) Yes ( ) No

2) First Year M.B.A.

i) Details of qualification:-

Examination Passed	Name of Board/ University	Year	Subject Specialization	Marks	Percentage/ Score	Remark
S.S.C.						
H.S.C.						
Graduation						
Post graduation						
Any other exam.						

For M.B.A. Course		
EXAM.	**MERIT NO.**	**SCORE**
MH-CET		
University Merit No.		
Any other Entrance Test		

09) Work experience (attach extra sheet, if space is not enough)

Name of the Organization/Industry	Period	Nature of Work

10). Presently Employed or Unemployed? : Yes/No

If employed, give details

Name of Organization: _____

Date of appointment: _____

Regular/ Temporary :_____

11) Sponsorship certificate attached? Yes/No

(Note : Employed candidates will have to produce a certificate from the employer in the prescribed format attached with the form, without which the application may not be considered)

12) List of Certificates attached with application form:- Tick only available documents

1) CET Score Card (2) CAP Allotment letter (3) SSC (10^{th}) Marksheet
4) HSC (12^{th}) / Diploma Marksheet (5) Latest L.C./T.C. (6) Migration Certificate
7) Indian Nationality Certificate (8) Character/ Bonafide Certificate
9) First Attempt Certificate (10) Gap Affidavit (If applicable)
11) Caste Certificate (If applicable) (12) Validity Certificate (If applicable)
13) Non-Creamy Layer (If applicable) except SC/ST students only
14) Degree Marksheet (15) Degree Certificate
16) Experience Certificate (17) Sponsor Certificate
18) No Objection Certificate (19) Domicile Certificate

Please do not attach any original or photo copy of certificate not asked for.

However you shall have to submit all original certificates at the time of admission.

Declaration by the Candidates
(Undertaking)

I _____ declare that:

1) I have read all the Rules of Admission for the current year, after understanding these rules I have filled up this application form for the current year.
2) The information given by me in my application is true to the best of my knowledge and belief.
3) I have not been debarred from appearing at any examination held by any Govt. body constituted or statutory examination authority in India.
4) I fully understand that the offer of a course or branch of Engineering/ Technology/ Management will be made to me depending on my merit inter-se and availability of seat at the time of scrutiny of my application when I will report to the Admission Authority according to the schedule of the admission.
5) I understand that no other document other than those attached to the application form will be entertained for the purpose of claims/ concession etc. in connection with my admission.
6) I hereby agree to confirm to all rules and laws enforced by the Govt. including ragging Act 1999 of Maharashtra, the College Management and North Maharashtra University, Jalgaon. I hereby undertake that as long as I am a student of the college, I will do nothing either inside or outside the College which may result in disciplinary action against me under the act and laws refer to under rules Nos. 13-0. I will abide by all the rules of the Hostel, if I am given admission in to the Hostel.
7) I fully understand that the Principal of the college will have the right to expel/ rusticate me from the college for any infringement of the rules of conduct and discipline refer to under Rules No.13-0 and the rules of conduct and discipline prescribed by the College/University and the undertaking given above.
8) The total numbers of certificates attached with the application form are:_____

Place:
Date: Signature of the Candidate

Declaration by the Parents/Guardians
(Undertaking)

I _____ declare that the particulars furnished by my son/daughter/ward in this application form are correct to the best of my knowledge and belief.

I undertake & bind myself to pay on behalf my son/daughter/ward, such fees charges etc. which the College/Government of Maharashtra/University may levy from time to time by due date & in the event of failure on my part and/or on the part of my son/daughter/ward the Principal of the College may take such action against my son/daughter/ward as he may deem fit.

I will sign the requisite agreement bond as prescribed by the Government (In case or Minor only).

Place:
Date: Signature of the Parent/Guardian

A G R E E M E N T

I Shri/Shrimati/Kumari_____
(Name of the Candidate)
do hereby affirm that I have taken admission in _____ at College of Engineering & Technology, Jalgaon on my own and I solemnly declare that I will abide by all Rules & Regulation laid down by the Management of the aforesaid College, University and Government of Maharashtra, from time to time and if I fail to do so I will be liable for any punishment including expulsion from the College.

I shall not ask for transfer from the aforesaid College, to any other College, under any circumstances, I shall be responsible for full payment of fees and all dues for the entire course and shall not be entitled for refund of any fees at any stage.

Signature of the Father/Guardian Signature of the Student

Place:
Date

M E D I C A L C E R T I F I C A T E

I certify that I have carefully examined Shri/Kum._____
_____
on_____and hereby certify that him/her eye sight is good and that any minor defects in the same can be corrected by means of suitable glasses that he/she is fairly robust, his/her constitution is sound/is not likely to make him/her unfit for manual work in the workshop or active out-door service as an Engineer, (Score out whichever is not applicable)

Date: Signature_____

Address:_____ Name:_____

_____ Qualification_____

Registration No.:_____

UNDERTAKING-1

I, _____ taking admission in First Year/ Second Year_____ in the year 20 - 20 give an undertaking that as per the letter No.NMU/7/A/4718/2008, dated 27/09/2008, North Maharashtra University, Jalgaon I am not engaged in any job full time/part time. Similarly I have not taken admission in any other college within this University or any other University.

Date:- Signature of candidate

PRINCIPAL

UNDERTAKING-2

I, _____ interested to take admission in First Year/ Second Year_____ in the year 20 - 20 . As per North Maharashtra University, Jalgaon vide letter No.NMU/2/106/2002, dated 26/06/2002, I undertake that if I fail to maintain my attendance in the classes as per the rule means 80% out of total 180 working days then I will not be eligible to appear in College/University examinations. It is in my knowledge and I will not do any type of complaint against the same.

Date:- Signature of Candidate

Signature of Parents

PRINCIPAL

Shram Sadhana Bombay Trust's
COLLEGE OF ENGINEERING AND TECHNOLOGY,
BAMBHORI POST BOX NO. 94, JALGAON – 425001. (M.S.)
Included under section 2 (f) of the UGC Act, 1956
Included under section 12 (B) of the UGC Act, 1956
with NBA Accredited courses & ISO 9001 : 2008 certified
ISO 9001:2008

Website- www.sscoetjalgaon.ac.in
Email: sscoetjal@gmail.com
Phone No. (0257) 2258393.
Fax No. (0257) 2258392.

Chairman — Dr. D.R. Shekhawat
Trustee — Raosaheb Shri R.D. Shekhawat
Principal — Dr. Rakesh Mowar

GUIDELINES TO CURB THE MENACE OF RAGGING IN UNIVERSITIES/EDUCATIONAL INSTITUTIONS

What is ragging?

The word 'ragging' means the act of teasing, playing a practical joke upon some one or holding comic parades and other activities during certain period of a college term to raise money for charity.

Causes of ragging:

Eagerness of seniors to show off their power, authority, superiority.
An attitude of backlash – a 'do unto others did to you'.
(similar to mother-in-law Vs daughter-in-law syndrome)

Recommendations:

Before ragging to any individual please read the following and remember the cost of this heinous crime.

MAHARASHTRA ACT NO. XXXIII OF 1999:

1) This Act may be called the Maharashtra Prohibition of Ragging Act, 1999

HIGHER AND TECHNICAL EDUCATION DEPARTMENT

Mantralaya Annexe, Mumbai 400 032, dated the 19th May 1999.

NOTIFICATION

Maharashtra Prohibition of Ragging Act, 1999.

No Sankirana 1098 (133/98)/UNI-3-In exercise of the powers conferred by sub- section (2) of section 1 of the Maharashtra Prohibition of Ragging Act, 1999 (Mah. XXXIII of 1999) the Government of Maharashtra hereby appoints the First day of June 1999 to be the date on which the said Act shall come in to force. By order and in the name of the Governor of Maharashtra.

V.P. Raja
Secretary of Government

PROHIBITION OF RAGGING: Ragging within or outside of any educational institution is prohibited.

PENALTY OF RAGGING: Whoever directly or indirectly commits, participates in a beta or propagates ragging within or outside any education institution shall, on conviction, be punished with imprisonment for a term which may extend to two years and shall also be a liable to fine which may extend to ten thousand rupees.

DISMISSAL OF STUDENT: Any student convicted of an offence under section 4 shall be dismissed from the educational institution and such student shall not be admitted in any other educational institution for a period of the five years from the date of order such of dismissal.

SUSPENSION OF STUDENT:

1. Whenever any student or, as the case may be, the parent or guardian, or a teacher of an educational institution complaints, in writing, of ragging to the head of the educational institution who shall, without prejudice to the foregoing provisions, within seven days of the receipt of the complaint, enquire into the matter mentioned in the complaint and if, prima facie, it is found true, suspend the student who is accused of the offence, and shall immediately forward the complaint to the police station having jurisdiction over the area in which the educational institution is situated, for further action.
2. Where, one enquiry by the head of the educational institution, it is proved that there is substance, prima facie, in the complaint received under sub-section (i) he shall intimate the fact, in writing to the complainant.
3. The decision of the head of the educational institution that the students has indulged in ragging under sub-section (l), shall be final.

UNDERTAKING BY STUDENTS AND THEIR PARENTS:

Following two undertakings should be taken through the Head of the concerning Departments at the beginning of First Session from the students of II year onwards.

1) UNDERTAKING FROM THE STUDENTS

Name of the student _____

_____

Branch & Class _____

Address _____

_____

Affix Passport size Photo

I am aware of the law that ragging in educational institutions or its hostels is a cognizable offence. If it is committed while under institution by anyone is liable to rigorous punishments, expelled from classes and / or rustication from the college and / hostel.

Date:-_____

Signature of student

2) UNDERTAKING FROM THE PARENTS/GUARDIANS

My son/daughter/ward Name_____
has secured admission in the college in the session_____

I am aware of the law of ragging in educational institutions and agree to abide by the punishment to my son/daughter/ward in case he/she is found guilty of the offence of ragging.

Date:-_____

Signature of Parents/Guardian
Full Name:_____
_____
Address:_____
_____
_____
Ph. No. _____

3) I am not in service or in part time service nor I will do so during tenure of my study in the college.

Signature of student
Address:_____
_____
Ph. No. _____

Item No. 3: **To decide on the proposals received for approval of fee structure for the courses stated during Academic Year 2015-16:**

Item No. 3(a): **To discuss and decide on proposals where there are no discrepancies.**

The Samiti considered the proposals of the following Colleges/Institutes for finalization of fee structure for the students who joined the course started during Academic Year 2015-16. After deliberations, the Samiti decides to approve the final fee structure of the following Colleges/Institutes for the students who joined the course started during Academic Year 2015-16, subject to final approval/affiliation/permissions from respective Authorities. Figures are arrived at after considering the calculations drawn in the worksheet – calculation sheets of the respective colleges/institutes prepared by a Chartered Accountant. The students admitted in Academic Year 2015-16 and there after continuing their studies will pay an enhanced fee of 8% each successive year as per the norms for 2015-16 till completion of the course. For example if the fee approved is Rs. 1,00,000/- then from IInd years onward till completion of the course i.e. say II, III and IV year the fees will be Rs. 1,08,000/- per @. In case the students take Vth years for completing the course then he shall pay the fee approved in that year. In case a student joins the course direct in second year, then he shall be required to pay Rs. 1,08,000/-. Worksheet – Calculation sheets are available in the office.

ENGINEERING

Sr. No.	Code No.	Name of the Institute	Final Fees for Course Starting from AY 2014-15	Interim Fees for Course Starting from AY 2015-16	Final Fees for Course Starting from AY 2015-16	Institute Demands
1	EN1122	Dr. Bhausaheb Nandurkar College of Engineering, Waghapur,Yavatmal	61710	64795	**50010**	-
2	EN2114	Marathwada Shikshan Prasarak Mandal's Group of Institution, Aurangabad	76560	80388	**82000**	84269
3	EN2134	Peoples Education Society's College of Engineering, Aurangabad EN/ME	63000	66150	**66150**	81661
4	EN2146	Adarsh Shikshan Prasarak Mandal's K. T. Patil College of Engineering and Technology, Osmanabad	20620	21651	**18030**	18030
5	EN3135	Manjara Charitable Trust's Rajiv Gandhi Institute of Technology, Mumbai	90000	94500	**95000**	98639
6	EN3209	Don Bosco Institute of Technology, Mumbai	105000	110250	**110250**	137484

Sr. No.	Code No.	Name of the Institute	Final Fees for Course Starting from AY 2014-15	Interim Fees for Course Starting from AY 2015-16	Final Fees for Course Starting from AY 2015-16	Institute Demands
7	EN3220	Saraswati Education Society, Yadavrao Tasgaonkar College of Engineering and Management, Nasarapur, Chandai, Karjat	82000	86100	**86100**	88680
8	EN3445	Vishvatmak Jangli Maharaj Ashram Trust's Vishvatmak Om Gurudev College of Engineering, Mohili-Aghai, Shahpur.	61510	64585	**61630**	63337
9	EN3447	G.M.Vedak Institute of Technology, Tala, Raigad.	83600	87780	**84010**	84007
10	EN3465	IDEAL INSTITUTE OF TECHNOLOGY	60000	63000	**66000**	76221
11	EN3721	Siddhivinayak Technical Campus, School of Engineering & Research Technology, Shirasgon, Nile	52660	55293	**52930**	52931
12	EN4123	Lokmanya Tilak Jankalyan Shikshan Sanstha, Priyadarshani College of Engineering, Nagpur	98700	103635	**104000**	107798
13	EN4142	Ankush Shikshan Sanstha's G. H. Raisoni Institute of Engineering & Technology for Women, Nagpur EN/ME	81670	85753	**76950**	78129
14	EN4145	Wainganga College of Engineering and Management, Dongargaon, Nagpur EN/ME/MB	77700	81585	**81830**	92235
15	EN4177	Smt. Bhagwati Chaturvedi College of Engineering, Harpur Nagar, Nagpur EN/M.Tech	85000	89250	**90000**	93000
16	EN5104	Shramsadhana Bombay Trust, College of Engineering & Technology, Jalgaon EN/ME/MB	70110	73615	**70440**	

XV. INFORMATION ON INFRASTRUCTURE AND OTHER RESOURCES AVAILABLE LIBRARY.

A) Number of Library books/Titles/Journals available (Programme-wise)

S.No.	Department	No. of Titles of the Books	No. of Volumes	No.of Journals	
				National	International
1	Civil	1841	8449	12	02
2	Chemical	1068	4084	06	02
3	Computer	2165	11464	12	02
4	I.T	835	4197	06	02
5	Electonics& Tele.	1429	8190	12	02
6	Electrical	1062	4437	06	02
7	Mechanical	1552	9474	12	02
8	M.B.A	932	2658	12	02
9	App.Sci	759	5635	06	02
10	Bio-Tech	646	1724	06	02
11	General	698	994		
Total		**12987**	**61306**	**90**	**20**

B) E-Library facilities Our College Library is Subscribed E-Journals i.e. 1) IEEE 2) Springer (Mechanical) 3) ASCE 4) J-gate (management Science) 5) Elsevier (Chemical Engineering) for the year 2016.

Annexure No.

18. Details of Laboratories and Workshop

NAME OF THE DEPARTMENT :- APPLIED SCIENCE

S.No.	**Name of the Laboratory /Workshop Details**	**Total area of Lab./w.s. in m^2**	**Major Equipment above 50,000/-**
01	Physics Laboratory	153	Nil
02	Chemistry Laboratory	135	Nil
03	Language Laboratory	135	Nil
04	Environmental / Maths Laboratory	108	Nil

Annexure No.

18. Details of Laboratories and Workshops

Name of the Department: - BIOTECHNOLOGY

Laboratories Name	Area Sq.M.	Major Equipment* Above 50000/-
1. Microbiology	69	Rotary flask shaker, Incubator
2. Biochemistry	69	Double distilled water plant, Vacuum Oven, Orbital Shaking Incubator
3. Fermentation Biotechnology	66	Fermenter, Bacteriological Incubator
4. Bioprocess Engineering	66	Autoclave, Rotary flask shaker.
5. Bioprocess Modeling & Simulation/ Computer Lab	66	Computers, 5KVA UPS
6. Immunology Lab/ Molecular Biology and Genetic Engineering	66	Laminar Air Flow, Cooling Centrifuge, Deep Freezer
7. Project Lab	68	--
8. Plant Tissue Culture Lab	68	Laminar Air Flow
9. Bioinformatics	108	Computers 16 No.
10. Down Stream Processing Lab	66	----
11. Research Lab	72	U.V. Visible Spectrophotometer, Lyophilizer, Power supply

(Costing ≥Rs. 50,000/-)

Annexure No.

18. **Details of Laboratories and Workshop**

Name of Department: - CIVIL ENGINEERING

Sr No	Name of the laboratory/Workshop Detail	Total Area of lab/work shop in m^2	Major Equipment above 50,000/-
1	Testing of Materials laboratory I	74	1. Computerized Universal Testing Machine 2. Compression Testing Machine 3. Digitalized Tensile Testing Machine
2	Testing of Materials laboratory II	81	1. Computerized Compression Testing Machine 2. Universal Testing Machine
3	Surveying lab	68	1. Total station 2. 1" Theodolite 3. Electronic distance measuring device
4	Fluid Mechanics Lab I	96	1. Pelton wheel turbine 2. Francis turbine
5	Fluid Mechanics II	90	3. Wind tunnel digitalized
6	Geo-technical Engineering Lab	147	1. Digitalized Triaxial shear testing machine 2. Standard penetration test apparatus 3. Plate load test Apparatus
7	Transportation Engineering lab	81	Ductility test machine
8	Engineering Geology Lab	96	Aqua meter
9	Environmental Engineering Lab	66	1. Spectrophotometer, 2. Auto exhausts analyzer, 3. High volume sampler, 4. BOD incubator.
10	Engineering Mechanics Lab I	81	-
11	Engineering Mechanics Lab I	81	-
12	Computer Lab	108	SAP 2000 software, DLP Projector

Details of Laboratories and Workshop

NAME OF THE DEPARTMENT: - CHEMICAL ENGINEERING

S.No.	Name of the Laboratory /Workshop Details	Total area of lab./w.s. in m^2	Major equipment* Above 50000/-
01	LAB-1: Mass Transfer- I	68	Absorption in Packed Column, Cooling Tower
02	LAB-2: Mass Transfer- II	68	Bubble Cap Distillation, Ion Exchange, Single Effect Evaporator, Vapor liquid Equilibrium Set Up Apparatus
03	LAB-3: Fluid Flow Operation	66	-
04	LAB-4: Mechanical Operation	66	Rotary Vaccum Filter, Vertical Pressure Leaf Filter
05	LAB-5: Instrumentation	66	-
06	LAB-6: Process Control	66	Dynamic Response of Control Valve Rotameter, Flow Control Trainer, Pressure Control Trainer
07	LAB-7: Project	81	Evaporator Set up , Film Wise Drop Wise Condensation
08	LAB-8: Computer	81	Software Packages: ASPEN HYSIS, U.P.S. With Batteries
09	LAB-9: Chemical Reaction Engineering	90	Rotating Basket Reactor, Continuous Stirred Tank Reactor, Plug Flow Reactor (Coil Type), Cascaded Continuous Stirred Tank Reactor
10	LAB-10: Chemical Technology	90	Viscometric Bath
11	LAB-11: Research	72	FTIR Spectrophotometer, Liquid Ultrasonic Processor Reflectance Meter Digital Electronic Balance

*(Costing ≥ Rs. 50,000/-)

Details of Laboratories

Name of the Department:- **COMPUTER ENGINEERING**

Sr. No.	Name of the Laboratory	Total Area of Lab in m^2	Major Equipment above 50,000/-
1	Lab 1 /Data Structure Lab	90	-
2	Lab 2/Embedded System Lab	68	-
3	Lab 3 / ME (CSE) Computer Lab	66	-
4	Lab 4/Digital & Microprocessor Lab	81	-
5	Lab 5/Software Engineering Lab	68	-
6	Lab 6/Programming Lab-I	67	-
7	Lab 7/Database Lab	67	-
8	Lab 8/System Programming Lab	67	-
9	Lab 9/Project Lab	81	-
10	Lab-10/Linux Lab	144	Interactive White Board Veron make Model No. IB 78 (4*6 feet)
11	Lab-11/Programming Lab-II	71	-
12	Lab-12/ME (CSE) Research Lab	71	-
13	Server Room	56	IBM Server@ 1.26GHz UPS Online 5KVA with Batteries
14	HOD Cabin (Computer)	40	UPS 1 battery 12V-65H-12Nos battery with Maintainance free battery IBM System X3100 M4 Server Desktop, 8 GB RAM, Hard disk 1 TB, Lenovo 18.5 W LED Monitor Lenovo Monitor

Annexure No.

18. Details of Laboratories and Workshop

NAME OF THE DEPARTMENT: - ELECTRICAL ENGINEERING

Sr. No.	Name of the Lab	Area in Sq.m.	Total Major Equipment Above 50000/-
01	Measurement/ NA	68 (E002)	--
02	I D C Lab	82 (E003)	--
03	Electrical Machine I	75 (E004)	1. DC Shunt Motor Generator Set 2. DC Series Motor Generator Set
04	Electrical Machine lab II	81 (E005)	1. Synchronous Machine on Infinite Bus 2. Slip Ring Induction Motor with Loading Arrangement 3. Synchronous Motor With Loading Arrangement
05	Power System lab	67 (E006)	1. 400 km Transmission Line Study Unit
06	Switch Gear & Protection Lab	68 (E007)	1. Simulation Model for Differential protection of Transformer 2. Simulation Model for Distance Protection of Transmission Line 3. Simulation Model for Protection of Alternator
07	P G Lab	68 (E001)	PS CAD Software
08	High Voltage	67 (E 009)	50KV AC, 70 KV DC Set
09	Research Lab PG	68 (E101)	1. ETAP Software 2. MATLAB Software **3.** 1kW Solar Inverter
10	Electronic Lab ADE/MPMC/PE	68 (E105)	--
11	Control system	68 (E 106)	--
12	Computer lab	83 (E 109)	PLC/SCADA

Annexure No. 18. Details of Laboratories and Workshop

NAME OF THE DEPARTMENT :- ELECTRONICS & TELECOMMUNICATION ENGG.

Sr No	Name of the laboratory/Workshop Detail	Total Area of lab/work shop in m^2	Major Equipment above 50,000/-
1	Semiconductor Devices & Circuit Lab	90	---
2	UG Computer Lab	68	1. IBM Server 2. UPS
3	Communication Lab	71	----
4	RMT Lab	71	1. Microwave kit(MT9000) 2. Microwave kit(MT9001) 3. Microwave kit(MT9002) 4. Klystron Based Microwave Bench 5. Gunn diode Based Microwave Bench 6. Klystron Based Microwave Bench for radiation pattern of antennas
5	Television Engg / Consumer Elex Lab	71	----
6	Electronics Design Lab / Telematics	71	----
7	Project Lab/ Basic Electronics Lab / FOC Lab	135	---
8	Basic Elect Lab/ Power Elex Lab	75	---
9	E M / E.I Lab	72	1. GHZ Spectrum Analyzer
10	Network Analysis Lab	81	---
11	PG Computrer Lab	71	---
12	PG Research Lab	71	---
13	Seminar Hall	162	1. LAPTOP
14	Departmental Library	22	---

***** Major Equipment mean cost above Rs. 50,000/-

Annexure No.

67. Details of Laboratories and Workshop

NAME OF THE DEPARTMENT: - INFORMATION TECHOLOGY

Sr. No	Name of the laboratory/Workshop Detail	Total Area of lab/work shop in m^2	Major Equipment above 50,000/-
01	Lab1-Digital and Microprocessor Lab	73	Computers, 8085 microprocessor kit, power supply, Stabilizer.
02	Lab2 - Data Structure Lab	87	Computers, Stabilizer.
03	Lab3 - Programming Lab	73	Computers, Stabilizer, printer
04	Lab4 - Multimedia/Web Design Lab	69	Computers, printer, Stabilizer
05	Lab5 - Operating system Lab	58	Computers, Stabilizer
06	Lab6 - Computer Network Lab	83	Computers, Stabilizer
07	Lab7 - Database management Lab.	116	Computers
08	Lab8 - Software Engg. Lab	97	Computers
09	Lab9 - Computer Graphics Lab	87	Computers, printer
10	Lab10 - Project Lab	87	Computers

Annexure No.

18. Details of Laboratories and Workshop

NAME OF THE DEPARTMENT: - MECHANICAL ENGINEERING .14-15

Sr. No.	Name of the Laboratory /Workshop Details	Total area of Lab in m^2	Major Equipment above 50,000/-
01	Heat Power Lab	141	1. Four Cylinder Four Stroke Diesel Engine Test Rig. & Accessories 2. Hydraulic Trainer & Accessories 3. Computerized Twin cylinder Diesel Engine.
02	Refrigeration & Air Conditioning	85.5	1. Vapour Absorption System 2. ICE Plant Tutor 3. Computerized A/c cycle Test Rig.
03	Heat Transfer lab.1	70	---
04	Turbo machinery lab	73	1. Kaplan Turbine Test Rig.
05	Tribology Lab.	107	1. Friction In Journal Bearing 2. Michel Tilting Pad Thrust Bearing Apparatus. 3. Friction & Wear Test Rig
06	Cad /Cam lab	107	1. Auotcad2005 10 Seats 2.IDEAS 11NX Series 07 Seats
07	Theory of Machine	107	1. Slip and Creep Measurement Apparatus
08	Mechanical Measurement & Metrology Lab	107	1. Gear Test Bench 2. Auto Collimator Model A-1 3. Angle Dekkor 4. Tool Maker Microscope Model No. TM 25 5. Gear Test Bench 6. Profile Projector 7. Surface Test
09	Material Science & Engineering Metallurgy	114	1. Trinocular Metallurgical microscope with C.C.T.V. attachment 2. Metallurgical Microscope 3. Ultrasonic Flow Detector 4. Metzer Monocular Metallurgical Research Microscope Metz-783(08 Nos) Metallurgical 5. Metzer binocular universal research microscope 6. Muffel Furnance
10	M.E. Computer Lab	109	1. Ansys introdactory multiphysics software ver.10.0 (5 licence) 2. MATLAB 2007 Software (2 licence) 3. ACER – LCD Projector 4. HP Design jet Printer. 5. UPS 7.5 Kva, Exide Make 6EL 144 V 6. AutoCAD Inverter Professional Suite 2010 Software (15 User)
11	Model Lab	114	---
12	Mechatronics Lab	107	1. Trainers 2. Pneumatic Actuator

DEPARTMENT OF BUSINESS ADMINISTRATION

Details of Laboratory

NAME OF THE DEPARTMENT: - M.B.A.

A)

Sr.No	Name of the laboratory/Workshop Detail	Total Area of lab/work shop in m^2	Major Equipment above 50,000/-
01	Computer Lab-01	102	**-NIL-** .

Details of Laboratories and Workshop

NAME OF THE DEPARTMENT: - WORKSHOP

Sr. no	Name of the Workshop Section Details	Total area of Lab./W.S. in m^2	Major Equipment above 50,000/-
01	Machine shop with CNC lab	187.29	Lathe Machine (16 No.) Milling Machine (02No.) Shaper Machine (01 No.) Radial Drilling Machine (01 No.) CNC Lathe Machine (01No.) CNC Milling Machine (01No.)
02	Welding shop	107.02	MIG Welding Machine
03	Foundry shop	100.50	----
04	Black smithy shop	41.85	-----
05	Fitting shop	107.02	-----
06	Plumbing shop	15.60	-----
07	Tin smithy shop	15.60	-----
08	Carpentry Shop	133.78	-----

Item No.26

A) Facilities for conducting Practical in the Laboratories

Name of Course: - **Engineering** Class: - **FE Common** Subject: - **Engg. Chemistry**

Name of the Department / Section: -Applied Science Dept./ Chemistry Section.

Subject wise & laboratory wise Lists of material, machinery, equipment & Instrument required to perform prescribed Practical (**Note: Minimum FIVE Experiments from the following**)

Subject: **EC -I**

Sr. No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt. can be conducted
			Required	Available	
1	To measure total hardness of given water sample.	a. Burette (25ml) b. Pipette c. Measuring cylinder d. Titration Flask (250ml) e. Burette stand f. Beakers (500 ml)	10 10 10 10 10 10	24 24 12 30 15 12	Yes
2	Estimation of phenol volumetrically in given solution	a. Burette (25 ml) b. Pipette c. Measuring cylinder d. Titration Flask (250 ml e. Burette stand f. Beakers (250 ml)	10 10 10 10 10 10	24 24 12 30 15 12	Yes
3	Determination of chloride content in the given sample of water by Mohr's method	a. Burette (25 ml) b. Pipette d. Titration Flask. (250 ml) d. Beakers(250 ml) e. Burette stand	10 10 10 10 10	24 24 30 12 15	Yes
4	Determination of alkalinity of water sample.	a. Burette (25 ml) b. Pipette c. Measuring cylinder d. Titration Flask (250 ml) e. Burette stand f. Beakers (250 ml)	10 10 10 10 10 10	24 24 12 30 15 12	Yes
5	To Estimate Copper in brass idometrically.	a. Burette (25 ml) b. Pipette c. Measuring cylinder d. Titration Flask (250 ml) e. Burette stand f. Beakers (250 & 500 ml)	10 10 10 10 10 20	24 24 12 30 15 24	Yes

6	To Estimate zinc in brass idometrically.	a. Burette (25 ml) b. Pipette c. Measuring cylinder d. Titration Flask (250 ml) e. Burette stand f. Beakers	10 10 10 10 10 10	24 24 12 30 15 12	Yes
7	Preparation of phenol formaldehyde resin	Glass rod, Beaker(500 ml) glass funnel	10 10 10	20 12 12	Yes
8	To Determine percentage of calcium in cement.	water bath	05	00	NO
9	Preparation of polystyrene by Bulk polymerization	Round bottom flask, Condenser, Over head motor Thermostat	10 10 10 01	00 00 00 00	NO
10	Determination of DO in given water sample(Winklers method)	Burette (25ml) Pipette(25 ml) Titration Flask (250 ml glass bottles, Measuring Cylinder	10 10 10 10 10	24 24 30 20 12	Yes

Subject **: EC - II**(**Note: Minimum FIVE Experiments from the following**)

Sr. No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt. can be conducted
			Required	Available	
1	Determination of acid value of vegetable oils.	a. Burette (10ml) b. Pipette c. Measuring cylinder d. Titration Flask e. Burette stand f .Digital balance	10 10 10 10 10 02	12 24 12 36 24 02	Yes
2	Determination of amount of NaOH & Na_2CO_3 in given Alkali mixture	a. Burette (25 ml) b. Pipette c. Measuring cylinder d. Titration Flask (250ml) e. Burette stand f. Beakers	10 10 10 10 10 10	24 24 12 30 24 24	Yes
3	Determination of PH value of water by PH meter.	a pH-meter b. Beaker c. Glass electrode d. Stirrer e. Burette stand	02 06 02 06 02	02 24 02 10 24	Yes
4	Determination of percentage of moisture ash content coal sample.	a. Oven b. Muffle Furnace c. Desiccators d. Digital balance	01 01 01 01	01 01 01 02	Yes
5	Determine of partition coefficient of iodine bet^{n}.water and carbon tetra-chloride.	a. Burette (25 ml) b. Pipette c. Measuring cylinder d. Titration Flask e. Burette stand f. Beakers g. Stoppered Bottles h. Separating flasks	10 10 10 10 10 10 10 03	24 24 12 36 24 24 24 03	Yes
6	To determine the coefficient of viscosity of a given liquid using Ostwald viscometer.	a. Ostwald viscometer. b. Burette (25ml) c. Beakers d. Burette stand	10 10 10 10	15 24 24 24	Yes
7	Determination of Calorific value of Fuel sample by using Bomb calorimeter.	Bomb calorimeter**,**	01	00	No

8	Determination of Aniline Point of an Oil	Aniline Point thermometer, Aniline Point apparatus	10 10	00 00	No
9	Determination of Iodine value of given lubricating Oil by Wij`s method.	water bath	05	00	No
10	Determination of Saponification Value of an Oil.	Water Condenser, Water bath.	10 05	00 00	No

Item No.26

A) Facilities for conducting Practical in the Laboratories

Name of Course: - **Engineering** Class: - **FE Common** Subject: - **Engg. Physics**

Name of the Department / Section: -Applied Science Dept./ **Physics Section**.

Subject wise & laboratory wise Lists of material, machinery, equipment & Instrument required to perform prescribed Practical (**Note: Minimum FIVE Experiments from the following**)

Subject: **EP -I**

Sr. No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt. can be conducted
			Required	Available	
1	Semiconductor Diode characteristics	Diode characteristics kit	05	07	Yes
2	Forbidden gap in semiconductor	Forbidden gap kit	05	03	Yes
3	Four Probe Method	Four Probe Kit	05	05	Yes
4	Wavelength of He-Ne laser	He-Ne laser Diffraction grating	05	03	Yes
5	Fibre Optics Communication	Fibre Optics trainer kit	05	03	Yes
6	Hall Effect	Gauss meter, Electromagnets	05	05	Yes
7	Characteristics Of Solar Cell & Calculation Of Fill Factor	Solar Cell kit	5	7	Yes
8	Wavelength by Diffraction grating	Diffraction grating Spectrometer	5	4	Yes
9	Determination Of Wavelength Of Sodium Light By Michelson Interferometer	Michelson Interferometer Sodium Lamp	5 1	2 1	Yes
10	Brewster Law	Sodium source, Spectrometer	05	02	Yes
11	Law of Malus	Polarizer, Light source	05	02	Yes
12	Crystal Structure	Crystal Structure	05	05	Yes

Subject: **EP –II** (**Note: Minimum FIVE Experiments from the following**)

Sr. No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt. can be conducted
			Required	Available	
1	Use Of Sound Level Meter	Sound Level Meter	5	3	Yes
2	Ultrasonic Interferrometer	Frequency Generator Measuring cell	5 5	2 2	No
3	Use Of Ultrasonic Detector	Frequency Generator	5	3	Repairing required
4	Determination Of Specific Charge Of An Electron By Thomson Method	C.R.T. Power supply Magnetometer Stop Watch	5 5 5 5	5 5 5 5	Yes
5	B-H Curve	B-H Curve kit	05	05	Yes
6	Magnetic susceptibility measurement	Magnetic power supply Strong magnets	05	03	Repairing required
7	Uses of CRO	CRO Function generator	05	02	Yes
8	Synthesis and Characterization of Nano Composites.	TEM, XRD	01	Nil	No

Item No.26

A) Facilities for conducting Practical in the Laboratories

Name of Course: **- Engineering** Class: - **FE Common** Subject: - **Soft Skills**

Name of the Department / Section: -Applied Science Dept./ **English Section**.

Subject wise & laboratory wise Lists of material, machinery, equipment & Instrument required to perform prescribed Practical

Subject: **SS -I**

Sr. No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt. can be conducted
			Required	Available	
1	Communication Skills and Barriers to Communication	Computers Software Headphones	48 1 48	48 1 48	Yes
2	A Matter of Pronunciation	Computers Software Headphones	48 1 48	48 1 48	Yes
3	Speaking in Public	Computers Software Headphones	48 1 48	48 1 48	Yes
4	E-Presentations	Computers Software Headphones	48 1 48	48 1 48	Yes
5	Comprehension of Passages	Computers Software Headphones	48 1 48	48 1 48	Yes

Subject: **SS –II**

Sr. No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt. can be conducted
			Required	Available	
1	Understanding of English Language	Computers Software Headphones	48 1 48	48 1 48	Yes
2	Resume and Curriculum Vitae Writing	Computers Software Headphones	48 1 48	48 1 48	No
3	Basics of Group Discussion	Computers Software Headphones	48 1 48	48 1 48	Yes
4	Strategies During the Interview	Computers Software Headphones	48 1 48	48 1 48	Yes
5	Principles of Team-Workmanship	Computers Software Headphones	48 1 48	48 1 48	Yes

ITEM:26 **APPENDIX:-15**

NAME OF COURSE: - BIOTECHNOLOGY ENGINEERING.
NAME OF THE DEPT: - BIOTECHNOLOGY.
NAME OF SUBJECT: - MICROBIOLOGY [S.E]
Subject wise and laboratory wise list of material, machinery, equipments and instruments required to perform prescribed practical and term work.
Facilities for conducting practical in the laboratory.

Sr.No.	Title of the Experiment	Name of eqpt M/c, inst, etc.Required to conduct the expt.	Quantity		Whether Expt, Can be conducted.
			Requ.	Avail.	
1	Study and use of microscope a. Examination of prepared slides	Compound microscope	10	10	Yes
2	Preparation of laboratory media: a. Autoclaving, b. Preparation of agar slants and agar plates. c. Preparation of liquid media.	Autoclave	10	10	Yes
3	Isolation & Cultivation of microorganisms (Bacteria & Fungi) on solid and liquid media and observation of cells a. By streak plate method b. By pour plate method. c. By spreading d. Observation of cells: i. Cultural characteristics, ii. Biochemical characteristics	Autoclave, Agar, Media, Compound microscope, Stage Micrometer & Occular Micrometer	10 10 10	10 10 10	Yes
4	Staining techniques: a. Simple staining, b. Gram staining, c. Lactophenol cotton blue mounting of fungi.	Compound microscope, Stains			
5	Isolation by serial dilution method, maintenance & preservation.	Autoclave, Incubator, Refrigerator	10 10	10 10	Yes
6	Influence of antimicrobial agent, UV radiation & heat on microbial growth.	Autoclave, Colony counter Petri plates Incubator	01 36 01	01 40 02	Yes
7	Study of bacterial growth curve. (Turbidity measurement as direct expression of growth)	Spectrophotometer Micropipettes Conical Flask Beaker Orbital incubator shaker	01 02 04 02 01	01 06 10 10 01	Yes

NAME OF COURSE: - BIOTECHNOLOGY ENGINEERING.
NAME OF THE DEPT: - BIOTECHNOLOGY.
NAME OF SUBJECT: - CONCEPTS IN BIOTECHNOLOGY [S.E.]
Subject wise and laboratory wise list of material, machinery, equipments and instruments required to perform prescribed practical and term work.
Facilities for conducting practical in the laboratory.

Sr. no.	Expt. Title	Name of eqptM/c, inst, etc.Required to conduct the expt.	Quantity		Whether Expt,Can be conducted.
			Requ.	Avail.	
01	Cell staining of Animal cell	Microscope	10	10	Yes
02	Cell staining of Plant cell.	Microscope	10	10	Yes
03	Cell staining of Bacteria cell.	Microscope	10	10	Yes
4	Mitosis of onion root tips	Microscope	10	10	Yes
05	Meiosis of earthworm ovary	Microscope	10	10	Yes
06	Microscopic identification of bacterial chromosomes	Microscope	10	10	Yes
07	Microscopic identification of Plant chromosomes	Microscope	10	10	Yes
08	Isolation of cell organelles: nucleus, mitochondria, lysosomes	Research Centrifuge	03	03	Yes
09	Isolation of cell organelles: nucleus, mitochondria, lysosomes.	Research Centrifuge	03	03	Yes
10	Karyotyping of animal, plant & bacterial cell	Microscope	10	10	Yes

NAME OF COURSE: - BIOTECHNOLOGY ENGINEERING.
NAME OF THE DEPT: - BIOTECHNOLOGY.
NAME OF SUBJECT: - COMPUTER APPLICATION [S.E.]
Subject wise and laboratory wise list of material, machinery, equipments and instruments required to perform prescribed practical and term work.
Facilities for conducting practical in the laboratory.

Sr. no.	Expt. Title	Name of eqptM/c, inst, etc.Required to conduct the expt.	Quantity		Whether Expt,Can be conducted.
			Requ.	Avail.	
1	To solve Matrices using Matrix Inversion Method.	Pentium-iv, digital computer.	15	15	Yes
2	To solve Matrices using Gauss Elimination method.	Pentium-iv, digital computer.	15	15	Yes
3	To solve Differential equation of first order by Taylor's series method	Pentium-iv, digital computer.	15	15	Yes
4	To solve Differential equation of first order by Modified Euler's method	Pentium-iv, digital computer.	15	15	Yes
5	To solve Differential equation of first order by Picards method	Pentium-iv, digital computer.	15	15	Yes
6	To solve Differential equation of first order by Runge Kutta's 4th order method	Pentium-iv, digital computer.	15	15	Yes
7	To solve Numerical Integration by Weddle's rule.	Pentium-iv, digital computer.	15	15	Yes
8	To solve Numerical Integration by Trapezoidal Rule	Pentium-iv, digital computer.	15	15	Yes
9	To solve Numerical Integration by Simpson's 1/3rd Rule	Pentium-iv, digital computer.	15	15	Yes
10	To solve Numerical Integration by Simpson's 3/8th rule	Pentium-iv, digital computer.	15	15	Yes

NAME OF COURSE: - BIOTECHNOLOGY ENGINEERING.
NAME OF THE DEPT: - BIOTECHNOLOGY.
NAME OF SUBJECT: - BIOCHEMISTRY [S.E.]
Subject wise and laboratory wise list of material, machinery, equipments and instruments required to perform prescribed practical and term work.
Facilities for conducting practical in the laboratory.

Sr.No.	Title of the Experiment	Name of eqpt M/c, inst, etc.Required to conduct the expt.	Quantity		Whether Expt, Can be conducted.
			Requ.	Avail.	
1	Estimation of carbohydrates.	Electronic balance Spectrophotometer Beaker Conical flask Pipettes Burettes Test tubes	01 01 06 05 05 02 25	01 01 15 15 25 02 50	Yes
2	Estimation of proteins.	Electronic balance Spectrophotometer Water bath Beaker Conical flask Pipettes Test tubes	01 01 01 06 05 05 25	01 01 01 15 15 25 50	Yes
3	Estimation of nucleic acids.	Electronic balance Spectrophotometer Water bath Beaker Conical flask Pipettes Test tubes	01 01 01 06 05 05 25	01 01 01 15 15 25 50	Yes
4	Isoelectric Precipitation	Electronic balance Spectrophotometer Water bath Beaker Conical flask Pipettes Test tubes	01 01 01 06 05 05 25	01 01 01 15 15 25 50	Yes
5	Separation of amino acids by paper chromatography.	Whatmann filter paper Chromatographic Chamber Sprayer Incubator	01 01 02 01	10 01 02 02	Yes
6	Separation of sugars by paper chromatography.	Whatmann filter paper Chromatographic Chamber Sprayer Incubator	01 01 02 01	10 01 02 02	Yes
7	Extraction of Lipids.	Electronic Balance Beaker Conical flask Pipettes Test tubes Centrifuge	01 05 05 05 20 01	01 15 15 25 50 01	Yes

8	Thin layer Chromatography.	Electronic Balance Glass plates TLC Kit Incubator UV Chamber Sprayer	01 18 01 01 01 02	01 20 01 02 01 02	Yes
9	Gel Electrophoresis.	Electronic Balance Vertical electrophoresis Kit Horizontal electrophoresis Kit Power supply unit Beaker Conical flask Micro-pipette Microcentrifuge	01 01 01 01 05 05 02 01	01 01 01 01 20 15 02 01	Yes
10	Assay of enzyme activity	Spectrophotometer Electronic Balance Water bath Incubator Beaker Conical flask Pipettes Test tubes	01 01 01 01 05 05 08 25	01 01 01 02 15 15 25 50	Yes
11	Assay of enzyme kinetics.	Spectrophotometer Electronic Balance Water bath Incubator Beaker Conical flask Pipettes Test tubes	01 01 01 01 05 05 08 25	01 01 01 02 15 15 25 50	Yes
12	Identification and estimation of an intermediate of EMP pathway	--	--	--	--
13	Cell fractionation.	Centrifuge Beaker Conical flask Electronic Balance	01 05 05 01	01 15 15 01	Yes
14	Vitamin Assay.	Centrifuge Beaker Conical flask Electronic Balance	01 05 05 01	01 15 15 01	Yes

NAME OF COURSE: - BIOTECHNOLOGY ENGINEERING.
NAME OF THE DEPT: - BIOTECHNOLOGY.
NAME OF SUBJECT: - UNIT OPERATIONS-I [S.E.]
Subject wise and laboratory wise list of material, machinery, equipments and instruments required to perform prescribed practical and term work.
Facilities for conducting practical in the laboratory

Sr. no.	Expt. Title	Name of eqpt,M/c, inst, etc.Required to conduct the expt	Quantity		Whether ExptCan be conducted.
			Requ.	Avail.	
1	Determination of Viscosity	Ostwald Viscometer	02	02	Yes
2	Study of Manometers	Manometers	--	--	Yes
3	Verification of Bernoulli's theorem.	Bernoulli's Instrument	01	01	Yes
4	To determine the coefficient of Venturi meter	Venturi meter	01	01	Yes
5	To determine the coefficient of Orifice meter.	Orifice meter	01	01	Yes
6	To determine the coefficient of Nozzle meter	Nozzle meter	01	01	Yes
7	Reynolds Experiment.	Reynolds Apparatus	01	01	Yes
8	Minor losses in pipe.	Pipe Material	01	01	Yes
9	To determine the fanning friction factor for given pipe.	Pipe Material	01	01	Yes
10	Notches & Weirs.	Different Notches & Weirs	01	01	Yes
11	To study the characteristics curves of Centrifugal Pump.	Centrifugal Pump	01	01	Yes
12	To study of the different types of Fans, Blowers & Compressors	Fans, Blowers & Compressors	01	01	Yes

NAME OF COURSE: - BIOTECHNOLOGY ENGINEERING.
NAME OF THE DEPT: - BIOTECHNOLOGY.
NAME OF SUBJECT: - UNIT OPERATIONS-II [S.E.]
Subject wise and laboratory wise list of material, machinery, equipments and instruments required to perform prescribed practical and term work.
Facilities for conducting practical in the laboratory

Sr. no.	Expt. Title	Name of eqpt,M/c, inst, etc.Required to conduct the expt	Quantity		Whether ExptCan be conducted.
			Requ.	Avail.	
1	To study the separation of solid by sedimentation	Measuring cylinder	02	02	Yes
2	Sieve Shaker: To ascertain the fineness number and to study the differential & cumulative screen analysis of the sand	Sieve Shaker unit	01	01	Yes
3	Ball Mill :To verify the laws of crushing & grinding	Ball Mill	01	01	Yes
4	Jaw Crusher : To verify the laws of crushing & grinding	Jaw Crusher	01	01	Yes
5	Plate & Frame Filter Press: To determine the rate of filtration ,specific cake resistance and filter medium resistance	Plate & Frame Filter Press	01	01	Yes
6	Rotary Vacuum Filter: To find out the rate of filtration	Rotary Vacuum Filter	01	01	Yes
7	Fluidization : To observe and study the behavior of the bed during fluidization and to calculate minimum fluidization velocity	Fluidization bed reactor	01	01	Yes
8	Sigma Kneader Mixer : To study the sigma Kneader Mixer	Sigma Kneader Mixer	01	01	Yes
9	Vibrating Shifter : To find out the effectiveness of the Vibrating Shifter	Vibrating Shifter	01	01	Yes
10	Mini Pulveriser : To study the Mini Pulveriser	Mini Pulveriser	01	01	Yes
11	Cyclone Separator : To study the operating behavior of cyclone separator and to find out its efficiency	Cyclone Separator	01	01	Yes
12	Ribbon Blender : To study the Ribbon Blender & to find out the mixing index	Ribbon Blender	01	01	Yes

NAME OF COURSE: - BIOTECHNOLOGY ENGINEERING.
NAME OF THE DEPT: - BIOTECHNOLOGY.
NAME OF SUBJECT: - IMMUNOLOGY [S.E.]
Subject wise and laboratory wise list of material, machinery, equipments and instruments required to perform prescribed practical and term work.
Facilities for conducting practical in the laboratory.

Sr.No.	Title of the Experiment	Name of eqpt M/c, inst, etc.Required to conduct the expt.	Quantity		Whether Expt, Can be conducted.
			Requ.	Avail.	
1	Immunoelectrophoresis	Immunoelectrophoresis unit Power supply Micropipettes Refrigerator	01 01 02 01	01 01 06 01	Yes
2	Radial immunodiffusion	Immunoelectrophoresis unit Power supply Micropipettes Refrigerator	01 01 02 01	01 01 06 01	Yes
3	Antigen –Antibody interaction: The Ouchterlony procedure	Immunoelectrophoresis unit Power supply Microcentrifuge Micropipettes Refrigerator	01 01 01 02 01	01 01 01 06 01	Yes
4	Introduction to ELISA reactions	Micropipettes Refrigerator	02 01	06 01	Yes
5	Western Blot Analysis – demo	Vertical Electrophoresis Power supply Micropipettes Refrigerator	01 01 02 01	01 01 06 01	Yes
6	Immunology of pregnancy test – demo	Micropipettes Refrigerator	02 01	06 01	Yes
7	Latex agglutination test	Immunoelectrophoresis unit Power supply Micropipettes Refrigerator	01 01 02 01	01 01 06 01	Yes
8	Precipitin reaction	Micropipettes Refrigerator	02 01	06 01	Yes
9	Antibody titer test	Micropipettes Refrigerator	02 01	06 01	Yes
10	Agglutination reaction	Microcentrifuge Micropipettes Refrigerator	01 01 02	01 01 06	Yes

NAME OF COURSE: - BIOTECHNOLOGY ENGINEERING.
NAME OF THE DEPT: - BIOTECHNOLOGY.
NAME OF SUBJECT: - CHEMICAL REACTION ENGINEERING [T.E.]
Subject wise and laboratory wise list of material, machinery, equipments and instruments required to perform prescribed practical and term work.
Facilities for conducting practical in the laboratory.

Sr.No.	Title of the Experiment	Name of eqpt M/c, inst, etc.Required to conduct the expt.	Quantity		Whether Expt, Can be conducted.
			Requ.	Avail.	
1	To determine the reaction rate constant {k} for given reaction.(CSTR / BATCH / SEMIBATCH / PFR)	CSTR / BATCH / SEMIBATCH / PFR)	1	1	Yes
2	To determine the effect of temperature on reaction rate constant. .(CSTR / BATCH / SEMIBATCH / PFR)	CSTR / BATCH / SEMIBATCH / PFR	1	1	Yes
3	To determine the activation energy {E} for the given reaction. .(CSTR /BATCH / SEMIBATCH / PFR)	CSTR /BATCH / SEMIBATCH / PFR	1	1	Yes
4	To draw C [t], E [t] and F [t] curve and to calculate the mean residence time {tm} variance { σ2} and skewness { S3} for plug flow reactor.	Plug flow reactor.	1	1	Yes
5	To draw C [t], E [t] and F [t] curve and to calculate the mean residence time {tm} variance {σ_2} and skewness{S_3} for annular reactor.	Annular reactor	1	1	Yes
6	To draw C [t], E [t] and F [t] curve and to calculate the mean residence time {tm} variance {σ2} and skewness {S3} for packed Bed reactor.	Packed Bed reactor	1	1	Yes
7	To study the cascade CSTR	CSTR	1	1	Yes
8	To study the kinetic in tubular flow reactor [coiled tube] for the given reaction	Tubular flow reactor	1	1	Yes

NAME OF COURSE: - BIOTECHNOLOGY ENGINEERING.
NAME OF THE DEPT: - BIOTECHNOLOGY.
NAME OF SUBJECT: - LAB TISSUE CULTURE ENGINEERING [T.E.]
Subject wise and laboratory wise list of material, machinery, equipments and instruments required to perform prescribed practical and term work.
Facilities for conducting practical in the laboratory.

Sr.No.	Title of the Experiment	Name of eqpt M/c, inst, etc.Required to conduct the expt.	Quantity		Whether Expt, Can be conducted.
			Requ.	Avail.	
1	Laboratory Setup & Introduction to PTC techniques	Laminar Air Flow & Plant Tissue Culture Rack	1	1	Yes
2	General Sterilization techniques	Laminar Air Flow & Plant Tissue Culture Rack	1	1	Yes
3	Preparation of culture medium sterilization of explants	Laminar Air Flow & Plant Tissue Culture Rack	1	1	Yes
4	Initiation of callus culture	Laminar Air Flow & Plant Tissue Culture Rack	1	1	Yes
5	Micropropogation/ Multiple shoot induction	Laminar Air Flow & Plant Tissue Culture Rack	1	1	Yes
6	Embryo culture	Laminar Air Flow & Plant Tissue Culture Rack	1	1	Yes
7	In-vitro seed germination	Laminar Air Flow & Plant Tissue Culture Rack	1	1	Yes
8	Meristem culture	Laminar Air Flow & Plant Tissue Culture Rack	1	1	Yes
9	RAPD (DEMO)	--	--	--	--
10	Lab design, sterilization procedures, media preparation for ATC and cryopreservation	Laminar Air Flow & Plant Tissue Culture Rack	1	1	Yes
11	Hardening and acclimatization of in vitro raised rooted shoots	Laminar Air Flow & Plant Tissue Culture Rack	1	1	Yes
12	Encapsulate the shoot buds/ seeds to demonstrate the production of synthetic seeds	Laminar Air Flow & Plant Tissue Culture Rack	1	1	Yes
13	Primary culture from chick embryo.	Laminar Air Flow & Plant Tissue Culture Rack	1	1	Yes

NAME OF COURSE: - BIOTECHNOLOGY ENGINEERING.
NAME OF THE DEPT: - BIOTECHNOLOGY.
NAME OF SUBJECT: - MASS TRANSFER [T.E.]
Subject wise and laboratory wise list of material, machinery, equipments and instruments required to perform prescribed practical and term work.
Facilities for conducting practical in the laboratory.

Sr. no.	Expt. Title	Name of eqpt, M/c, inst, etc. Required to conduct the expt.	Quantity		Whether Expt, Can be conducted.
			Requ.	Avail.	
1	To determine mass transfer coefficient for dissolution of benzoic acid without chemical reaction.	Glasswares, stirrer with speed control, vernier caliper	01	01	Yes
2	Simple Distillation: To verify Rayleigh's equation for simple distillation	Batch Distillation unit	01	01	Yes
3	To study Bubble Cap Distillation	Bubble Cap Distillation unit			Yes
4	Liquid – Liquid Extraction: To study and determine the efficiency of cross Current liquid-liquid extraction	Liquid – Liquid Extraction setup	04	04	Yes
5	To construct ternary diagram for acetic acid – water –benzene	Beaker, Conical Flask, Burette, pipette	01	01	Yes
6	To plot Tie line diagram for acetic acid –water – benzene	Beaker, conical flask, Burette, pipette	01	01	Yes
7	To determine the percentage leaching of NaOH from a mixture of NaOH and $CaCo_3$	Solid – Liquid Extraction setup	01	01	Yes
8	Adsorption: To study adsorption of acetic acid on activated charcoal	Adsorption Column	01	01	Yes
9	To calculate percentage yield of crystals obtained with and without seeding in saturated solution of solute.	Beaker, weighing balance, heating mantle, stirrer	01	01	Yes

NAME OF COURSE: - BIOTECHNOLOGY ENGINEERING.
NAME OF THE DEPT: - BIOTECHNOLOGY.
NAME OF SUBJECT: - MOLECULAR BIOLOGY [T.E.]
Subject wise and laboratory wise list of material, machinery, equipments and instruments required to perform prescribed practical and term work.
Facilities for conducting practical in the laboratory.

Sr.No.	Title of the Experiment	Name of eqpt M/c, inst, etc.Required to conduct the expt.	Quantity		Whether Expt, Can be conducted.
			Requ.	Avail.	
1	Isolation of genomic DNA from bacteria	Submarine electrophoresis kit Power supply Microcentrifuge Micropipettes Refrigerator Deep Freezer	01 01 01 04 01 01	04 03 01 13 01 01	Yes
2	Isolation of RNA from yeast	Submarine electrophoresis kit Power supply Microcentrifuge Micropipettes Refrigerator Deep Freezer	01 01 01 04 01 01	04 03 01 13 01 01	Yes
3	Isolation of total plasmid DNA from bacteria	Submarine electrophoresis kit Power supply Microcentrifuge Micropipettes Refrigerator Deep Freezer	01 01 01 04 01 01	04 03 01 13 01 01	Yes
4	Calculation of molecular weight by using DNA marker with agarose gel electrophoresis	Submarine electrophoresis kit Power supply Microcentrifuge Micropipettes Refrigerator Deep Freezer	01 01 01 04 01 01	04 03 01 13 01 01	Yes
5	DNA extraction from blood.	Submarine electrophoresis kit Power supply Microcentrifuge Micropipettes Refrigerator Deep Freezer	01 01 01 04 01 01	04 03 01 13 01 01	Yes
6	Spooling of chromosomal DNA from onion cells.	Submarine electrophoresis kit Power supply Microcentrifuge Micropipettes Refrigerator Deep Freezer	01 01 01 04 01 01	04 03 01 13 01 01	Yes
7	Determination of melting temperature (Tm) and base composition of DNA from thermal denaturation characteristics	Submarine electrophoresis kit Power supply Microcentrifuge Micropipettes Refrigerator Deep Freezer	01 01 01 04 01 01	04 03 01 13 01 01	Yes

8	Principles and practice of agarose gel electrophoresis	Submarine electrophoresis kit Power supply Microcentrifuge Micropipettes Refrigerator Deep Freezer	01 01 01 04 01 01	04 03 01 13 01 01	Yes
9	Quantitation of Nucleic acids.	Submarine electrophoresis kit Power supply Microcentrifuge Micropipettes Refrigerator Deep Freezer	01 01 01 04 01 01	04 03 01 13 01 01	Yes

NAME OF COURSE: - BIOTECHNOLOGY ENGINEERING.
NAME OF THE DEPT: - BIOTECHNOLOGY.
NAME OF SUBJECT: - LAB BIOPROCESS INSTRUMENTATION & ANALYSIS [T.E.]
Subject wise and laboratory wise list of material, machinery, equipments and instruments required to perform prescribed practical and term work.
Facilities for conducting practical in the laboratory.

Sr.No.	Title of the Experiment	Name of eqpt M/c, inst, etc.Required to conduct the expt.	Quantity		Whether Expt, Can be conducted.
			Requ.	Avail.	
1	To study the response of bimetallic thermometer.	Bimetallic thermometer	01	01	Yes
2	To study Calibration of thermocouple.	Thermocouple.	01	01	Yes
3	To measure the pH of given solution.	pH meter	01	01	Yes
4	To determine concentration of given solution by colorimeter	colorimeter	01	01	Yes
5	To study Flame photometry	Flame photometry	01	01	Yes
6	To study Abbey's refractometer	Abbey's refractometer	01	01	Yes
7	To study infra red spectrophotometer	infra red spectrophotometer	01	01	Yes
8	To study UV spectrophotometer	UV spectrophotometer	01	01	Yes

NAME OF COURSE: - BIOTECHNOLOGY ENGINEERING.
NAME OF THE DEPT: - BIOTECHNOLOGY.
NAME OF SUBJECT: - GENETIC ENGINEERING [T.E.]
Subject wise and laboratory wise list of material, machinery, equipments and instruments required to perform prescribed practical and term work.
Facilities for conducting practical in the laboratory.

Sr. no.	Expt. Title	Name of eqpt, M/c, inst, etc. Required to conduct the expt.	Quantity		Whether Expt, Can be conducted.
			Requ.	Avail.	
1	Restriction digestion of genomic DNA of bacteria	Submarine electrophoresis kit Power supply Microcentrifuge Micropipettes Refrigerator Deep Freezer	01 01 04 01 01	04 03 01 13 01 01	Yes
2	Ligation of bacterial DNA	Submarine electrophoresis kit Power supply Microcentrifuge Micropipettes Refrigerator Deep Freezer	01 01 04 01 01	04 03 01 13 01 01	Yes
3	Plasmid preparation	Submarine electrophoresis kit Power supply Microcentrifuge Micropipettes Refrigerator Deep Freezer	01 01 04 01 01	04 03 01 13 01 01	Yes
4	DNA fingerprinting (by RFLP)	Submarine electrophoresis kit Power supply Microcentrifuge Micropipettes Refrigerator Deep Freezer	01 01 04 01 01	04 03 01 13 01 01	Yes
5	DNA mapping using restriction enzymes	Submarine electrophoresis kit Power supply Microcentrifuge Micropipettes Refrigerator Deep Freezer	01 01 04 01 01	04 03 01 13 01 01	Yes
6	Transformation of *E.coli* with plasmid pBR 322	Autoclaves	01	02	Yes

7	Transduction	Autoclaves, Incubators	01 01	02 03	Yes
8	Southern Blotting	Southern Blotting unit Power supply Microcentrifuge Micropipettes Refrigerator Deep Freezer	01 01 01 04 01 01	04 03 01 13 01 01	Yes
9	Northern Blotting	Northern Blotting unit Power supply Microcentrifuge Micropipettes Refrigerator Deep Freezer	01 01 01 04 01 01	04 03 01 13 01 01	Yes

NAME OF COURSE: - BIOTECHNOLOGY ENGINEERING.
NAME OF THE DEPT: - BIOTECHNOLOGY.
NAME OF SUBJECT: -BIOPROCESS ENGINEERING &FERMENTATION TECHNOLOGY [T.E.]
Subject wise and laboratory wise list of material, machinery, equipments and instruments required to perform prescribed practical and term work.
Facilities for conducting practical in the laboratory.

Sr.No.	Title of the Experiment	Name of eqpt M/c, inst, etc.Required to conduct the expt.	Quantity		Whether Expt, Can be conducted.
			Requ.	Avail.	
1	Introduction to the fermenter.	Fermenter, Autoclave, U.V. Spectrophotometer	01 03 01	01 03 01	Yes
2	Feed Sterilization	Fermenter Autoclave U.V. Spectrophotometer	01 03 01	01 03 01	Yes
3	Fermenter Sterilization	Fermenter Autoclave U.V. Spectrophotometer	01 03 01	01 03 01	Yes
4	Growth kinetics of microorganisms using shake flask method.	Fermenter Autoclave U.V. Spectrophotometer	01 03 01	01 03 01	Yes
5	Determination of specific thermal death rate constant (Ka).	Fermenter Autoclave U.V. Spectrophotometer	01 03 01	01 03 01	Yes
6	Determination of Volumetric oxygen transfer coefficient (KLa), effect of aeration and agitation speed	Fermenter Autoclave U.V. Spectrophotometer	01 03 01	01 03 01	Yes
7	Preparation of Immobilized enzymes and cells and evaluation of kinetic parameters	Fermenter Autoclave U.V. Spectrophotometer	01 03 01	01 03 01	Yes
8	Kinetics study of Product formation.	Fermenter Autoclave U.V. Spectrophotometer	01 03 01	01 03 01	Yes
9	Effect of substrate and product concentration on biomass yield for baker's yeast production.	Fermenter Autoclave U.V. Spectrophotometer	01 03 01	01 03 01	Yes
10	Studies on settling characteristics of various microbial cultures	Fermenter Autoclave U.V. Spectrophotometer	01 03 01	01 03 01	Yes
11	Study of Physical and chemical sensors for medium and gases.	Fermenter Autoclave U.V. Spectrophotometer	01 03 01	01 03 01	Yes
12	Fermentative production of Sauerkraut	Fermenter Autoclave U.V. Spectrophotometer	01 03 01	01 03 01	Yes

NAME OF COURSE: - BIOTECHNOLOGY ENGINEERING.
NAME OF THE DEPT: - BIOTECHNOLOGY.
NAME OF SUBJECT: - BIOPROCESS MODELING & SIMULATION [B.E.]
Subject wise and laboratory wise list of material, machinery, equipments and instruments required to perform prescribed practical and term work.
Facilities for conducting practical in the laboratory.

Sr.No.	Title of the Experiment	Name of eqpt M/c, inst, etc.Required to conduct the expt.	Quantity		Whether Expt, Can be conducted.
			Requ.	Avail.	
1	CAD of shell and tube exchanger.	Pentium-iv,digital Computer, Aspen Hysys Software	15	19	yes
2	CAD of adsorption column	Pentium-iv,digital Computer, Aspen Hysys Software	15	19	yes
3	CAD of single effect evaporator.	Pentium-iv,digital Computer, Aspen Hysys Software	15	19	yes
4	Computer controlled heat exchanger.	Pentium-iv,digital Computer, Aspen Hysys Software	15	19	yes
5	CAD for rotary dryer.	Pentium-iv,digital Computer, Aspen Hysys Software	15	19	yes
6	Simulation of temperature on surface catalyst	Pentium-iv,digital Computer, Aspen Hysys Software	15	19	yes
7	Simulation of reactor design.	Pentium-iv,digital Computer, Aspen Hysys Software	15	19	yes
8	Simulation of ammonia production system	Pentium-iv,digital Computer, Aspen Hysys Software	15	19	yes
9	Modeling and simulation of protein.	Pentium-iv,digital Computer.	15	19	yes
10	Drug designing	Pentium-iv,digital Computer.	15	19	yes

NAME OF COURSE: - BIOTECHNOLOGY ENGINEERING.
NAME OF THE DEPT: - BIOTECHNOLOGY.
NAME OF SUBJECT: - FOOD BIOTECHNOLOGY-II [B.E.]
Subject wise and laboratory wise list of material, machinery, equipments and instruments required to perform prescribed practical and term work.
Facilities for conducting practical in the laboratory.

Sr. No.	Title of the Experiment	Name of eqpt M/c, inst, etc.Required to conduct the expt.	Quantity		Whether Expt, Can be conducted.
			Requ.	Avail.	
1	Standard plate count.	Colony Counter	01	01	YES
2	Structural straining-spore straining.	Stains, Microscope	01	01	YES
3	Microbial examination of water by multiple tube fermentation test.	Test Tubes, Microscope, Colorimeter, Incubator	01 01 01	01 03	YES
4	Vinegar production.	Fermenter, Rotary flask shaker, Incubator, Autoclave Refrigerator	01 01 01 01 01	01 03 03 02 03	YES
5	Wine making.	Fermenter, Rotary flask shaker, Incubator, Autoclave Refrigerator	01 01 01 01 01	01 03 03 02 03	YES
6	Microbial examination of canned foods.	Microscope	01	10	YES
7	Assay of quality of milk by methylene blue reduction test	Colorimeter Spectrophotometer	01 01	01 01	
8	Sauerkrant fermentation.	Water Bath Heating Mentle	02		
9	Control of microbial growth by physical methods-heat.	Burner Water Bath Hot Air Oven			
10	Analysis of mycotoxin (Aflatoxin) in fungus contaminated food material.	Petri Plates, Autoclave			

NAME OF COURSE: - BIOTECHNOLOGY ENGINEERING.
NAME OF THE DEPT: - BIOTECHNOLOGY.
NAME OF SUBJECT: - Downstream Processing [B.E.]
Subject wise and laboratory wise list of material, machinery, equipments and instruments required to perform prescribed practical and term work.
Facilities for conducting practical in the laboratory

Sr.No.	Title of the Experiment	Name of eqpt M/c, inst, etc.Required to conduct the expt.	Quantity		Whether Expt, Can be conducted.
			Requ.	Avail.	
1	Cell Disruption by Ultrasonication.	Ultrasonicator, Autoclave	01 01	01 02	YES
2	Cell Disruption by Enzymatic Reaction.	Rotary flask shaker, Incubator, Autoclave	01 01 01	03 04 02	YES
3	Aqueous Two-phase Extraction.	Conical Flask, Beakers, Test tubes	05 Each	50	YES
4	Centrifugal Separation- Ultra Centrifugation	Centrifuge, Rotary flask shaker, Incubator, Balance, pH meter, Autoclave Conical Flask, Beakers, Test tubes	01	01	YES
5	Separation & identification of amino acids by paper chromatography.	Whatman Filter Paper, Sprayer	01 Each 01	02	YES
6	Separation & identification of sugars by paper chromatography.	Whatman Filter Paper, Sprayer	01 Each 01	02	YES
7	Separation & identification of lipids by thin layer chromatography.	Spreader TLC Plates	01 01	01 10	YES
8	Ammonium Sulphate Precipitation of biomolecules	Autoclave	01	02	YES
9	Isoelectric Precipitation.	Autoclave,	01	02	YES
10	Crystallisation of biomolecules.	Crystallizer, Autoclave,	01 01	01 02	YES

NAME OF COURSE: - BIOTECHNOLOGY ENGINEERING.
NAME OF THE DEPT: - BIOTECHNOLOGY.
NAME OF SUBJECT: - BIOINFORMATICS [B.E.]
Subject wise and laboratory wise list of material, machinery, equipments and instruments required to perform prescribed practical and term work.
Facilities for conducting practical in the laboratory

Sr.No.	Title of the Experiment	Name of eqpt M/c, inst, etc.Required to conduct the expt.	Quantity		Whether Expt, Can be conducted.
			Requ.	Avail.	
1	Databases search: NCBI, EMBL	Pentium-iv,digital Computer, Bioinformatics software, Internet	15	16	yes
2	Basic Local Alignment Search Tool	Pentium-iv,digital Computer, Bioinformatics software, Internet	15	16	yes
3	Multiple sequence alignment.	Pentium-iv,digital Computer, Bioinformatics software, Internet	15	16	yes
4	Rasmol	Pentium-iv,digital Computer, Bioinformatics software, Internet	15	16	yes
5	Swiss PDB Viewer.	Pentium-iv,digital Computer, Bioinformatics software, Internet	15	16	yes
6	Homology modelling	Pentium-iv,digital Computer, Bioinformatics software, Internet	15	16	yes
7	DS Visualizer	Pentium-iv,digital Computer, Bioinformatics software, Internet	15	16	yes
8	ArgusLab	Pentium-iv,digital Computer, Bioinformatics software, Internet	15	16	yes
9	Modeller	Pentium-iv,digital Computer, Bioinformatics software, Internet	15	16	yes
10	Chemsketch	Pentium-iv,digital Computer, Bioinformatics software, Internet	15	16	yes
11	Comparative docking of different HIV Protease inhibitors.	Pentium-iv,digital Computer, Bioinformatics software, Internet	15	16	yes
12	Pair wise alignment using Align / EMBOSS	Pentium-iv,digital Computer, Bioinformatics software, Internet	15	16	yes
13	Restriction Mapper.	Pentium-iv,digital Computer, Bioinformatics software, Internet	15	16	yes
14	Chou-Fasman Structure prediction	Pentium-iv,digital Computer, Bioinformatics software, Internet	15	16	yes

NAME OF COURSE: - BIOTECHNOLOGY ENGINEERING.
NAME OF THE DEPT: - BIOTECHNOLOGY.
NAME OF SUBJECT: - BIOPROCESS INDUSTRIES [B.E.]
Subject wise and laboratory wise list of material, machinery, equipments and instruments required to perform prescribed practical and term work.
Facilities for conducting practical in the laboratory

Sr.No.	Title of the Experiment	Name of eqpt M/c, inst, etc.Required to conduct the expt.	Quantity		Whether Expt, Can be conducted.
			Requ.	Avail.	
1	Growth kinetics of microorganisms using shake flask method.	Autoclave Incubator Orbital Shaker	01 01 01	02 04 03	yes
2	Determination of specific thermal death rate constant (Ka).	Autoclave Incubator Orbital Shaker Water Bath	01 01 01 01	02 04 03 02	yes
3	Determination of Volumetric oxygen transfer coefficient (KLa), effect of aeration and agitation speed.	Autoclave Incubator Orbital Shaker Water Bath	01 01 01 01	02 04 03 02	yes
4	Preparation of Immobilized enzymes and cells and evaluation of kinetic parameters.	Autoclave Refrigerator	01 01	02 03	yes
5	Kinetics study of Product formation.	Autoclave Incubator Orbital Shaker Water Bath	01 01 01 01	02 04 03 02	yes
6	Effect of substrate and product concentration on biomass yield for bakers yeast production	Autoclave Incubator Orbital Shaker Water Bath	01 01 01 01	02 04 03 02	yes
7	Studies on settling characteristics of various microbial cultures.	Autoclave Incubator Orbital Shaker Water Bath	01 01 01 01	02 04 03 02	yes
8	Explant preparation and their inoculation on suitable plant growth media.	Autoclave Laminar Air Flow Culture Rack	01 01 01	02 02 01	yes
9	Callus induction technique and regeneration of plant from callus culture.	Autoclave Laminar Air Flow Culture Rack	01 01 01	02 02 01	yes
10	Artificial seed production.	Autoclave Laminar Air Flow Culture Rack	01 01 01	02 02 01	yes
11	Shake flask studies of plant cell culture.	Autoclave Laminar Air Flow Culture Rack Orbital Shaker	01 01 01 01	02 02 01 03	yes

NAME OF THE DEPT: - BIOTECHNOLOGY.
NAME OF SUBJECT: - BIOPROCESS INDUSTRIES [B.E.]
Subject wise and laboratory wise list of material, machinery, equipments and instruments required to perform prescribed practical and term work.
Facilities for conducting practical in the laboratory

Sr.No.	Title of the Experiment	Name of eqpt M/c, inst, etc.Required to conduct the expt.	Quantity		Whether Expt, Can be conducted.
			Requ.	Avail.	
1	Air microbiology by solid and liquid impingement methods.	Autoclave Incubator Laminar Air Flow Refrigerator	01 01 01 01	02 03 02 03	yes
2	Coliform count of water by MPN technique	Autoclave Incubator	01 01	02 03	yes
3	Test for sterility as per IP (Injection water/ non absorbent cotton/soluble powder/ear drops)..	Autoclave Incubator Laminar Air Flow Refrigerator	01 01 01 01	02 03 02 03	yes
4	Microbial limit test on excipients as per I.P. – Hard gelatin, tragacanth, starch, lactose	Autoclave Incubator Laminar Air Flow Refrigerator	01 01 01 01	02 03 02 03	yes
5	Studies on selective media: McConkey Agar, Cetrimide Agar, Vogel Johnson, Salt mannitol agar	Autoclave Incubator Laminar Air Flow Refrigerator	01 01 01 01	02 03 02 03	yes
6	Antibiotic sensitivity test by disc method.	Autoclave	01	02	yes
7	Widals test tube agglutination method	Widal Teaching Kit Slides	01 01	01 01	yes
8	Biochemical tests (Catalase, Oxidase, Urease, Nitratase, Protease, Amylase and IMVIC).	Glasswares (Test Tubes, Conical Flask, Beakers) As per requirement Refrigerator	 01	 03	yes
9	Antimicrobial assay of antibiotic, introduction to zone of inhibition and calculation.	Autoclave Centrifuge	01 01	02 03	yes
10	Immobilization of enzymes/cells by calcium alginate/gelatin/agar.	Autoclave Orbital Shaker	01 01	02 03	yes
11	Isolation of DNA.	Electrophoresis Unit Voltage Supply Eppendorf Tubes Cooling Centrifuge	01 01 24 01	03 05 1000 01	yes
12	Selection and isolation of bacteria by replica plating.	Autoclave Incubator Refrigerator	01 01 01	02 03 03	yes
13	Determination of thermal death time and thermal death point.	Water bath, Incubator Autoclave	01 01 01	02 03 02	yes

14	Effect of Ultra-Violet exposure on growth of E coli.	Incubator Autoclave Laminar Air Flow	01 01 01	03 02 02	yes
15	Demonstration of electrophoresis either by PAGE or Agarose gel electrophoresis	SDS PAGE Kit Voltage Supply	01 01	01 05	yes

B) List of Practicals which cannot be performed or conducted in the existing facilities actually available in the college.

Sr.No.	Name of the Department	Class	Title of Experiment	Name of Institute where the experiments are processed to conducted	When the deficiency in equipment will be fulfilled
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Item No. 26

Name of department: Civil Engineering

A) Facilities for conducting practical in the laboratories

Name of course: Civil Engineering **Class: FE (Common)**

Subject: **Elements of Civil Engineering and Engineering mechanics**

SN	Experiment title	Name of equipment, machinery, instrument, Etc required to conduct experiment	Quantity		Whether experiment can be performed
			Required	Available	
01	Observation of bearing and calculation and adjustment of included angle	Prismatic compass, ranging rods, tap and nails.	06 each	30 each	Yes
02	To find law of machine, efficiency of machine	a) Differential axle and Wheel b) Worm & Worm Wheel c) Single &Double Purchase Crab d) Sets of Weights e) Scales	02 02 02 each 04 02	02 02 02 each 04 02	Yes Yes Yes Yes Yes
03	Reaction of Beam	a) Sets of Weights b) Scales	04 02	04 02	Yes Yes
04	To find the forces in the members of Jib Crane	a) Jib crane b) Sets of Weights c) Scale	02 02 02	02 02 02	Yes Yes Yes
05	Verification of Lami's theorem	Lami's apparatus	01	01	Yes

Concern Teacher

Name of department: Civil Engineering

Name of subject: Surveying: -I Class: SE (Civil)

Facilities for conducting practicals in laboratory:

Note: - As per Syllabus the Term Work consisting of following Experiment.

SN	Experiment title	Name of equipment, machine, instrument etc	Quantity		Whether experiment can be performed
			Required	Available	
1	Measurements of horizontal and vertical angles by transit Theodolite ,	Theodolite	6	9	YES
2	Measurements of horizontal angles of a triangle by repetition method.	Theodolite	6	9	YES
3	Theodolite Traverse survey project of a closed traverse with at least four sides.	Theodolite	6	9	YES
4	Computation of horizontal distances and elevations by Tacheometry for horizontal and inclined sights.	Theodolite	6	9	YES
5	Tacheometric contouring project with at least two instrument stations at 60 m apart.	Theodolite	6	9	YES

6	Radiation and intersection method in plane Table survey.	Plane Table, Tripod Allidade,U-Fork, Plumb-bob, Bubble Tube Ranging Rods, Pegs	6	12	YES
7	Plane table survey project of a closed traverse of minimum four sides.	Plane Table, Tripod Allidade,U-Fork, Plumb-bob, Bubble Tube Ranging Rods, Pegs	6	12	YES
8	Use of box sextant and Abney level.	Box Sextant Abney level	2	2	YES
9	Study and use of Indian pattern clinometer and pantagraph.	Clinometer Pantagraph	3	3	YES
10	Road project for minimum length of 500m, including fixing of alignment, profile leveling, and cross sectioning.	Auto level	2	2	YES
11	Use and study of dumpy level for finding out the level by various method	Dumpy level	06	11	Yes

Concern Teacher

Name of subject: Concrete Technology **Class: SE (Civil)**

Facilities for conducting practicals in laboratory:

Note: - As per Syllabus the Term Work consisting of following Experiment.

SN	**Experiment title**	**Name of equipment, machine, instrument etc**	**Quantity**		**Whether experiment can be performed**
			Required	Available	
1	To determine Fineness of cement	I.S. sieves Cement Balance	1	2	Yes
2	To determine Setting time of Cement	V-Cat's Apparatus Mould Balance	1	2	YES
3	To determine Compressive strength of Cement	Crushing Testing Machine Mould Balance	1	1	
4	To determine Soundness of Cement	Le- Chatelier Balance	6	12	Yes
5	To determine Fineness modulus and sieve analysis of aggregate.	I.S. Sieves Balance	1 set	1 set	Yes
6	To determine Crushing value of aggregate	Crushing Testing Machine Balance	1	1	Yes
7	To determine Impact value of aggregate	Impact Testing Machine Balance	1	1	YES
8	To determine moisture content of aggregate	Oven Containers Balance	1	1	YES
9	To determine Abrasion value of aggregate	Loss-Angles Balance	1	2	YES

10	To determine shape factor of aggregate	Elongation index Flakiness index Balance	1	1	YES
11	To determine specific gravity of aggregate	Jar Balance	1	1	YES
12	To determine Workability of concrete (Slump cone and compaction factor)	Slump cone Balance	3	3	YES
13	To determine Compressive strength of concrete (Cubes and cylinders)	Crushing Testing Machine, Mould Balance	1	1	YES
14	To determine Split test or tensile test of concrete (cylinders)	Crushing Testing Machine Mould Balance	1	1	YES

Name of subject: Surveying II **Class: SE (Civil)**

Facilities for conducting practicals in laboratory:

Note: - As per Syllabus the Term Work consisting of following Experiment.

SN	**Experiment title**	**Name of equipment, machine, instrument etc**	**Quantity**		**Whether experiment can be performed**
			Required	Available	
1	Measurement of horizontal and vertical angles by 1" theodolite..	1" Theodolite	2	2	Yes
2	Measurement of horizontal angles by reiteration method by 1" theodolite.	1" Theodolite	2	2	Yes

3	Study and use of nautical sextant for measurement of angles for hydrographic survey.	Nautical sextant	2	3	Yes
4	Solution of three point problem for hydrographic survey.	Three arm protactor	1	1	Yes
5	To find out the scale of the photograph	Aerial photographs	4 pairs	4 pairs	Yes
6	Study and use of mirror stereoscope and finding out the air base distance.	Mirror stereoscope	3	4	Yes
7	Study and use of E.D.M. and its principle	EDM	1	1	Instrument is not in working condition.
8	Study and use of total station	Total station	1	1	yes

Concern Teacher

Name of subject: Fluid Mechanics I **Class: SE (Civil)**

Facilities for conducting practicals in laboratory:

Note: - As per Syllabus the Term Work consisting of any nine Experiment.

SN	Experiment title	Name of equipment, machine, instrument etc	Quantity		Whether experiment can be performed
			Required	Available	
1.	Measurement of variation of viscosity of oil with temperature	Viscosity meter	01	01	YES

2.	Study of simple and differential manometers.	Manometer setup	01	01	YES
3.	Buoyancy: metacentric height of ship model.	Metacentric height apparatus with water tank Weights	01	01	YES
4.	Study of Bernoulli's theorem	Bernoulli's theorem apparatus with collecting water tank	01	01	YES
5.	Calibration of Venturimeter / Orificementre	Venturimeter Orifice meter	01	01	YES
6.	Electrical analogy method.	Electrical analogy apparatus set up	01	01	YES
7.	Study of laminar flow/ Heleshaw's apparatus.	Haleshaw apparatus set up	01	01	YES

8.	Coefficients of Orifice / Mouthpiece / notches.	Orifice meter & mouthpiece apparatus setup	01	01	YES
9.	Study of Impact of jet.	Impact of jet apparatus.	01	01	YES
10.	Calibration of notch	Notch setup	01	01	YES

Concern Teacher

Name of subject: Engineering Geology **Class: SE (Civil)**

Facilities for conducting practicals in laboratory:

Note: - As per Syllabus the Term Work consisting of following Experiment.

SN	**Experiment title**	**Name of equipment, machine, instrument etc**	**Quantity**	**Whether experiment can be performed**	
			Required	Available	

1.	Study of the minerals in hand specimen:	Mineral Specimens	35	182	YES
2.	Study of the rock types in hand specimens	Rock specimens	40	170	YES
3.	Construction of geological sections from contoured geological maps	Geological maps	-	-	YES
4.	Logging of drill core and interpretation of drilling data	Structural problems			YES

Concern Teacher

Item no. 26

APPENDIX 15

A) Facilities for conducting practical in the laboratories

Name of course**: Civil Engineering** Class: **T.E.** Subject: **Fluid Mechanics II**

Note: - As per Syllabus the Term Work consisting of following Experiment.

Sr. No.	Experiment Title	Name of Equipment, machinery Instrument etc. required to conduct experiment	Quantity	Whether Expt. can be conducted

			Required	Available	
01	Study of boundary layer on flat plate	Wind Tunnel	01	01	Yes
02	determination of friction factor of given pipes	Losses in pipes apparatus	01	01	Yes
03	Drag and lift on an airfoil	Wind Tunnel Aerofoil Model	01	01	Yes
04	Drag and lift on cylinder	Wind Tunnel Cylinder	01	01	Yes
05	Hydraulic Jump	Adjustable channel with gates	01	01	Yes
06	Standing wave flume (Venturi Flume)	Adjustable channel with Model	01	01	Yes
07	Velocity distribution in open channel	Adjustable channel apparatus	01	01	Yes
08	Characteristics of Pelton Wheel	Pelton Wheel Turbine	01	01	Yes
09	Characteristic of Turbines	Franci's Turbine Kaplon Turbine	01 01	01 01	Yes
10	Characteristic of centrifugal pump	Centrifugal Pump	01	01	Yes

11	Determination and analysis of pressure distribution over circular cylinder	Wind tunnel Cylinder model	01	01	Yes
12	Study of uniform flow formule in open channel	Open channel apparatus	01	01	Yes
13	Stydy of specific energy and specific force in open channel	Open channel apparatus	01	01	Yes

Concern Teacher

Name of course: **Civil Engineering** Class: **T. E.**

Subject : **Environmental Engineering I**

Note: - As per Syllabus the Term Work consisting of Minimum Eight Experiment.

SN	**Experiment title**	**Name of equipment, machinery, instrument, Etc required to conduct experiment**	**Quantity**		**Whether experiment can be performed**
			Required	Available	
01	Alum Jar Test	Jar equipments,Chemicals,Nephelometer,	1, 2	1, 2	Yes
02	M.P.N.Test	Autoclave ,Oven	1	1	Yes
03	Total Solids test	Oven,Imhoff cone	1, 3	1,3	Yes
04	Chlorine demand and residual chlorine	Chlorine Testing Kit	1	2	Yes
05	Conductivity of water	Conductivity meter	-	-	Yes
06	Alkalinity Determination	Chemicals	-	-	Yes
07	Fluoride Test	Spectrophotometer	1	1	Yes
08	Dissolve Oxygen Test	Chemicals	1	1	Yes
09	Determination of P^H of water	P^H meter	1	1	Yes
10	Hardness of water	Burrete with stand chemicals	1	1	Yes

Concern Teacher

Name of course**: Civil Engineering** Class: **T. E.**

Subject: **Geotechnical Engineering I**

Note: - As per Syllabus the Term Work consisting of Minimum Eight Experiment

SN	Experiment title	Name of equipment, machinery, instrument, Etc required to conduct experiment	Quantity	Whether experiment can be performed
1	Field Density by core cutter method ,sand replacement method	Core cutter, sand replacement equipment	1	Yes
2	Sieve Analysis & particle size determination	Sieve set	1	Yes
3	Specific gravity determination by Pycnometer	Pycnometer	1	Yes
4	Determination of liquid limit & plastic limit	Casagrade's Apparatus	1	Yes
5	Determination of shrinkage limit	shrinkage dish, measuring cylinder	1	Yes
6	Determination of coefficient of permeability by constant head or variable head permeamerter	constant head permeamerter variable head permeamerter	1	Yes
7	Direct shear test	Direct shear test Machine	1	Yes
8	Unconfined compression test	Unconfined compression test Machine	1	Yes
9	Vane shear test	Vane shear test Apparatus	1	Yes
10	Proctor's test	Proctor's test Apparatus	1	Yes
11	Triaxial test	Triaxial Test Machine	1	Yes
12	C.B.R. Test or consolidation test	C.B.R. Test Machine	1	Yes
13	Swelling Test	Glass ware	-	Yes
14	a) Classification of Soils. b) Construction of Pressure bulb	Any one of the following assignments using software / programming	-	-
15	a) Rebhann's and Cullman's graphical method for determination of earth Pressure. b) Solution of problems on shear strength parameters using graph	Assignments on the following topics	-	-

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Concern Teacher

Name of Course: **Civil Engineering** Class: **T.E**

Subject: **Testing of Materials-I**

Note: - As per Syllabus the Term Work consisting of following Experiment.

SN	Experiment Title	Name of equipment, Machinery ,Instrument.etc required to conduct experiment	Quantity	Whether Experiment Can be performed
1	Rebound hammer test on concrete	Rebound hammer	1	Yes
2	Compressive strength of Solid/Hollow block	CTM	1	Yes
3	Determining of modulus of elasticity of concrete by extensometer	Extensometer	1	Yes
4	Concrete mix design for IS method	-	1	Yes
5	Effect of admixture on concrete strength	-	1	Yes

Concern Teacher

Name of Course: **Civil Engineering** Class: **T.E**

Subject: **Testing of Materials-II**

Note: - As per Syllabus the Term Work consisting of following Experiment.

SN	Experiment Title	Name of equipment, Machinery, Instrument. etc required to conduct experiment	Quantity	Whether Experiment Can be performed
1	Water absorption of brick	Oven	1	Yes
2	Compressive strength of brick	CTM	1	Yes
3	Moisture content of timber	Oven	1	Yes
4	Bending test on timber	UTM	1	Yes
5	Tensile strength on metal	UTM	1	Yes
6	Abrasion test on tile	Abrasion testing machine	1	Yes

Concern Teacher

Name of Course: **Civil Engineering** Class:**T.E**

Subject: **Infrastructural Engineering-II**

Note: - As per Syllabus the Term Work consisting of Minimum Five Experiment.

SN	Experiment Title	Name of equipment, Machinery, Instrument.etc required to conduct experiment	Quantity		Whether Experiment Can be performed
			Required	Available	
1	Penetration Test	Penetration Machine	1	1	Yes
2	Ductility of Bitumen	Ductility Testing Machine	1	1	Yes
3	Softening Point of Bitumen	Softening Point Apparatus	1	1	Yes
4	Specific Gravity of Bitumen	Weights, Glassware	1	0	No
5	Flash and Fire point Test	Flash/Fire Apparatus	1	1	Yes
6	Viscosity of Bitumen	Viscometer	1	1	Yes
7	Marshal Stability Test	Marshal Stability Machine	1	1	Yes
8	Bitumen Extraction Test	Bitumen Extraction Apparatus	1	1	Yes
9	Stripping Value of Road Aggregate	Film Stripping Device	1	0	No

Concern Teacher

Name of course: **Civil Engineering** **Class: T.E.**

Subject: Geotechnical Engineering II

Note: - As per Syllabus the Term Work consisting of following Experiment.

S. No.	**Experiment title**	**Name of equipment, machinery, instrument, Etc required to conduct experiment**	**Quantity**		**Whether experiment can be performed**
			Required	available	
1	Plate load test	Plate load test apparatus	1	1	Yes
2	Standard penetration test –	Standard penetration test apparatus	1	1	Yes
3	Pile Load Test	Hammer	1	1	Yes

Concern Teacher

Item no. 26

A) Facilities for conducting practicals in the laboratories

Name of course: **Civil Engineering** Class: **B.E.**

Subject : Environmental Engineering II

Note: - As per Syllabus the Term Work consisting of following Experiment.

SN	Experiment title	Name of equipment, machinery, instrument, Etc required to conduct experiment	Quantity		Whether experiment can be performed
			Required	available	
1	Determination of Total solids	Oven, Muffle Furnace	1 1	1 1	Yes
2	Determination of Oil Grease	Glass ware	5	6	Yes
3	Determination of BOD	BOD Incubator	1	1	Yes
4	Determination of COD	COD Assembly with heating coil	1	1	Yes
5	Determination of Sulfate/Chloride	Burette with Stand	1	1	Yes
6	Determination of salt content by electrical conductivity meter	conductivity meter	1	1	Yes
7	Determination of Total Nitrogen / different form of Nitrogen	Kjeldahl distillation assembly	1	1	yes
8	Determination of sulfate / phosphate content	Spectrophotometer	1	1	yes
9	General technique of Microbiology	Microbiological colony counter	1	1	Yes

Concern Teacher

Name of course: **Civil Engineering**

Class: B.E.

Subject : Industrial Water Pollution Control

Note: - As per Syllabus the Term Work consisting of following Experiment.

SN	Experiment title	Name of equipment, machinery, instrument, Etc required to conduct experiment	Quantity		Whether experiment can be performed
			Required	available	
1	Hardness by EDTA method	Burrete with stand	5	6	Yes
2	Ammonia/Nitrogen	Kjeldahl distillation assembly	5	6	Yes
3	Nitratrate /nitrogen	Kjeldahl distillation assembly	5	6	Yes
4	Estimation of Phosphate	Spectrophotometer	1	1	Yes
5	Sulphate by spectrophotometric & turbidity meter	Spectrophotometer & tubiditymeter	1	1	Yes
6	Biological oxygen demand	BOD incubator	1	1	Yes
7	Chemical oxygen demand	COD assembly with heating coil	1	1	yes
8	Fluorides by SPANDS reagent	Spectrophotometer	1	1	yes
9	Heavy metals by AAS	Spectrophotometer	1	1	Yes
10	Estimation of NO_x	High volume sampler	1	00	NO
11	Estimation of SO_x	High volume sampler	1	00	NO
12	Estimation of particulate matter	High volume sampler	1	00	NO

Concern Teacher

Name of course: **Civil Engineering**

Class: **M. E**

Subject: **Lab practice I**

Note: - As per Syllabus the Term Work consisting of following Experiment.

SN	Experiment title	Name of equipment, machinery, instrument, Etc required to conduct experiment	Quantity		Whether experiment can be performed
			Required	Available	
1	Determination of Chloride	Burette with Stand	1	1	Yes
2	M.P.N. Test	Autoclave ,Oven	1	1	Yes
3	Chemical oxygen demand	COD assembly with heating coil	1	1	yes

Concern Teacher

Name of course: **Civil Engineering**

Class: M. E. Subject: Lab practice II

Note: - As per Syllabus the Term Work consisting of following Experiment.

SN	**Experiment title**	**Name of equipment, machinery, instrument, Etc required to conduct experiment**	**Quantity**		**Whether experiment can be performed**
			Required	Available	
1	Determination phosphate content	Spectrophotometer	1	1	yes
2	Hardness by EDTA method	Burrete with stand	5	6	Yes
3	Nitrate/nitrogen	Kjeldahl distillation assembly	5	6	Yes

Concern Teacher

NAME OF COURSE: - CHEMICAL ENGINEERING.
NAME OF THE DEPT: - CHEMICAL ENGG.
NAME OF SUBJECT: - LAB CHEMICAL ENGINEERING MATERIALS [S.E.]

Subject wise and laboratory wise list of material, machinery, equipments and instruments required to perform prescribed practical and term work.
Facilities for conducting practical in the laboratory.

Sr. no.	Expt. Title	Name of eqpt,M/c, inst, etc.Required to conduct the expt	Requ.	Avail.	Whether ExptCan be conducted.
1	Microstructure observation and study of metals and alloys. (Minimum five) low carbon steel, medium carbon steel, high carbon Steel, tin, bronze, brass, phosphor bronze.	Microscope	01	01	Yes
2	Different types of hardness test on metals. i.e. Rockwell hardness test, Brinell hardness test.	Hardness Tester	01	01	Yes
3	Izod and Charpy impact test on mild steel, copper, brass and aluminum	Izod Charpy test apparatus	01	01	Yes
4	Macrostructure observation: (flow lines observation in forging by macro etching sulphur printing of steel.)	Sulphur Print Test Kit	01	01	Yes
5	Study experiments based on, i) Dye penetration ii) Rubber lining iii) Heat treatments. iv) Ultrasonic Test	Dye Penetration Kit	01	01	Yes
6	Tension test on mild steel for studying stress, strain & Young's modulus	Universal Testing Machine	01	01	Yes
7	Bending test on steel sheets	Universal Testing Machine	01	01	Yes
8	Bending test on copper sheets	Universal Testing Machine	01	01	Yes

NAME OF COURSE: - CHEMICAL ENGINEERING.
NAME OF THE DEPT: - CHEMICAL ENGG.
NAME OF SUBJECT: - LAB FLUID FLOW OPERATION [S.E.]

Sr. no.	Expt. Title	Name of eqpt,M/c, inst, etc.Required to conduct the expt	Requ.	Avail.	Whether ExptCan be conducted.
1	Study of Bernouillis theorem	Bernouillis Setup.	01	01	Yes
2	Measurement of coefficient of discharge for venturimeter	Venturimeter	01	01	Yes
3	Measurement of coefficient of discharge for orificemeter	Orificemeter	01	01	Yes
4	Measurement of coefficient of discharge for notch	Notch Setup	01	01	Yes
5	Study of Reynolds experiment	Reynolds Apparatus	01	01	Yes
6	Study of characteristics of centrifugal pump	Centrifugal pump	01	01	Yes
7	Study of characteristics of reciprocating pump	Reciprocating pump	01	01	Yes
8	Study of Rotameter	Rotameter	01	01	Yes
9	Study of manometers	Manometers	01	01	Yes

NAME OF COURSE: - CHEMICAL ENGINEERING.
NAME OF THE DEPT: - CHEMICAL ENGG.
NAME OF SUBJECT: - LAB APPLIED INORGANIC CHEMISTRY [S.E.]

Sr. no.	Expt. Title	Name of eqptM/c, inst, etc.Required to conduct the expt.	Requ.	Avail.	Whether Expt,Can be conducted.
1	To find strength of solution in g/l & in normal terms	Burette. Pipette. Conical flask	10 10 10	10 10 10	Yes
2	Determination of amount of Magnesium volumetrically by using disodium EDTA.	Burette. Pipette. Conical flask.	10 10 10	10 10 10	Yes
3	Determination of amount of Manganese by Volhards Method	Volum. Flask. Burette. Pipette. Conical flask.	10 10 10 10	10 10 10 10	Yes
4	Estimation of Manganese dioxide in pyrolusite ore	Volum. Flask. Burette. Pipette. Conical flask.	10 10 10 10	10 10 10 10	Yes
5	Gravimetric determination of Fe as Fe_2O_3	Volum. Flask Funnel Crucible. Muffle furnace	10 10 10 01	10 10 10 01	Yes
6	Gravimetric estimation of Nickel as Ni- DMG.	Volum. Flask. Beakers Suction pump. Laboratory Oven.	10 10 01 01	10 10 01 01	Yes
7	Determination of amount of Copper(II) volumetrically from the given solution of CuSO4	Burette. Pipette. Conical flask. Funnel.	10 10 10 10	10 10 10 10	Yes
8	Preparation of tetramine copper (II) sulphate	Beaker watch glass Suction pump	10 10 01	10 10 01	Yes
9	Preparation of tris-ethylenediamine nickel(II) thiosulphate	Beaker Tripod stand Wire gauge Suction pump	10 10 10 01	10 10 10 01	Yes
10	Preparation of potassium tri-oxalato aluminate tri-hydrate	Beaker Porcelain dish	10 10	10 10	Yes

NAME OF COURSE: - CHEMICAL ENGINEERING.
NAME OF THE DEPT: - CHEMICAL ENGG.
NAME OF SUBJECT: - LAB APPLIED ORGANIC CHEMISTRY [S.E.]

Sr. no.	Expt. Title	Name of eqpt,M/c, inst, etc.Required to conduct the expt	Requ.	Avail.	Whether ExptCan be conducted.
1	Purification of organic compound by crystallization	Beaker Funnel Tripod Stand	10 10 10	10 10 10	Yes
2	Purification of organic compound by distillation	Distillation Assembly	04	04	Yes
3	Estimation of Acetone	Burette, Pipette, Conical flask, stopper bottles.	10 10 10	10 10 10	Yes
4	Estimation of Glucose	Burette, pipette, Conical flask, stopper bottles.	10 10 10	10 10 10	Yes
5	Preparation of p-nitro acetanilide from acetanilide.	Beakers, Suction pump. Buchner funnel	10 01 02	10 01 02	Yes
6	Preparation of Quinone from hydroquinone.	Beakers, Suction pump. Buchner funnel	10 01 02	10 01 02	Yes
7	Preparation of Urea Formaldehyde resin.	Beakers Glass rod	10 10	10 10	Yes
8	Preparation of acetyl derivative of –NH2 / -OH group.	Conical flask Suction pump. Buchner funnel	10 01 02	10 01 02	Yes
9	Preparation of benzoyl derivative of –NH2 / -OH group.	Conical flask Suction pump. Buchner funnel	10 01 02	10 01 02	Yes
10	Preparation of 2:4 dinitro-phenyl hydrazone (2,4 DNP) derivative of –CHO / -CO group.	Conical flask Suction pump. Buchner funnel	10 01 02	10 01 02	Yes

NAME OF COURSE: - CHEMICAL ENGINEERING.
NAME OF THE DEPT: - CHEMICAL ENGG.
NAME OF SUBJECT: - LAB COMPUTER APPLICATION [S.E.]

Sr. no.	Expt. Title	Name of eqpt,M/c, inst, etc.Required to conduct the expt	Requ.	Avail.	Whether ExptCan be conducted.
1	To solve Matrices using Matrix Inversion Method	Pentium-IV, digital computer	20	20	Yes
2	To solve Matrices using Gauss Elimination method.	Pentium-IV, digital computer	20	20	Yes
3	To solve Differential equation of first order by Taylor's series method	Pentium-IV, digital computer	20	20	Yes
4	To solve Differential equation of first order by Modified Euler's method	Pentium-IV, digital computer	20	20	Yes
5	To solve Differential equation of first order by Picards method	Pentium-IV, digital computer	20	20	Yes
6	To solve Differential equation of first order by Runge Kutta's 4th order method	Pentium-IV, digital computer	20	20	Yes
7	To solve Numerical Integration by Weddle's rule.	Pentium-IV, digital computer	20	20	Yes
8	To solve Numerical Integration by Trapezoidal Rule	Pentium-IV, digital computer	20	20	Yes
9	To solve Numerical Integration by Simpson's 1/3rd Rule	Pentium-IV, digital computer	20	20	Yes
10	To solve Numerical Integration by Simpson's 3/8th rule	Pentium-IV, digital computer	20	20	Yes

NAME OF COURSE: - CHEMICAL ENGINEERING.
NAME OF THE DEPT: - CHEMICAL ENGG.
NAME OF SUBJECT: - LAB CHEMICAL PROCESSES [S.E.]

Sr. no.	Expt. Title	Name of eqptM/c, inst, etc.Required to conduct the expt.	Requ	Avail	Whether Expt,Can be conducted.
1	Determination of the Na_2CO_3 content of washing soda	Burette, pipette, conical flask	10	10	Yes
2	To determine the loss per gram and the percentage purity of the given sample of sodium bicarbonate by heating.	Crucible, Pipe clay triangle	10	10	Yes
3	Estimation of available chlorine in bleaching powder.	Burette, pipette, stand, conical flask.	10	10	Yes
4	Preparation of sodium thiosulphate.	Evaporating dish. Buckner funnel, water bath.	10 01	10 01	Yes
5	Preparation of biuret from urea	Test tubes, Beaker	10	10	Yes
6	Preparation of soap	Beaker Glass rod	10 10	10 10	Yes
7	Preparation of drug aspirin	Conical flask Measuring cylinder Suction pump. Buchner funnel	10 10 01 02	10 10 01 02	Yes
8	Estimation of formaldehyde.	Burette. Pipette. Conical flask	10 10 10	10 10 10	Yes
9	Determination of TFM in soap	Beaker, glass rod	10	10	Yes
10	Preparation of acetaldehyde by the oxidation of ethanol	Conical Flask Beaker Funnel	10 10 10	10 10 10	Yes

NAME OF COURSE: - CHEMICAL ENGINEERING.
NAME OF THE DEPT: - CHEMICAL ENGG.
NAME OF SUBJECT: - LAB MECHANICAL OPERATION [S.E.]

Sr. no.	Expt. Title	Name of eqptM/c, inst, etc.Required to conduct the expt.	Requ.	Avail.	Whether Expt,Can be conducted.
1	To study the separation of solids by sedimentation.	Batch sedimentation assembly.	01	01	Yes
2	To study the differential and cumulative screen analysis of sand. (Sieve analysis)	Sieve shaker	01	01	Yes
3	To verify the laws of crushing and grinding by ball mill	Ball mill	01	01	Yes
4	To verify the laws of crushing and grinding by Jaw crusher	Jaw Crusher	01	01	Yes
5	To determine the rate of filtration, cake resistance and filter medium resistance.	Plate & Frame Filter Press	01	01	Yes
6	To determine the rate of filtration by vacuum filter	Rotary Vacuum Filter	01	01	Yes
7	To study the behavior of the bed during fluidization and to calculate minimum fluidization velocity.	Fluidization equipment	01	01	Yes
8	To study the sigma Kneader Mixer	Sigma Kneader Mixer	01	01	Yes
9	To study the operating behavior of cyclone separator and to find out its efficiency	Cyclone separators	01	01	Yes
10	To study the Ribbon Blender and to find out the mixing index	Ribbon blender	01	01	Yes

NAME OF COURSE: - CHEMICAL ENGINEERING.
NAME OF THE DEPT: - CHEMICAL ENGG.
NAME OF SUBJECT: - LAB APPLIED PHYSICAL CHEMISTRY [S.E.]

Sr. no.	Expt. Title	Name of eqpt,M/c, inst, etc.Required to conduct the expt	Requ.	Avail.	Whether ExptCan be conducted.
1	Determination of equivalent weight of metal eudiometrically	Eudiometer Evaporating dish Measuring cylinder	10 10 02	10 10 02	Yes
2	Detrmination of atomic weight of the metal using Dulong-Petit law	Crucible Electronic balance	10 01	10 01	Yes
3	Determination of surface tension of liquids by Stalagmometer	Stalagmometer Beaker	10 10	10 10	Yes
4	Determination of rate constant of hydrolysis of methyl acetate by dilute HCl & to show that the reaction is of first order	Stopper bottle 5 ml pipette Water bath Laboratory Oven Conical flask Burette	10 10 02 01 10 10	10 10 02 01 10 10	Yes
5	Determination of rate constant of hydrolysis of ethyl acetate by NaOH & to show that the reaction is of second order	Stopper bottle 25 ml pipette Water bath Conical flask Burette	10 10 02 10 10	10 10 02 10 10	Yes
6	Determination of energy of activation for the reaction between potassium pursulphate and potassium iodide	Stopper bottle 25 ml pipette Water bath Conical flask Burette	10 10 02 10 10	10 10 02 10 10	Yes
7	Determination of heat of solution of KNO_3	Hard glass tube Beaker Thermometer	10 10 10	10 10 10	Yes
8	Determination of water equivalent of copper calorimeter & heat of neutralization of strong acid & strong base by calorimeter	Cu-calorimeter Wooden box with insulation & Cu stirrer setup Measuring cylinder	10 04	10 04	Yes
9	To determine ΔH, ΔG, ΔS of a reaction.	Thermos flask Thermometer Measuring cylinder	05 05 05	05 05 05	Yes
10	Determination of molecular weight of substance by depression in freezing point method.	Hard glass tube Beaker Thermometer	10 10 10	10 10 10	Yes

NAME OF COURSE: - CHEMICAL ENGINEERING.
NAME OF THE DEPT: - CHEMICAL ENGG.
NAME OF SUBJECT: - LAB PROCESS HEAT TRANSFER [T.E.]

Sr. no.	Expt. Title	Name of eqpt, M/c, inst, etc. Required to conduct the expt.	Quantity		Whether Expt, Can be conducted.
			Requ	Avail	
1	Diffusion in Still Air: To estimate mass transfer coefficient for given system at room temperature.	Compressor, linear scale, glass tube with fluid, stand.	3 sets	3 sets	Yes
2	Determination of thermal conductivity of metals rod	Metal rod ,heater coil, Digital temp indicator, Dimmerstat Voltmeter, Ammeter, Measuring flask, stop watch, supporting structure,	1 set	1 set	Yes
3	To determine heat flux through composite walls	Heater,voltmeter,temperature indicator and supporting structure	1 set	1 set	Yes
4	Determination of heat transfer coefficient in natural/ forced convection.	Brass Tube,Pipe, temperature indicator, Ammeter, Voltmeter, dimmerstat, blower.	1 set	1 set	Yes
5	Determination of temperature distribution, fin efficiency in natural and forced convection	Duct, fins, Temp indicator, Dimmerstat, Heater, Voltmeter, Ammeter	1 set	1 set	Yes
6	Determination of emissivity of a test surface.	Emmisivity of test plates, temperature indicator, Ammeter, Voltmeter, dimmerstat.	1set	1set	Yes
7	Determination of Stefan Boltzmann constant.	Stefan Boltzman apparatus	1 set	1 set	Yes
8	Determinations of log mean temperature difference and over all heat transfer coefficient of Parallel and counter flow heat exchanger	Parallel/Counter flow heat exchanger , Temperature indicator, rotameter.	1 set	1 set	Yes
9	Study and calculate the efficiency of a fin in natural convection.	Duct, fins, Temp indicator, Dimmerstat, Heater, Voltmeter, Ammeter	1 set	1 set	Yes
10	To find out overall heat transfer coefficient by drop wise and film wise condensation.	Dropwise and filmwise condensation apparatus	1 set	1 set	Yes

NAME OF COURSE: - CHEMICAL ENGINEERING.
NAME OF THE DEPT: - CHEMICAL ENGG.
NAME OF SUBJECT: - LAB INSTRUMENTATION & INSTRUMENTAL ANALYSIS [T.E.]

Sr. no.	Expt. Title	Name of eqpt, M/c, inst, etc. Required to conduct the expt.	Quantity		Whether Expt, Can be conducted.
			Requ.	Avail.	
1	To study the response of bimetallic thermometer.	Bimetallic thermometer, mercury thermometer, beaker.	01	01	Yes
2	To study the response of thermocouple.	Thermocouple, mercury thermometer, beaker.	01	01	Yes
3	To measure the pH of given solution.	pH meter	01	01	Yes
4	To measure the conductance of given solution.	Conductivity meter	01	01	Yes
5	To investigate the conductometric titration of strong acid and strong base	Conductivity meter	01	01	Yes
6	To determine concentration of given solution by colorimeter	Colorimeter	01	01	Yes
7	To study separation of components present in given mixture by thin layer chromatography	TLC apparatus.	04	04	Yes
8	To study separation of components present in given sample by paper chromatography	Paper chromatography apparatus	04	04	Yes
9	To determine refractive index of liquids by Abbey's refractometer	Abbey's Refractometer	01	01	Yes
10	To identify the given sample by FTIR.	FTIR Spectrophotometer	01	01	Yes

NAME OF COURSE: - CHEMICAL ENGINEERING.
NAME OF THE DEPT: - CHEMICAL ENGG.
NAME OF SUBJECT: - LAB MASS TRANSFER-I [T.E.]

Sr. no.	Expt. Title	Name of eqpt, M/c, inst, etc. Required to conduct the expt.	Quantity		Whether Expt, Can be conducted.
			Requ	Avail	
1	Diffusion in Still Air: To estimate mass transfer coefficient for given system at room temperature.	Beakers, Weighing Balance	3 sets	3 sets	Yes
2	Liquid – Liquid Diffusion: To determine diffusion coefficient for given system as function of concentration	Standard porous pot with covering glass vessels, weighing balance, vernier caliper, measuring scale	3 unit	9 unit	Yes
3	Solid – Liquid Diffusion: To determine mass transfer coefficient for dissolution of given system without chemical reaction.	Glasswares, stirrer with speed control, stand, vernier caliper	1 unit	1 unit	Yes
4	Solid in Air Diffusion: To calculate mass transfer coefficient for vaporization of given solid in air using packed bed.	Solid in Air Diffusion Apparatus	1 unit	1 unit	Yes
5	Wetted Wall Column: To determine mass transfer coefficient for air – water system	Wetted wall column with rotameter, temperature measuring system, compressor.	1 unit	1 unit	Yes
6	Cooling Tower: To determine volumetric mass transfer coefficient for air – water system.	Cooling tower with air blower, centrifugal pump, water storage tank, Rotameter, heater, temperature sensors, tower with packing material, physical chart.	1 unit	1 unit	Yes
7	Crystallization: To determine percentage yield of crystallization without and with seeding	Beaker, Weighing Balance, Heating Mantle, Stirrer etc.	1 unit	1 unit	Yes
8	Natural Drying: To obtain drying curve for batch drying operation.	Pan dryer, Electronic balance, etc.	1 unit	1 unit	Yes
9	Fluidized Bed Dryer: To determine the rate of drying and to obtain mass transfer coefficient for the given material.	Fluidized bed dryer with heat controller.	1 unit	1 unit	Yes

NAME OF COURSE: - CHEMICAL ENGINEERING.
NAME OF THE DEPT: - CHEMICAL ENGG.
NAME OF SUBJECT: - LAB CHEMICAL REACTION ENGINEERING-I [T.E.]

Sr. no.	Expt. Title	Name of eqpt, M/c, inst, etc. Required to conduct the expt.	Quantity		Whether Expt, Can be conducted.
			Requ.	Avail.	
1	To determine the reaction rate constant {k} for given reaction.	Batch Reactor /CSTR/ SemiBatch / PFR.	01	01	Yes
2	To determine the effect of temperature on reaction rate constant.	Batch Reactor/CSTR/ Semi Batch / PFR.	01	01	Yes
3	To determine the activation energy {e} for the given reaction.	Batch Reactor/CSTR/ Semi Batch / PFR.	01	01	Yes
4	To draw C [t], E [t] & f [t] curve & to calculate the mean residence time {tm} variance $\{r^2\}$ & skew ness $\{s^3\}$ for plug flow reactor.	Plug flow Reactor [Straight tube type]	01	01	Yes
5	To draw C [t], E [t] & f [t] curve & to calculate the mean residence time {tm} variance $\{r^2\}$ & skew ness $\{s^3\}$ for packed Bed reactor.	Packed Bed Reactor.	01	01	Yes
6	To study the cascaded CSTR	Cascaded CSTR	01	01	Yes
7	To draw C [t], E [t] & f [t] curve & to calculate the mean residence time {tm} variance $\{r^2\}$ & skew ness $\{s^3\}$ for Annular reactor.	Annular reactor	01	01	Yes
8	To study the kinetic in tubular flow reactor [coiled tube] for the given reaction.	Plug flow Reactor (Coil type)	01	01	Yes

NAME OF COURSE: - CHEMICAL ENGINEERING.
NAME OF THE DEPT: - CHEMICAL ENGG.
NAME OF SUBJECT: - LAB MASS TRANSFER-II [T.E.]

Sr. no.	Expt. Title	Name of eqpt, M/c, inst, etc. Required to conduct the expt.	Quantity		Whether Expt, Can be conducted.
			Requ.	Avail.	
1	Simple Distillation: To verify Rayleigh's equation for simple distillation	Batch distillation.	01	01	Yes
2	To plot the vapor liquid equilibrium curve for a binary mixture.	Vapor liquid equilibrium set up apparatus	01	01	Yes
3	Determination of HTU, HETP and NTU.	Distillation Assembly	01	01	Yes
4	Ternary Diagram: To construct ternary diagram for given system.	Beaker, Conical Flask, Burette, Pipette etc.	01	01	Yes
5	Tie Lines	Beaker, Conical Flask, Burette, Pipette etc.	01	01	Yes
6	Liquid – Liquid Extraction: To study and determine the efficiency of cross current liquid- liquid extraction.	Liquid- liquid extraction Setup	01	01	Yes
7	Spray Column	Spray Column	01	01	Yes
8	Leaching: To calculate efficiency of cross current leaching operation	Solid liquid extraction setup.	01	01	Yes
9	Adsorption: To study adsorption of acetic acid on activated charcoal	Adsorption column.	01	01	Yes
10	Ion Exchange	Ion Exchange Column	01	01	Yes

NAME OF COURSE: - CHEMICAL ENGINEERING.
NAME OF THE DEPT: - CHEMICAL ENGG.
NAME OF SUBJECT: - LAB PROCESS DYNAMIC & CONTROL [B.E.]

Sr. no.	Expt. Title	Name of eqpt, M/c, inst, etc. Required to conduct the expt.	Quantity		Whether Expt, Can be conducted.
			Requ.	Avail.	
1	To study dynamic response of first order system {mercury thermometer.}	Thermometer, heater, stopwatch.	01	01	Yes
2	To study dynamic behaviour of single tank system.	Single tank, pump, level indicator, weighing machine	01	01	Yes
3	Dynamic behaviour of two tank non-interacting system.	Non-interacting system, stopwatch, pump, weighing machine	01	01	Yes
4	Dynamic behaviour of two tank interacting system.	Interacting system, stopwatch, pump, weighing machine	01	01	Yes
5	Study of pneumatic controllers.	PI controller, compressor.	01	01	Yes
6	Dynamic behaviour of second order system	Mercury Manometer, stopwatch.	01	01	Yes
7	Study of characteristics & calibration of diaphragm actuated pneumatic control valve.	Pneumatically operated valve, compressor, Rota meter, and stopwatch.	01	01	Yes
8	Study of closed loop control system.	Closed loop control system consisting of valve, tank, recorder, and controller.	01	01	Yes
9	Study of temperature control trainer	Temperature control trainer	01	01	Yes
10	Study of pressure control trainer	Pressure control trainer	01	01	Yes
11	Study of flow control trainer	Flow control trainer	01	01	Yes

NAME OF COURSE: - CHEMICAL ENGINEERING.
NAME OF THE DEPT: - CHEMICAL ENGG.
NAME OF SUBJECT: - LAB CHEMICAL REACTION ENGINEERING-II [B.E.]

Sr. no.	Expt. Title	Name of eqpt, M/c, inst, etc. Required to conduct the expt.	Quantity		Whether Expt, Can be conducted.
			Requ.	Avail.	
1	To study the reaction of solid liquid system for an instantaneous reaction for benzoic acid NaOH & calculate the enhancement factor.	Solid liquid reactor.	01	01	Yes
2	To study the isothermal decomposition of ethyl alcohol in tubular reactor packed with activated alumina catalyst.	Catalytic packed bed reactor.	01	01	Yes
3	To improve the % purity of commercially used ethanol using reactive distillation.	Distillation assembly.	01	01	Yes
4	To improve the % purity of commercially used ethanol using extractive distillation.	Distillation assembly.	01	01	Yes
5	To carry out the catalytic reaction to convert the nitrobenzene to aniline in presence of iron filling/HCl catalyst in the reactor.	Rotating basket reactor.	01	01	Yes
6	To study the reaction of liquid liquid system for butyl acetate NaOH & to calculate the enhancement factor.	Stirrer, conical flask, beaker, pipette, burette	01	01	Yes

7	Absorption – to study the reaction of liquid gas system for NaOH –CO_2 % to determine rate of absorption.	Absorption column.	01	01	Yes
8	Adsorption- to study the adsorption of Acetic acid on charcoal	Adsorption column.	01	01	Yes

NAME OF COURSE: - CHEMICAL ENGINEERING.
NAME OF THE DEPT: - CHEMICAL ENGG.
NAME OF SUBJECT: - LAB COMPUTER AIDED PROCESS EQUIPMENT DESIGN

MODELING & SIMULATION [B.E.]

Sr. no.	Expt. Title	Name of eqpt, M/c, inst, etc. Required to conduct the expt.	Quantity		Whether Expt, Can be conducted.
			Requ.	Avail.	
1	Computer aided design of shell & tube heat exchanger.	Computer (Window XP), digital computer.	15	15	Yes
2	Computer aided design of single effect evaporator.	Computer (Window XP), digital computer.	15	15	Yes
3	Computer aided design of rotary dryer.	Computer (Window XP), digital computer.	15	15	Yes
4	Simulation of ammonia production system.	Computer (Window XP), digital computer.	15	15	Yes
5	Simulation of temperature on surface catalyst.	Computer (Window XP), digital computer.	15	15	Yes
6	Simulation of Reactor Design	Computer (Window XP), digital computer.	15	15	Yes
7	Study of Computer control heat exchanger.	Computer control heat exchanger.	01	01	Yes
8	Computer Aided Design of absorption column	Computer (Window XP), digital computer.	15	15	Yes

NAME OF COURSE: - CHEMICAL ENGINEERING.
NAME OF THE DEPT: - CHEMICAL ENGG.
NAME OF SUBJECT: - LAB INDUSTRIAL POLLUTION CONTROL [B.E.]

Sr. no.	Expt. Title	Name of eqpt, M/c, inst, etc. Required to conduct the expt.	Quantity		Whether Expt, Can be conducted.
			Requ.	Avail.	
1	Determination of biological oxygen demand	Burette Pipettes Measuring cylinder BOD bottles pH meter BOD Incubator	01 01 01 04 01 01	01 01 01 04 01 01	Yes
2	Determination of chemical oxygen demand	Burette Pipette Measuring cylinder beaker COD Digester COD Analyzer	01 01 01 04 01 01	01 01 01 04 01 01	Yes
3	Determination of dissolved oxygen	Burette Pipettes Measuring cylinder BOD bottles Conical flask Thermometer.	01 01 01 04 01 01	01 01 01 04 01 01	Yes
4	Determination of chloride ion in given water	Burette Pipettes Measuring cylinder Conical flask	01 01 01 01	01 01 01 01	Yes
5	Measurement of various types solids in a given sample	Crucibles Measuring cylinder Oven Muffle furnace Weighing Balance	02 01 01 01 01	02 01 01 01 01	Yes
6	Determination of turbidity in given sample	Turbidity meter	01	01	Yes
7	Determination of phenol	Distillation Assembly Separating funnel pH Meter	01 01 01	01 01 01	Yes
8	Determination of metal (any one) in waste water.	Burette Pipettes Measuring cylinder Conical flask	01 01 01 02	01 01 01 02	Yes

		Weighing Balance	01	01	

B) List of Practicals which cannot be performed or conducted in the existing facilities actually available in the college.

Sr.No.	Name of the Department	Class	Title of Experiment	Name of Institute where the experiments are processed to conducted	When the deficiency in equipment will be fulfilled
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Department of Computer Engineering

Facilities for conducting practical in the laboratories

Name of course**: Computer Engineering** Class: **F.E**. Semester**: I**
Subject: **Computer Programming**

Sr. No.	**Experiment Title**	**Name of Equipment, machinery Instrument etc. required to conduct experiment**	**Quantity**		**Whether Expt. can be conducted**
			Required	Available	
01	Program for basic arithmetic operations	PC,Turbo c	20	20	Yes
02	Program for find the area Circle & Volume of Cylinder	PC,Turbo c	20	20	Yes
03	Program for finding Smallest & Greatest number between two numbers	PC,Turbo c	20	20	Yes
04	Program for finding number is Even or Odd	PC,Turbo c	20	20	Yes
05	Program for finding the factorial of number	PC,Turbo c	20	20	Yes
06	Program for checking given number is Palindrome or not	PC,Turbo c	20	20	Yes
07	Program for array element operation	PC,Turbo c	20	20	Yes
08	Program for Matrix Operation	PC,Turbo c	20	20	Yes
09	Program for sorting of numbers using bubble sort	PC,Turbo c	20	20	Yes
10	Program for String operations	PC,Turbo c	20	20	Yes

Facilities for conducting practical in the laboratories

Name of course**: Computer Engineering** Class: S.E. Semester: **I**
Subject: **SOFT SKILL III**

Sr. No.	Experiment Title	Name of Equipment, machinery Instrument etc. required to conduct experiment	Quantity		Whether Expt. can be conducted?
			Required	Available	
01	To Perform Arithmetic Operations on number. To perform HCF & LCM To calculate Average and Mixture	-	20	20	Yes
02	To calculate Percentage To Measure Profit and Loss To solve Time and work Problems	-	20	20	Yes
03	To perform Permutations and Combinations To perform problems on probability To perform problems on time and distance	-	20	20	Yes
04	To perform examples on Analogies To perform examples on Classification To perform examples on Sequences	-	20	20	Yes
05	To perform examples on Analytical Puzzles To perform examples on Letter and number Series To perform examples on Coding and Decoding	-	20	20	Yes

Facilities for conducting practical in the laboratories

Name of course**: Computer Engineering** Class: S.E. Semester: **I** Subject: **DSGT**

Sr. No.	Experiment Title	Name of Equipment, machinery Instrument etc. required to conduct experiment	Quantity		Whether Expt. can be conducted?
			Required	Available	
01	A program for set operations: Union, Intersection, Difference, Symmetric difference.	PC, GCC	20	20	Yes
02	A program for generation of Power set of a given set.	PC, GCC	20	20	Yes
03	A program for generation of permutations.	PC, GCC	20	20	Yes
04	A program for generation of combinations	PC, GCC	20	20	Yes
05	A Program for Bubble sort.	PC, GCC	20	20	Yes
06	A Program for Matrix multiplication.	PC, GCC	20	20	Yes
07	A Program for Binary search.	PC, GCC	20	20	Yes
08	A program for implementation of Kruskal's algorithm.	PC, GCC	20	20	Yes
09	A program for implementation of Prim's algorithm.	PC, GCC	20	20	Yes
10	A program for Inter conversion of number system.	PC, GCC	20	20	Yes

Facilities for conducting practical in the laboratories

Name of course**: Computer Engineering** Class: S.E. Semester: **I**
Subject: **MPMC Lab**

Sr. No.	Experiment Title	Name of Equipment, machinery Instrument etc. required to conduct experiment	Quantity		Whether Expt. can be conducted?
			Required	Available	
01	Study and execution of DOS/Windows Commands.	PC	20	20	Yes
02	Study of DOS &BIOS Interrupts and Assembler Directives.	PC, MASM software	20	20	Yes
03	8086 Assembly Language Program to display personal information using Macro.	PC, MASM software	20	20	Yes
04	8086 Assembly Language Program for Addition of two 8 bit HEX numbers using NEAR Procedure.	PC, MASM software	20	20	Yes
05	8086 Assembly Language Program for Multiplication of two 8 bit HEX numbers using NEAR Procedure.	PC, MASM software	20	20	Yes
06	8086 Assembly Language Program for Addition of two 8 bit HEX numbers using FAR Procedure.	PC, MASM software	20	20	Yes
07	8086 Assembly Language Program for Multiplication of two 8 bit HEX numbers using FAR Procedure.	PC, MASM software	20	20	Yes

08	8086 Assembly Language Program to find out Factorial of a number (Range 0 to 8).	PC, MASM software	20	20	Yes
09	8086 Assembly Language Program for Password Verification.	PC, MASM software	20	20	Yes

10	8086 Assembly Language Program for 2-digit BCD Addition.	PC, MASM software	20	20	Yes
11	8086 Assembly Language Program for 2-digit BCD to HEX Conversion.	PC, MASM software	20	20	Yes
12	8086 Assembly Language Program to generate Fibonacci Series (first 12 numbers).	PC, MASM software	20	20	Yes
13	Assembly Language Program to Calculate area of circle using 8087 instructions.	PC , MASM software	20	20	Yes
14	Assembly Language Program to calculate length of hypotenuse of right angled triangle using 8087 instructions.	PC,MASM software	20	20	Yes
15	Assembly Language Program to Generate sum of series of Squares of numbers using 8087 instructions.	PC,MASM software	20	20	Yes
16	Assembly Language Program to solve the Quadratic Equations using 8087 instructions.	PC,MASM software	20	20	Yes

Facilities for conducting practical in the laboratories

Name of course**: Computer Engineering** Class: S**.E**. Semester**: I**
Subject: **Objet Oriented Technology**

Sr. No.	**Experiment Title**	**Name of Equipment, machinery Instrument etc. required to conduct experiment**	**Quantity**		**Whether Expt. can be conducted**
			Required	Available	
01	Write a Program for Arithmetic Operation by class and Object.	PC, g++ Compiler	20	20	Yes
02	Program for Parameterized Constructor for bank management system.	PC, g++ Compiler	20	20	Yes
03	Implementation of function overloading for area of different objects	PC, g++ Compiler	20	20	Yes
04	C++ Program for admission system using the unary operator overloading	PC, g++ Compiler	20	20	Yes
05	Program for Factorial by Using Copy Constructor	PC, g++ Compiler	20	20	Yes
06	Program for Matrix addition using Friend Function	PC, g++ Compiler	20	20	Yes
07	Program in C++ for implementation of Payroll System by using multilevel Inheritance	PC, g++ Compiler	20	20	Yes
08	Program in C++ for implementation of Student Result System by using Hybrid Inheritance.	PC, g++ Compiler	20	20	Yes
09	Implement the function template for bubble sort method.	PC, g++ Compiler	20	20	Yes
10	Implement the function template for swapping method.	PC, g++ Compiler	20	20	Yes

Facilities for conducting practical in the laboratories

Name of course**: Computer Engineering** Class: **S.E.** Semester**: II**
Subject: **Data Communication Lab**

Sr. No.	Experiment Title	Name of Equipment, machinery Instrument etc. required to conduct experiment	Quantity		Whether Expt. can be conducted
			Required	Available	
01	Comparative analysis of different types of network with Cables	-	20	20	Yes
02	Network related Commands	Terminal window	20	20	Yes
03	Network Connecting devices Specification and Configuration	-	20	20	Yes
04	Crimping of Cross wire & Straight through UTP Cable to interconnect two Computers	Crimping tool,cat6 Cable, cable tester	20	20	Yes
05	Interconnection of Computers in Local Area Network to Share resources	PC in lab connected with LAN	20	20	Yes
06	Implementation of Stop & wait protocol	GCC compiler	20	20	Yes
07	Implementation of internet Checksum	GCC compiler	20	20	Yes
08	I.T Infrastructure planning using network Connecting Devices	Cisco Packet Tracer	20	20	Yes

Facilities for conducting practical in the laboratories

Name of course**: Computer Engineering** Class: S.E. Semester: **II** Subject: **MPMCI Lab**

Sr. No.	Experiment Title	Name of Equipment, machinery Instrument etc. required to conduct experiment	Quantity		Whether Expt. can be conducted?
			Required	Available	
01	Program for mouse interfacing.	PC, MASM software	20	20	Yes
02	Program for graphics editor.	PC, MASM software	20	20	Yes
03	Program for PC to PC communication using serial port.	PC, MASM software	20	20	Yes
04	Program for parallel printer interfacing.	PC, MASM software, Printer	4	4	Yes
05	Program for DAC interfacing with 8086.	PC, MASM software, 8086 kit, DAC Kit, CRO	20	20	Yes
06	Program for stepper motor interfacing with 8086	PC, MASM software 8086 kit, Stepper motor Kit	20	20	Yes
07	Program for interfacing LEDs with 8051	PC, Keil software, RS232, 8051 kit, LED panel	4	4	Yes
08	Program for interfacing 7-segment displays with 8051	PC, Keil software, RS232, 8051 kit, 7 Segment Kit	4	4	Yes
09	Program for keyboard interfacing with 8051	PC, Keil software, RS232, 8051 kit with keyboard	4	4	Yes
10	Program for stepper motor interfacing with 8051	PC, Keil software, RS232, 8051 kit, steper motor kit	4	4	Yes

Facilities for conducting practical in the laboratories

Name of course**: Computer Engineering** Class: **S.E.** Semester: **II**
Subject: **Data Structures Lab**

Sr. No.	Experiment Title	Name of Equipment, machinery Instrument etc. required to conduct experiment	Quantity		Whether Expt. can be conducted
			Required	Available	
01	Implementation of stack using array.	PC, Gcc	20	20	Yes
02	Implementation of queue using array	PC, Gcc	20	20	Yes
03	Implementation of circular queue using array	PC, Gcc	20	20	Yes
04	**Conversion of infix to postfix expression.**	PC, Gcc	20	20	Yes
05	Conversion of postfix expression to infix expression	PC, Gcc	20	20	Yes
6	Implementation of doubly linked list insertion, deletion & searching.	PC, Gcc	20	20	Yes
7	Program for creation of binary tree and nonrecursive tree traversal on binary tree.	PC, Gcc	20	20	Yes
8	Implementation of Hashing Function with Linear Probing	PC, Gcc	20	20	Yes
9	Implementation of Quick Sort	PC, Gcc	20	20	Yes
10	Implementation of Radix Sort	PC, Gcc	20	20	Yes

Facilities for conducting practical in the laboratories

Name of course**: Computer Engineering** Class: S.E. Semester: **II**
Subject: **Computer Graphics Lab**

Sr. No.	Experiment Title	Name of Equipment, machinery Instrument etc. required to conduct experiment	Quantity		Whether Expt. can be conducted?
			Required	Available	
01	Line Generation using DDA line drawing Algorithm	PC, gcc	20	20	Yes
02	Differential Line Style using Bresenham‟s Algorithm	PC, gcc	20	20	Yes
03	Circle generation using Bresenham‟s algorithms	PC, gcc	20	20	Yes
04	Program for Polygon Filling using Flood fill algorithm and Boundary fill algorithm.	PC, gcc	20	20	Yes
05	Program for Segmentation.	PC, gcc	20	20	Yes
06	Program for 2D Transformation.	PC, gcc	20	20	Yes
07	Program for 3D Rotation.	PC, gcc	20	20	Yes
08	Program for Parallel projections.	PC, gcc	20	20	Yes
09	Program for Perspective projections.	PC, gcc	20	20	Yes
10	Program for Animation.	PC, gcc	20	20	Yes

Facilities for conducting practical in the laboratories

Name of course**: Computer Engineering** Class: **T.E.** Semester: **I**
Subject: **Software Engineering Lab**

Sr. No.	Experiment Title	Name of Equipment, machinery, instrument etc. required to conduct experiment	Quantity		Whether Experiment can be conducted?
			Required	Available	
01	To Design an ATM System	Pentium IV and Any Open Source CASE Tool for Analysis & Design (StarUML)	16	16	Yes
02	To Design Library Management System	Pentium IV and Any Open Source CASE Tool for Analysis & Design (StarUML)	16	16	Yes
03	To Design Railway Reservation System	Pentium IV and Any Open Source CASE Tool for Analysis & Design (StarUML)	16	16	Yes
04	To Design Hospital Management System	Pentium IV and Any Open Source CASE Tool for Analysis & Design (StarUML)	16	16	Yes
05	To Design Vehicle Navigation System	Pentium IV and Any Open Source CASE Tool for Analysis & Design (StarUML)	16	16	Yes

Facilities for conducting practical in the laboratories

Name of course**: Computer Engineering** Class: **T. E**. Semester**: I**
Subject: **Linux Lab**

Sr. No.	Experiment Title	Name of Equipment, machinery Instrument etc. required to conduct experiment	Quantity		Whether Expt. can be conducted
			Required	Available	
01	Installation of Linux OS.	PC,Ubuntu 10.04	16	16	Yes
02	Study and execution of various Linux Commands.	PC,Ubuntu 10.04	16	16	Yes
03	Study of vi editor.	PC,Ubuntu 10.04	16	16	Yes
04	Configuration of Linux Server (FTP and WEB Server)	PC,Ubuntu 10.04	16	16	Yes
05	Shell script for finding out factorial of a number.	PC,Ubuntu 10.04	16	16	Yes
06	Shell script for finding out file type and displaying list of a directory.	PC,Ubuntu 10.04	16	16	Yes
07	Write shell script for displaying user process and system related information using environment variables.	PC,Ubuntu 10.04	16	16	Yes
08	Write a shell script to find the largest among the 3 given numbers.	PC,Ubuntu 10.04	16	16	Yes
09	Write a shell script to reverse the contents of a String.	PC,Ubuntu 10.04	16	16	Yes
10	Shell script to perform arithmetic operations.	PC,Ubuntu 10.04	16	16	Yes

Facilities for conducting practical in the laboratories

Name of course**: Computer Engineering** Class: **T.E.** Semester: **I**
Subject: **Computer Network Lab**

Sr. No.	Experiment Title	Name of Equipment, machinery Instrument etc. required to conduct experiment	Quantity		Whether Expt. can be conducted?
			Required	Available	
1	Implementation of Character count/Bit-Stuffing/Byte stuffing framing methods.	PC, Gcc	16	16	Yes
2	Socket programming for TCP.	PC, JAVA	16	16	Yes
3	Socket programming for UDP.	PC, JAVA	16	16	Yes
4	Encryption/Decryption using XOR symmetric-key	PC, JAVA	16	16	Yes
5	Encryption/Decryption using RSA asymmetric-key cryptography algorithm.	PC, JAVA	16	16	Yes
6	Implementation of RLE data compression algorithm.	PC, Gcc	16	16	Yes
7	Simulate the Ethernet LAN for wired networks.	PC, Ns2 Simulator	16	16	Yes
8	Simulate the point-to-point wired network.	PC, Ns2 Simulator	16	16	Yes

Facilities for conducting practical in the laboratories

Name of course**: Computer Engineering** Class: **T.E**. Semester**: I**
Subject: **System Programming Lab**

Sr. No.	Experiment Title	Name of Equipment, machinery Instrument etc. required to conduct experiment	Quantity		Whether Expt. can be conducted
			Required	Available	
01	Develop an application to simulate first pass of 2-pass assembler	PC,GCC	16	16	Yes
02	Develop an application to simulate second pass of 2-pass assembler.	PC,GCC	16	16	Yes
03	Develop an application to simulate first passof Macro assembler.	PC,GCC	16	16	Yes
04	Develop an application to create simple text editor.	PC,GCC	16	16	Yes
05	Develop an application for Lexical Analysis phase of compiler	PC,GCC	16	16	Yes
06	Develop an application for simulating Syntax Analysis phase of Compiler.	PC,GCC	16	16	Yes

Facilities for conducting practical in the laboratories

Name of course**: Computer Engineering** Class: T.E. Semester: **I**
Subject: **JAVA Programming LAB**

Sr. No.	Experiment Title	Name of Equipment, machinery Instrument etc. required to conduct experiment	Quantity		Whether Expt. can be conducted?
			Required	Available	
01	Program for string operation in java.	PC, ubuntu OS, default Jdk 1.6.	16	16	Yes
02	Program for package creation and use in program.	PC, ubuntu OS, default Jdk 1.6.	16	16	Yes
03	Program for Threads in java.	PC, ubuntu OS, default Jdk 1.6.	16	16	Yes
04	Program to demonstrate the abstract class and abstract method.	PC, ubuntu OS, default Jdk 1.6.	16	16	Yes
05	Program that illustrates the concepts of Java class that include constructor with and without parameters, Overloading methods and Overriding methods	PC, ubuntu OS, default Jdk 1.6.	16	16	Yes
06	Program that demonstrate inheritance by creating suitable classes	PC , ubuntu OS, default Jdk 1.6.	16	16	Yes
07	Program that demonstrates implementing interfaces and extending interfaces	PC, ubuntu OS, default Jdk 1.6.	16	16	Yes
08	Write a program using Applet.	PC, ubuntu OS, default Jdk 1.6.	16	16	Yes
09	Write programs for using Graphics class.	PC, ubuntu OS, default Jdk 1.6.	16	16	Yes
10	Write a program for exception handling	PC, ubuntu OS, default Jdk 1.6.	16	16	Yes

Facilities for conducting practical in the laboratories

Name of course**: Computer Engineering** Class: T.E. Semester: **II**
Subject: **Operating System Lab**

Sr. No.	Experiment Title	Name of Equipment, machinery Instrument etc. required to conduct experiment	Quantity		Whether Expt. can be conducted?
			Required	Available	
01	Study of Commercial and open source OS (Linux OS)	PC, Linux OS	16	16	Yes
02	Implementation of command interpreter using system calls.	PC, GCC	16	16	Yes
03	Implementation of CPU scheduling algorithms.	PC, GCC	16	16	Yes
04	Implementation of solution for critical section problem.	PC, GCC	16	16	Yes
05	Implementation of Memory management.	PC, GCC	16	16	Yes
06	Simulation of page replacement algorithms.	PC, GCC	16	16	Yes
07	Implementation of Banker algorithm.	PC, GCC	16	16	Yes
08	Implementation of Disk scheduling algorithm.	PC, GCC	16	16	Yes

Facilities for conducting practical in the laboratories

Name of course**: Computer Engineering** Class: **T.E.** Semester: **II**
Subject: **Object Oriented Modeling and Design Lab**

Sr. No.	Experiment Title	Name of Equipment, machinery Instrument etc. required to conduct experiment	Quantity		Whether Expt. can be conducted
			Required	Available	
01	Design ATM system using Structural and Behavioral UML diagram	PC, Rational Rose /StarUML Software	16	16	Yes
02	Design Library Management system using Structural and Behavioral UML diagram	PC, Rational Rose/StarUML Software	16	16	Yes
03	Design Railway Reservation system using Structural and Behavioral UML diagram	PC, Rational Rose/StarUML Software	16	16	Yes
04	Design Hospital Management system using Structural and Behavioral UML diagram	PC, Rational Rose/StarUML Software	16	16	Yes
05	Design Online Shopping system using Structural and Behavioral UML diagram	PC, Rational Rose/StarUML Software	16	16	Yes
06	Design Hotel Management system using Structural and Behavioral UML diagram	PC, Rational Rose/StarUML Software	16	16	Yes

Facilities for conducting practical in the laboratories

Name of course**: Computer Engineering** Class: T.E. Semester: **II**
Subject: **Database Management System Lab**

Sr. No.	Experiment Title	Name of Equipment, machinery Instrument etc. required to conduct experiment	Quantity		Whether Expt. can be conducted?
			Required	Available	
01	Creating a sample database using any client server RDBMS (Oracle/Open Source Database) package using SQL DDL queries. This will include constraints (Primary key, Foreign key, Unique, Not Null, and Check) to be used while creating tables.	PC, MYSQL5.0	16	16	Yes
02	SQL DML queries: Use of SQL DML queries to retrieve, insert, delete and update the database created in experiment No. 1.	PC, MYSQL5.0	16	16	Yes
03	SQL Queries: The queries should involve SQL feature such as aggregate functions, group by, having, order by the database created in experiment No. 1.	PC, MYSQL5.0	16	16	Yes
04	SQL Queries: The queries should involve Set Operations and Set Comparisons the database created in experiment No. 1	PC, MYSQL5.0	16	16	Yes
05	Screen design and Report generation: Sample forms and reports should be generated using any front end tools.	PC, MYSQL5.0	16	16	Yes
06	Write a program to demonstrate different types of JOIN.	PC, MYSQL5.0	16	16	Yes
07	Write a program to demonstrate use of Trigger	PC, MYSQL5.0	16	16	Yes
08	Write a program to demonstrate view.	PC, MYSQL5.0	16	16	Yes

09	Write a program to demonstrate PL/SQL block	PC, MYSQL5.0	16	16	Yes
10	Write a program to demonstrate stored function.	PC, MYSQL5.0	16	16	Yes
11	Write a program to demonstrate stored procedure.	PC, MYSQL5.0	16	16	Yes

Facilities for conducting practical in the laboratories

Name of course**: Computer Engineering** Class: T**.E.** Semester**: II**
Subject: **Web Programming Lab**

Sr. No.	**Experiment Title**	**Name of Equipment, machinery Instrument etc. required to conduct experiment**	**Quantity**		**Whether Expt. can be conducted**
			Required	Available	
01	Develop a complete web page using HTML basic tags, CSS, Table and Layout	PC,Ubuntu 10.04	16	16	Yes
02	Design a page web using JavaScript to demonstrate, if statement, if...else statement and Switch statement	PC,Ubuntu 10.04	16	16	Yes
03	Design a page web using JavaScript to demonstrate, Alert box Alert box with line breaks, Confirm box and Prompt box	PC,Ubuntu 10.04	16	16	Yes
04	Design a page web using JavaScript to demonstrate, Call a function ,Function with an argument, Function that returns a value	PC,Ubuntu 10.04	16	16	Yes
05	Design a page web using JavaScript to demonstrate, For loop, While loop, Do While loop, Break a loop, Break and continue a loop	PC,Ubuntu 10.04	16	16	Yes

06	Design a page web using JavaScript to demonstrate, Sort an array (alphabetically and ascending), Sort numbers (numerically and ascending), Sort numbers (numerically and descending)	PC,Ubuntu 10.04	16	16	Yes

07	Design a page web using PHP to demonstrate, variables, echo/print, data types, string functions and operators	PC,Ubuntu 10.04	16	16	Yes
08	Installation and configuration of any web server like IIS, Apache, WAMP, XAMP etc.	PC,Ubuntu 10.04	16	16	Yes
09	Design a page web using PHP to demonstrate, date, file, file upload, cookies and sessions	PC,Ubuntu 10.04	16	16	Yes
10	Design a page web using PHP to demonstrate, MySQL connect, create DB/Table, insert into, select, where, order by, update and delete	PC,Ubuntu 10.04	16	16	Yes

Facilities for conducting practical in the laboratories

Name of course**: Computer Engineering** **Class**: B.E Semester: **I**
Subject: **AI**

Sr. No.	Experiment Title	Name of Equipment, machinery Instrument etc. required to conduct experiment	Quantity		Whether Expt. can be conducted
			Required	Available	
1.	To develop Mini-Expert System (Medical Expert System) in PROLOG /TC	C or C++ Compiler, PROLOG,PC	15	15	Yes
2.	To develop Parsing Method in PROLOG	C or C++ Compiler, PROLOG,PC	15	15	Yes
3.	To Implement Single Perception Training Algorithm (AND Gate)	C or C++ Compiler, PROLOG,PC	15	15	Yes
4.	Application development using Neural Network: implementation of intelligent perceptron system (X-OR Gate)	C or C++ Compiler, PROLOG,PC	15	15	Yes
5.	To Implement Unification Algorithm	C or C++ Compiler, PROLOG,PC	15	15	Yes
6.	Program for Dynamic Database Management	C or C++ Compiler, PROLOG,PC	15	15	Yes

Facilities for conducting practical in the laboratories

Name of course**: Computer Engineering** Class: **B.E.** Semester: **I**
Subject: **Advance Computer Network Lab**

Sr. No.	Experiment Title	Name of Equipment, machinery Instrument etc. required to conduct experiment	Quantity		Whether Expt. can be conducted
			Required	Available	
01	Setting up wireless network without) infrastructure support (ad-hoc).	Access Point, P-IV Machines	16	16	Yes
02	Setting up wireless network with infrastructure support.	Access Point, P-IV Machines	16	16	Yes
03	Configuring Access Point with bridging mode (Point to Point and Point to Multi Point).	Router , P-IV machines	16	16	Yes
04	Configuring Security in wireless network with and without infrastructure support.	Router , P-IV machines	16	16	Yes
05	Configuring Routing between wired and wireless Networks.	Router , P-IV machines	16	16	Yes
06	Define a topology with four nodes using ns/2.	NS2 software, P-IV machines	16	16	Yes
07	Dynamic network where the routing adjusts to a link failure using ns/2.	NS2 software, P-IV machines	16	16	Yes
08	Creating output files for Xgraph using ns/2.	NS2 software, P-IV machines	16	16	Yes

Facilities for conducting practical in the laboratories

Name of course**: Computer Engineering** Class: B**.E.** Semester**: II**
Subject: **Compiler Design Lab**

Sr. No.	**Experiment Title**	**Name of Equipment, machinery Instrument etc. required to conduct experiment**	**Quantity**		**Whether Expt. can be conducted**
			Required	Available	
1	Implement a lexical analyzer for a subset of C using LEX Implementation should support Error handling	Linux OS with Flex and Bison package	16	16	Yes
2	Implement a lexical analyzer of identification of numbers (Numbers can be binary, octal, decimal, hexadecimal, float or exponential)	Linux OS with Flex and Bison package	16	16	Yes
03	Implement a Calculator using LEX and ACC.	Linux OS with Flex and Bison package	16	16	Yes
04	Implementation of Context Free Grammar	Linux OS with Flex and Bison package	16	16	Yes
5	Implementation of code generator	Linux OS with Flex and Bison package	16	16	Yes
06	Implement Deterministic Finite Automata	Linux OS with Flex and Bison package	16	16	Yes

Facilities for conducting practical in the laboratories

Name of course**: Computer Engineering** Class: **B.E.** Semester: **VII**
Subject: **Embedded Systems**

Sr. No.	Experiment Title	Name of Equipment, machinery Instrument etc. required to conduct experiment	Quantity		Whether Expt. can be conducted
			Required	Available	
01	Write a C program for blinking of LEDs to perform I/O operation	ARM 7 board with complete set, PC, Triton IDE	06 Set	06 Set	Yes
02	Write a C program to demonstrate interfacing of keyboard and display key pressed on LCD	ARM 7 board with complete set, PC, Triton IDE	06 Set	06 Set	Yes
03	Write a C program to demonstrate how communication is done between processor and EEPROM using I2C protocol	ARM 7 board with complete set, PC, Triton IDE	06 Set	06 Set	Yes
04	Write a C program to demonstrate how stepper motor is interfacing with ARM 7	ARM 7 board with stepper motor, PC, Triton IDE	06 Set	06 Set	Yes
05	Writing a scheduler / working with using RTOS for 4 tasks with priority	ARM 7 board with complete set, PC, Triton IDE	06 Set	06 Set	Yes
06	Implement a semaphore for any given task switching using RTOS on microcontroller board	ARM 7 board with complete set, PC, Triton IDE	06 Set	06 Set	Yes
07	Write a C program for task creation	ARM 7 board with complete set, PC, Triton IDE	06 Set	06 Set	Yes
08	Program for process creation in Real Time Linux	ARM 7 board with complete set, PC, Triton IDE	06 Set	06 Set	Yes

Facilities for conducting practical in the laboratories

Name of course**: Computer Engineering** Class: B**.E.** Semester**: I**
Subject: **Advanced Unix Programming**

Sr. No.	**Experiment Title**	**Name of Equipment, machinery Instrument etc. required to conduct experiment**	**Quantity**		**Whether Expt. can be conducted**
			Required	Available	
01	Develop a program for file management in Linux	Linux (Ubuntu 10.4), PC	16	16	Yes
02	Program for Simulation of various commands.	Linux (Ubuntu 10.4), PC	16	16	Yes
03	Develop a program using atexit function	Linux (Ubuntu 10.4), PC	16	16	Yes
04	Program for process creation using fork() function.	Linux (Ubuntu 10.4), PC	16	16	Yes
05	Program for process creation using v fork() function. II Named Pipe	Linux (Ubuntu 10.4), PC	16	16	Yes
06	Develop Daemon process in Linux Unix.	Linux (Ubuntu 10.4), PC	16	16	Yes
07	Program for client/server implementation using Socket Programming.	Linux (Ubuntu 10.4), PC	16	16	Yes
08	Program for interprocess communication Message Queue	Linux (Ubuntu 10.4), PC	16	16	Yes

Facilities for conducting practical in the laboratories

Name of course**: Computer Engineering** Class: **T.E.** Semester: **II**
Subject: **Object Oriented Modeling and Design Lab**

Sr. No.	Experiment Title	Name of Equipment, machinery Instrument etc. required to conduct experiment	Quantity		Whether Expt. can be conducted
			Required	Available	
01	Design ATM system using Structural and Behavioral UML diagram	PC, Rational Rose /StarUML Software	16	16	Yes
02	Design Library Management system using Structural and Behavioral UML diagram	PC, Rational Rose/StarUML Software	16	16	Yes
03	Design Railway Reservation system using Structural and Behavioral UML diagram	PC, Rational Rose/StarUML Software	16	16	Yes
04	Design Hospital Management system using Structural and Behavioral UML diagram	PC, Rational Rose/StarUML Software	16	16	Yes
05	Design Online Shopping system using Structural and Behavioral UML diagram	PC, Rational Rose/StarUML Software	16	16	Yes
06	Design Hotel Management system using Structural and Behavioral UML diagram	PC, Rational Rose/StarUML Software	16	16	Yes

Facilities for conducting practical in the laboratories

Name of course**: Computer Engineering** Class: **B.E.** Semester: **II**
Subject: **DWM.**

Sr. No.	Experiment Title	Name of Equipment, machinery Instrument etc. required to conduct experiment	Quantity		Whether Expt. can be conducted
			Required	Available	
01	Develop a program to construct a multidimensional data model (Star, Snowflake or Fact constellations)	PC,Ubuntu 10.4	16	16	Yes
02	Develop a program to implement Data Preprocessing Techniques.	PC,Ubuntu 10.4	16	16	Yes
03	Implement Apriori algorithm for frequent item set.	PC,Ubuntu 10.4	16	16	Yes
04	Develop a program to implement Data Generalization and Summarization techniques.	PC,Ubuntu 10.4	16	16	Yes
05	Develop a program for classification of data.	PC,Ubuntu 10.4	16	16	Yes

Department of Computer Engineering
Facilities for conducting practical in the laboratories

Name of course**: Computer Engineering** Class: **B.E**. Semester**: II**
Subject: **Software Metrics and Quality Assurance**

Sr. No.	**Experiment Title**	**Name of Equipment, machinery Instrument etc. required to conduct experiment**	**Quantity**		**Whether Expt. can be conducted**
			Required	Available	
01	Program for Calculating the Size of Program. (Line of Code Measure)	PC,T urbo c	16	16	Yes
2	Develop a program for implementation of COCOMO model	PC,T urbo c	16	16	Yes
3	Implementation of program for measuring size of program using Albrecht's Function Point method.	PC,T urbo c	16	16	Yes
4	Preparation for Project plan using Gantt Chart.	Planner	16	16	Yes
5	Study of Software Testing Tool J-Meter.	Jmeter	16	16	Yes

APPENDIX-15

ELECTRICAL ENGINEERING DEPARTMENT

A) Facilities for conducting Practicals in the Laboratories

Name of the Department / Section :-

Subject wise & laboratory wise Lists of material, machinery, equipment & Instrument required to perform prescribed Practical

Name of Course: : Electrical Engineering **Class- SE** **Sem-I**

Subject- Electrical Workshop

S.N.	Experiment Title	Name of Equipment, Machinery, Instrument required to Conduct Experiment	Quantity		Whether Experiment can be conducted
			Required	Available	
1	Study of different electrical symbols.	Electrical Symbol Charts	01	01	Yes
2	Electrical shocks and safety precautions	Safety precautions charts	01	00	Yes
3	Study of different Cables: a. Classification of cable, Types of three Phase cable b. Cable standards and specifications c. Insulating materials for cables, Cable joining d. Coaxial cable, twisted pair cable, Flat ribbon cable.	Different types of Cables as a atudy Practical	--	--	Yes
4	Study of different wires a. Size selection of wires b. Standard wires TRC and CTS wires c. Weather proof wires, Flexible wires.	TRC Wires CTS Wires Weather proof wires Flexible wire	01 01 01 01	00 00 01 01	Yes

5	Study of wiring accessories a. Types of switches b. Types of lamp holders, ceiling rose, mounting blocks, socket outlets plugs, wooden boards c. main switches (ICDP/ICTP/MCB), Junction boxes, Distribution boxes, fuse boards.	Switch Lamp holder Ceiling rose Socket outlet plugs Wooden boards ICDP/ICTP Distribution boxes Fuse	01 01 01 01 01 01 01 01	01 01 01 01 01 01 01 01	Yes
6	Study and use of: a. DC/AC voltmeter and ammeter. b. Analog multi-meter and Digital multi-meter for the measurement of electrical quantities. c. Megger, Clip-on meter. d. Power factor meter.	Dc voltmeter Ac voltmeter analog multimeter digital multimeter Megger Powr Factor Meter	01 01 01 01 01 01	01 01 01 01 01 01	Yes Yes Yes Yes
7	Domestic wiring and Lamp circuits a. Simple circuit, series and parallel circuit, b. Fluorescent lamp circuits, domestic switch board wiring.	Wires Switch Lamps Lamp holder Fuse	01 01 01 01 01	01 01 01 01 01	Yes
8	Industrial visit	Visit Substation Electrical workshops Industries	Visit	Visit	Yes

Name of Course: : Electrical Engineering **Class- SE** **Sem-I**
Subject- Electrical Measurement- I

S.N.	Experiment Title	Name of Equipment, Machinery, Instrument required to Conduct Experiment	Quantity		Whether Experiment can be conducted
			Required	Available	
1	Measurement of active power in three phase circuit by two wattmeter method.	3 Ph power supply ammeter, voltmeter, Wattmeter, Load	01 01 01 02 01	02 01 01 02 01	Yes
2	Measurement of reactive power by two wattmeter and single wattmeter.	3 Ph power supply ammeter, voltmeter, Wattmeter, Load	01 01 01 02 01	02 01 01 02 01	Yes
3	Calibration of single phase Energy meter at different. Power factor	1 Phase Energy meter, ammeter, voltmeter, Wattmeter	01 01 01 01	01 01 01 01	Yes
4	Calibration of three phase two element energy meter at different P.F.'s.	3 Phase Energy meter, ammeter, voltmeter, Wattmeter	01 01 01 01	01 01 01 01	Yes
5	D.C. potentiometer for calibration of ammeter and voltmeter.	DC Potentiometer Voltage Ratio Box Voltmeter	01 01 01	01 01 01	Yes
6	Kelvin's double bridge: Measurement of low resistance.	Kelvin Bridge Kit	01	01	Yes
7	Measurements of phase angle error and ration error of current Transformer	Phase angle error and ratio error measurement kit	01	01	Yes
8	Measurements of phase angle error and ration error of Potential Transformer.	Phase angle error and ratio error measurement kit	01	01	Yes
9	Epstein Squire	Epstein Squire	01	00	No
10	Measurement of Earth Resistance	Earth Testing Kit	01	01	Yes
11	Measurement of insulation resistance by Megger	Megger	01	01	Yes

Name of Course: : Electrical Engineering Class- SE Sem-I
Subject- Electrical Engineering Material

S.N.	Experiment Title	Name of Equipment, Machinery, Instrument required to Conduct Experiment	Quantity		Whether Experiment can be conducted
			Required	Available	
1	Testing of Insulating Oil as per IS	Oil testing Set	01	01	Yes
2	Testing of Solid Insulating Material as per IS	Solid Insulating Kit Material	01 01	01 01	Yes
3	Testing of Power Capacitor as per IS	3 Phase Induction Motor Power Capacitor Wattmeter AC Ammeter AC Voltmeter Belt and Balance set	01 01 02 01 01 01	01 01 02 01 01 01	Yes
4	Measurement of resistivity of conducting Materials	Conducting wire AC Ammeter Multimeter Load Bank	01 01 01 01	01 01 01 01	Yes
5	Measurement of resistivity of resistive Material	Resistive wire AC Ammeter Multimeter Load Bank	01 01 01 01	01 01 01 01	Yes
6	Study and Use of Gauss Meter	Gauss Meter	01	00	No
7	Use of Spark Gap for High Voltagetestings	Sphere Gap arrangement High Voltage Generator	01 01	01 01	Yes
8	To Study Seeback and Peltier effects	Seeback & Peltier Kit	01	00	No
9	Study of Hysterias Loop of Ferromagnetic material s	DC Shunt motor Generator set DC Ammeter DC Voltmeter Speedometer	01 01 01 01	01 01 01 01	Yes
10	Study of various insulating materials	Various Insulating Material	03	03	Yes

Name of Course: : Electrical Engineering Class- SE Sem-II
Subject-CP/ MATLAB.

S.N.	Experiment Title	Name of Equipment, Machinery, Instrument required to Conduct Experiment	Quantity		Whether Experiment can be conducted
			Required	Available	
1	Bisection method program	Computer C –Compiler Printer	01 01 01	01 01 01	Yes
2	Secant method prgram	Computer C –Compiler Printer	01 01 01	01 01 01	Yes
3	Newton raphson method program	Computer C –Compiler Printer	01 01 01	01 01 01	Yes
4	Gauss elimination method program	Computer C –Compiler Printer	01 01 01	01 01 01	Yes
5	Gauss seidal method program	Computer C –Compiler Printer	01 01 01	01 01 01	Yes
6	Simpson`s 1/3 rd and 3/8 th rule program.	Computer C –Compiler Printer	01 01 01	01 01 01	Yes
7	Arithmetic operations on matrix using MATLAB.	Computer Matlab Software Printer	01 01 01	01 01 01	Yes
8	Plot the simple, 2-D and 3-D plots using MATLAB.	Computer Matlab Software Printer	01 01 01	01 01 01	Yes
9	Finding roots of polynomial using MATLAB.	Computer Matlab software Printer	01 01 01	01 01 01	Yes
10	Find eigenvalues and eigenvectors, LU factorization.	Computer Matlab software Printer	01 01 01	01 01 01	Yes

Name of Course: : Electrical Engineering Class- SE Sem-II
Subject- Analog and Digital Electronics

S.N.	Experiment Title	Name of Equipment, Machinery, Instrument required to Conduct Experiment	Quantity		Whether Experiment can be conducted
			Required	Available	
1	Op-amp as square & sine wave generator using IC 741.	1. CRO 2.Dual Power Supply 3. kit	01 01 01	01 01 01	Yes
2	Op-amp as comparator & Schmitt trigger IC 741.	1. CRO 2.Function Generator 3. Dual Power Supply 4.Multimeter 5. kit	01 01 01 01 01	01 01 01 01 01	Yes
3	Instrumentation amplifier using 3 Op-amps	1. CRO 2.Function Generator 3. Dual Power Supply 4.Multimeter 5. kit	01 01 01 01 01	01 01 01 01 00	Yes (performed on bread board)
4	IC 555 application – Astable, Monostable, Square wave generator, Square counter.	1. CRO 2.Function Generator 3.Power Supply 4.Multimeter 5.kit	01 01 01 01 02	01 01 01 01 01	Yes (performed on bread board)
5	Study of JK flip flop IC 7476.	1. CRO 2.Function Generator 3.Power Supply 4.Multimeter 5. Kit	01 01 01 01 01	01 01 01 01 00	Yes (performed on bread board)
6	Study of binary counter using IC 7493	1.CRO 2.Function Generator 3.Power Supply 4.Multimeter 5. kit	01 01 01 01 01	01 01 01 01 01	Yes (performed on bread board)

8	Study of IC 723 as low / high voltage regulator	1. CRO 2.Function Generator 3.Power Supply 4.Multimeter 5. kit	01 01 01 01 01	01 01 01 01 00	Yes (performed on bread board)
9	IC 7805 used as fixed voltage regulator, elevated voltage and current, constant current source	1. CRO 2.Function Generator 3.Power Supply 4.Multimeter 5.kit	01 01 01 01 01	01 01 01 01 00	Yes (performed on bread board)

Name of Course: : Electrical Engineering Class- SE Sem-II
Subject:- Network Analysis

Sr. No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt. can be conducted
			Required	Available	
1	Verifications of Thevenin's Theorem for two port network.	A 470 ohm resistor B 680 ohm resistor C multimeter D connecting probes	2 1 2	2 1 2	Yes
2	Verification of Norton's Theorem for two port network.	A 470 ohm resistor B 680 ohm resistor C multimeter D connecting probes E dual power supply	2 1 2 1	2 1 2 1	Yes
3	Verification of Superposition Theorem for two port network.	A 470 ohm resistor B 680 ohm resistor C multimeter D connecting probes E dual power supply	2 1 2 2	2 1 2 2	Yes
4	Pole & Zero plot of one port network	Study	--	--	Yes

5	Measurement of Z-parameter of two port network	A 470 ohm resistor B 680 ohm resistor C multimeter D connecting probes E dual power supply	2 1 2 1	2 1 2 1	Yes
6	Measurement of Y-parameter of two port network	A 470 ohm resistor B 680 ohm resistor C multimeter D connecting probes E dual power supply	2 1 2 1	2 1 2 1	Yes
7	Measurement of ABCD-parameter of two port network	A 470 ohm resistor B 680 ohm resistor C multimeter D connecting probes E dual power supply	2 1 2 1	2 1 2 1	Yes

8	To plot frequency response of series RLC circuit.	A 470 ohm resistor B 680 ohm resistor C multimeter D connecting probes E dual power supply	2 1 2 1	2 1 2 1	Yes
9	To plot frequency response of parallel RLC circuit.	A 470 ohm resistor B 680 ohm resistor C multimeter D connecting probes E dual power supply	2 1 2 1	2 1 2 1	Yes
10	Study of filters	Study			Yes

Name of Course: : Electrical Engineering **Class- SE** **Sem-II**
Subject- Electrical Machines-I

S.N.	Experiment Title	Name of Equipment, Machinery, Instrument required to Conduct Experiment	Quantity		Whether Experiment can be conducted
			Required	Available	
1	Determination of magnetization, external , internal characteristics and critical field resistance of d. c. shunt generator	DC Shunt Generator DC Shunt Motor Set DC Ammeter DC Voltmeter Rheostats Speedometer Load Bank	01 02 01 02 01 01	01 02 01 02 01 01	Yes
2	Determination of external characteristics of d.c. compound generator as i) differential compound, ii) cumulative compound generator.	DC Compound Generator DC Shunt Motor Set DC Ammeter DC Voltmeter Rheostats Speedometer Load Bank	01 02 01 02 01 01	01 02 01 02 01 01	Yes
3	Speed control of D.C shunt motor by armature and field control.	DC Shunt Motor DC Ammeter DC Voltmeter Rheostats Speedometer	01 02 01 02 01	01 02 01 02 01	Yes
4	i) Study of 3 and 4 point starters. ii) Reversal of motor rotation of D. C. motor.	3 and 4 point Starters Rheostats Speedometer	02 02 01	02 02 01	Yes
5	Determination of performance characteristic of DC series motor by direct load.	DC Series Generator Generator Set DC Ammeter DC Voltmeter Rheostats Speedometer Load Bank	01 02 01 02 01 01	01 02 01 02 01 01	Yes
6	Swinburne's test on DC shunt Motor: Determination of losses & efficiency.	DC Shunt Motor DC Ammeter DC Voltmeter Rheostats Speedometer	01 02 01 02 01	01 02 01 02 01	Yes

7	Polarity and Ratio test on single phase transformer/three phase transformer.	1 Ph Transformer 3 Ph transformer AC Ammeter AC Voltmeter 1 Phase auto transformer	01 01 02 02 01	01 01 02 02 01	Yes
8	Determination of performance of single phase transformer by direct load test.	1 Ph Transformer Load bank AC Ammeter AC Voltmeter Wattmeter	01 01 02 02 01	01 01 02 02 01	Yes
9	Determination of performance of single phase transformer by conducting Open circuit and short circuit test.	1 Ph Transformer AC Ammeter AC Voltmeter Wattmeter 1 Phase auto transformer	01 02 02 01 01	01 02 02 01 01	Yes
10	Parallel operation of two single phase transformer.	1 Ph Transformer AC Ammeter AC Voltmeter Wattmeter 1 Phase auto transformer	02 02 02 01 01	02 02 02 01 01	Yes
11	Study of phaser and vector group of three phase transformer.	3 Phase transformer	01	01	Yes
12	Scott connection of two single phase transformer on no load and at balanced load.	1 Ph Transformer AC Ammeter AC Voltmeter Wattmeter 1 Phase auto transformer	02 02 02 01 01	02 02 02 01 01	Yes

Name of Course: : Electrical Engineering Class- SE Sem-II
Subject- Electrical Installation, Estimation and Distribution

S.N.	Experiment Title	Name of Equipment, Machinery, Instrument required to Conduct Experiment	Quantity		Whether Experiment can be conducted
			Required	Available	
1	Transmission line components : Five insulators –one piece pin, three piece pin type , suspension insulator (one disc) string insulator (one disc), shackle insulator; towers for single circuit and double circuit lines; lightening arrestor, stays, clamps, pin; typical pole including service mains, HT, LT lines supporting pole , 'H' type pole.	Study & Drawing Sheets	--	--	Yes
2	Distribution substation; Two views (front view and side view) of distribution substation layout ; single line diagram, pipe earthing , plate earthing.	Study & Drawing Sheets	--	--	Yes
3	Wiring diagrams and symbols: minimum 25 symbols as per IS standards. Any one circuit diagram out of the following: 1) Rotor resistance starter, 2) Automatic star /delta starter, 3)Maximum demand indicator.	Study & Drawing Sheets	--	--	Yes

4	Project on illumination design of laboratory / workshop or small scale industrial establishment along with estimation.	Study & Drawing Sheets	--	--	Yes
5	Project on electrification of given area showing distributors, feeders and substations. The drawing sheet along with report on each topics.	Study & Drawing Sheets	--	--	Yes

A)Facilities for conducting Practicals in the Laboratories

Name of the Department / Section: - Electrical
Subject wise & laboratory wise Lists of material, machinery, equipment & Instrument required performing prescribed Practical

Name of Course: : Electrical Engineering Class- TE Sem-I
Subject:- Electrical Machine -II

Sr. No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt. can be conducted
			Required	Available	
1	Determination of voltage regulation and efficiency of three phase alternator by direct load test.	D.C. Shunt Motor as P.M. Ammeter (0-10A) Voltmeter (0-600V) Lamp bank as Resistive Load Tachometer D.C. Ammeter (0-1A) Rheostats (800,1.2A)	1 1 1 1 1 1 2	2 1 1 1 1 1 2	Yes
2	Open and short circuit test on three phase alternator: determination of its regulation by e.m.f. method and m.m.f. method.	D.C. Shunt Motor as P.M./3Ph. Synchronous. Motor as P.M. Ammeter (0-10A) Voltmeter (0-600V) Lamp bank as Resistive Load Tachometer D.C. Ammeter (0-1A) Rheostats (800,1.2A)	1 1 1 1 1 1 2	1 1 1 1 1 1 2	Yes
3	Zero power factor test on three phase alternator: determination of regulation by Potier trangle method.	D.C. Shunt Motor as P.M. Ammeter (0-10A) Voltmeter (0-600V) 3Ph inductive load Tachometer D.C. Ammeter (0-1A) Rheostat (800,1.2A)	1 1 1 1 1 1 2	1 1 1 1 1 1 2	Yes

4	Determination of direct axis and quadrature axis reactance by slip test on synchronous machine. Determination of voltage regulation by two reactance theory.	Dc shunt motor as PM 3Ph Auto Transformer (10A,600V) Voltmeter (0-600V) Ammeter (0-5A) Tachometer	1 1 1 1 1	1 1 1 1 1	Yes
5	Synchronizing alternators: lamp methods and use of synchroscope.	Practical set of Synchronous machine on infinite bus including synchronscope	1	1	Yes
6	Synchronous alternator on infinite bus: behavior of machine under change in mechanical power and excitation	Practical set of Synchronous machine on infinite bus including synchronscope	1	1	Yes
7	Characteristic of synchronous motor at constant load and variable excitation.	3Ph alternator as load on synchronous motor ammeter(0-10A) Voltmeter(0-600V) DC ammeter (0-2A) Rheostats (400,1.2A) 2 Wattmeter (600V/10A) Synchronous motor with direct loading arrangment and Synchronising pannel	1 1 1 1 2 1	2 1 1 1 1 2 1	Yes Yes

8	Characteristic of synchronous motor at constant excitation and variable load.	Voltmeter (0-300V) Ammeter (0-10A) 1ph Auto transformer (10A/270V) Alt as a load Synchronous motor with direct loading arrangment and Synchronising pannel	1 1 1 1 1	1 1 1 1 1	Yes Yes
9	Determination of performance of three phase induction motor by direct load test.	3 Ph Auto transformer Voltmeter Ammeter Wattmeter Tachometer Brake Load	01 01 01 02 01 01	01 01 01 02 01 01	Yes
10	Determination of performance of three phase induction motor by no load, blocked rotor test and construction of circle diagram.	3 Ph Auto transformer Voltmeter Ammeter Wattmeter Tachometer	01 01 01 02 01	01 01 01 02 01	Yes
11	No load and blocked rotor tests on capacitor start single phase induction motor and determination of parameters of equivalent circuit.	Voltmeter(0-300V) Ammeter(0-10A) 1 ph Auto transformer Wattmeter(300V/ 10A	1 1 1 1	1 1 1 1	Yes
12	Load test on single phase induction motor.	Voltmeter(0-300V) Ammeter(0-10A) Auto transformer Wattmeter(300V/ 10A	1 1 1 1	1 1 1 1	Yes
13	Speed control of three phase Slip Ring Induction Motor.	3 ph Slip Ring Induction motor Voltmeter Ammeter Tachometer	1 1 1 1	1 1 1 1	Yes

Name of Course: : Electrical Engineering **Class- TE** **Sem-I**
Subject:-Power System II

Sr. No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt. can be conducted
			Required	Available	
1	Measurement of ABCD parameters of a medium transmission line.	Medium Transmission Line Kit	1	2	Yes
2	Measurement of ABCD parameters of a long transmission line.	400Km Transmission line study unit	1	1	Yes
3	Plotting of receiving end circle diagram to evaluate performance of medium transmission line.	Medium Transmission Line Kit	1	2	Yes
4	Study of the effect of VAR compensation on the profile of receiving end voltage using capacitor bank.	**DC shunt motor or synchronous. Motor as PM** **Voltmeter (0-600V)** Ammeter(0-10A) Capacitor bank	1 2 2 1	1 2 2 1	Yes
5	Static measurement of sub-transient reactance of a salient-pole alternator.	Synchronous motor Ammeter(O-10A) 1ph Auto transformer	1 1	1 1	Yes
6	Measurement of sequence reactance of a synchronous machine	3 ph synchronous motor 3 ph synchronous generator wattmeter voltmeter ammeter 1 ph transformer	1 1 2 1 1 1	1 1 2 1 1 1	Yes
7	Determination of steady state power limit of a transmission line.	400Km Transmission line study unit	1	1	Yes

8	Unsymmetrical fault analysis for LL,LG, LLG FAULT ON A.C / D.C network analyzer	400Km Transmission line study unit	1	1	Yes
9	Formulation and calculation of Y- bus matrix of a system using software.	Computer 400Km Transmission line study unit	1 1	1 1	Yes
10	Solution of a load flow problem using Gauss-Seidal method using a software.	Computer Matlab software	1 1	1 1	Yes
11	Solution of a load flow problem using Newton-Raphson method using software.	Computer Matlab software	1 1	1 1	Yes
12	Unsymmetrical fault analysis of a 3-bus system using a software.	Computer Matlab software	1 1	1 1	Yes
13	Calculation of inductance and capacitance for symmetrical and unsymmetrical configuration of transmission line using software.	Computer Matlab software	1 1	1 1	Yes

Name of Course: : Electrical Engineering Class- TE Sem-I
Subject:-Power Electronics

Sr. No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt. can be conducted
			Required	Available	
1	Triggering Circuit of SCR	Triggering circuit of SCR	01	01	YES
2	Characteristics of SCR,MOSFET,	MATLAB software	01	01	YES
3	Commutation circuit class C, class D	Commutation circuit class C & class D	01	01	YES
4	Single phase full wave controlled rectifiers R, R-L characters tics	Single phase full wave controlled rectifiers R, R-L, LOAD CHAR	01	01	YES
5	Single phase semi-converter	Single phase semi converter	01	01	YES
6	Three phase full wave controlled rectifiers	Three phase full wave controlled rectifiers	01	01	YES
7	Step up chopper	Step up chopper	01	01	YES
8	Step down chopper	Step down chopper	01	01	YES
9	Series and parallel inverter	Series inverter & Parallel inverter	01	01	YES
10	Three phase inverter	Three phase inverter. MOSFET	01	01	YES

Name of Course: : Electrical Engineering Class- TE Sem-I
Subject:-Electrical and Electronics Workshop

Sr. No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt. can be conducted
			Required	Available	
1	Details and Layout of DC Armature Windings.	Study & DC Machine Cross Section Demonstration	01	01	Yes
2	Details and Layout of AC Armature Windings.	Study & AC Machine Cross Section Demonstration	01	01	Yes
3	Study of substation equipment: a. Classification and use of Lightening arrester b. Different type of isolators. c. Substation earthing	Visit to Substation to study substation equipment and study	--	--	Yes
4	Transformer a. Standard rating, vector group of power transformer. b. Standard rating of instrument transformer a. Class of accuracy for instrument transformer.	Study & Model of 3 phase, 315 kVA, 11/0.433Kv, 50 Hz Distribution Transformer and Instrument Transformer	01	01	Yes
5	Study of Starters: a. Three phase induction motor starter. b. Study of three phase induction motor reverse forward starter.	Study and model of three phase starter	01	01	Yes
6	Study of different contactor ,relay and timer with switching demonstration.	Model of Different relays & as a Study Practical	01	01	Yes

7	Study of automatic star delta and soft starter for three phase induction motor.	As a Study Practical	--	--	Yes
8	Study and Testing of: a. Diode b. BJT c. MOSFET d. IGBT	As a Study Practical & multimeter	01	01	Yes
9	Study of Electronic ballast and fan regulator:	Demonstration	--	--	Yes

Name of Course: : Electrical Engineering **Class- TE** **Sem-I**
Subject:-Software Application-I

Sr. No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt. can be conducted
			Required	Available	
1	A. Simple Arithmetic Calculation: Perform simple arithmetic calculations:Addition, subtraction, multiplication, division and exponentiation. B. Assign values to variables. C. Suppress screen output. D. Control the appearance of floating point numbers on the screen.	Computer Matlab Printer	1 1 1	1 1 1	Yes
2	A. Compute the Y-Coordinates of line with given slope m and the intercept c at the x coordinates. B. Create a vector t with 10 elements: 1, 2, 3,…….., 10 and compute the following quantities: X= t sin(t), Y=(t-1)/(t+1), Z=sin(t2)/ t2 C. Create Matrices, Vectors for finding the size of matrices and perform the addition, subtraction, multiplication, transpose and inverse operation.	Computer Matlab Printer	1 1 1	1 1 1	Yes

3	Create : Simple sine plot, line plot, an exponentially decaying sine plot, space curve, log scale plot, Overlay plot and Fancy plots.	Computer Matlab Printer	1 1 1	1 1 1	Yes
4	Create Polynomial curve fit and compare different fits.	Computer Matlab Printer	1 1 1	1 1 1	Yes
5	A. Create a line along with an explicit handle and then use set command to change the line style, its thickness, and values of some y-coordinates. B. Write some text at a specified position, create its handle, and then use the set command to change the font size, font, and string of the text.	Computer Matlab Printer	1 1 1	1 1 1	Yes
6	Study of different types of errors.	Study			Yes
7	Write program to find voltage and power in voltage divider circuit.	Computer Matlab Printer	1 1 1	1 1 1	Yes
8	Write a program to calculate voltage across any resistance in a circuit.	Computer Matlab Printer	1 1 1	1 1 1	Yes
9	Write a program to find transient response in RC circuit.	Computer Matlab Printer	1 1 1	1 1 1	Yes
10	Write a program to find transient response in RL circuit.	Computer Matlab Printer	1 1 1	1 1 1	Yes

11	Write a program to plot voltage and current in resistive circuit.	Computer Matlab Printer	1 1 1	1 1 1	Yes
12	Write a program to plot voltage and current in inductive and capacitive circuit.	Computer Matlab Printer	1 1 1	1 1 1	Yes

Name of Course: : Electrical Engineering Class- TE Sem-II
Subject:-Control System I

Sr. No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt. can be conducted
			Required	Available	
1	To determine Speed Torque characteristic of an AC Servomotor.	Ac servo motor kit,Multimeter	1 1	1 1	Yes
2	To study potentiometer as an error detector.	Potentiometer kit, Multimeter	1 1	1 1	Yes
3	To determine time response of second order control system	Second order system kit, Multimeter,CRO	1 1 1	1 1 1	Yes
4	To determine speed-torque characteristics of dc servomotor.	dc servo motor kit tachometer multimeter	1 1 1	1 1 1	Yes
5	Study of PID controller	PID controller CRO	1 1	1 1	Yes
6	To study synchro-transmitter and receiver and obtain output V/S input Characteristics.	Kit of Synchros, Multimeter	1 1	1 1	Yes
7	To Study Stepper Motor.	stepper motor Tachometer Multimeter	1 1 1	1 1 1	Yes
8	To determine time domain response of a second order system for step input obtains performance parameters by using software.	Matlab Software	1	1	Yes
9	To plot root locus diagram of an open loop transfer function and determine range of gain ‘k’ for stability by using software.	Matlab Software	1	1	Yes
10	To plot a Bode diagram of an open loop transfer function by using software.	Matlab Software	1	1	Yes

Name of Course: : Electrical Engineering **Class- TE** **Sem-II**
Subject:-Electrical Measurement -II

Sr. No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt. can be conducted
			Required	Available	
1	Strain Measurement using strain gauge	strain Gauge measurement kit & Weights	1	1	Yes
2	Study of CRO & its different types and applications	CRO Function generator Probes	1 1 2	1 1 2	Yes
3	Measurement of temperature by RTD/Thermocouple.	Heater RTD Thermocouple Multimeter	1 1 2 1	1 1 2 1	Yes
4	Study of pressure transducer	pressure transducer kit compressor	1 1	1 1	Yes
5	Study of recorder	Strip chart recorder	1	1	Yes
6	Study of LVDT	LVDT Transducer unit with controller CRO PRobes	1 1 3	1 1 3	Yes
7	Measurement of inductance by Andersons Bridge.	a. KIT Anderson b. Headphone	1 1	1 1	Yes
8	Measurement of capacitance and loss angle of capacitor by Schering bridge	Schering Kit Probes multimeter	1 1	1 1	Yes
9	Step response of meter				No
10	Measurement of systematic errors of wattmeter.				No

Name of Course: : Electrical Engineering Class- TE Sem-II
Subject:-Microprocessor and Microcontroller

Sr. No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt. can be conducted
			Required	Available	
1	Study of architecture and instructions of 8085 along with opcodes.	8085 micro-controller kit	-	-	YES
2	Study of architecture & instructions of 8051	8051 micro-controller kit	-	-	YES
3	8255 interfacing	8255Kit	02	02	YES
4	Memory interfacing	Study			YES
5	Microprocessor 8085 assembly language programs based on data transfer instruction	8085 Microprocessor Kit with 7 segment LED display	05	06	YES
6	Microprocessor 8085 assembly language programs based on arithmetic instruction	8085 Microprocessor Kit with 7 segment LED display	05	06	YES
7	Microprocessor 8085 assembly language programs based on logical instruction	8085 Microprocessor Kit with 7 segment LED display	05	06	YES
8	Applications of microprocessor 8085 in Electrical drives and speed control for stepper motor.	Stepper Motor Kit	02	02	YES
9	Microcontroller 8051 assembly language programs based on data transfer instruction.	8051 Simulator	PC	PC	Yes
10	Microcontroller 8051 assembly language programs based on arithmetic and logical instructions.	8051 Simulator	PC	PC	Yes

Name of Course: : Electrical Engineering **Class- TE** **Sem-II**
Subject: Software Application-II

Sr. No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt. can be conducted
1	Build a simple circuit with power system blocks and connect it to other Simulink blocks.	Computer Matlab Software Printer	01 01 01	01 01 01	Yes
2	Use the Powergui block and analyze static and frequency-domain response.	Computer Matlab Software Printer	01 01 01	01 01 01	Yes
3	Create an electrical subsystem, and discretize simple circuits.	Computer Matlab Software Printer	01 01 01	01 01 01	Yes
4	Single phase fully controlled converter using R and RL load using MATLAB/SIMULINK	Computer Matlab Software Printer	01 01 01	01 01 01	Yes
5	Single phase AC voltage regulator using MATLAB/SIMULINK	Computer Matlab Software Printer	01 01 01	01 01 01	Yes
6	Formation of Y bus matrix by inspection / analytical method using MATLAB Software	Computer Matlab Software Printer	01 01 01	01 01 01	Yes
7	Gauss Seidal load flow analysis using MATLAB Software	Computer Matlab Software Printer	01 01 01	01 01 01	Yes
8	Newton Raphson method of load flow analysis using MATLAB Software	Computer Matlab Software Printer	01 01 01	01 01 01	Yes

A) Facilities for conducting Practicals in the Laboratories

Name of the Department / Section: - Electrical

Subject wise & laboratory wise Lists of material, machinery, equipment & Instrument required performing prescribed Practical

Name of Course: : Electrical Engineering **Class- BE** **Sem-I**

Subject: Industrial Drives and Control

Sr. No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt. can be conducted
			Required	Available	
1	Determination of Speed Torque characteristic of d.c motor controlled using single phase half controlled rectifier.	½ HP D.C Shunt Motor With Loading arrangement	1	1	Yes
2	Determination of Speed Torque characteristic of d.c motor controlled using single phase fully controlled rectifier.	½ HP D.C Shunt Motor With Loading arrangement	1	1	Yes
3	Performance analysis of one quadrant chopper control of d.c motor.	½ HP D.C Shunt Motor With Loading arrangement	1	1	Yes
4	Performance analysis of two quadrant chopper control of d.c motor.	½ HP D.C Shunt Motor With Loading arrangement	1	1	Yes
5	Speed control of single phase induction motor using ac voltage regulator.	1 HP Single Phase Induction motor.	1	1	Yes

6	Study of steeper motor drive circuit	Stepper Motor 2 phase , 3.5 Kg-cm, 12 volt	1	1	Yes
7	Speed control Universal motor	FHP AC/DC Universal Motor	1	1	Yes
8	Study of closed loop control of Dc motor.	½ HP D.C Shunt Motor	1	1	Yes
9	Study of Vector control method for induction motor	3 HP/2.2 KW, 415 volt , 4 Pole , 50 Hz, 1440 RPM Induction Motor	1	1	Yes

Name of Course: : Electrical Engineering **Class- BE** **Sem-I**
Subject:- High Voltage Engineering.

Sr. No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt. can be conducted
			Required	Available	
1	Measurement of insulation resistance of 11KV/110 V.P.T by Megger.	Meger	1	1	Yes
2	Power frequency withstand test on 11KV, 10/5 amp CT.	--	--	--	No
3	Study of Corona Discharge	50 KVA C/70 KV DC HV testing kit corona cage 2-0-50 KV HV Transformer 3-0-70 KV Rectifier 4-0-70 KV Filter 5-Bedding Resistor (0-90 KV)	1 1 1 1 1	1 1 1 1 1	Yes
4	Determination of insulation break-down strength of solid, Liquid and gaseous dielectric media	Insulation Tester Set & Oil Tester	1	1	Yes
5	Power frequency high voltage withstand test on cable	--	--	--	No
6	Study of Impulse Generator	As Study Experiment	-	-	Yes
7	Dry & wet power freq. With stand test on insulator	HV testing kit 0-50 KV AC Transformer Insulator Artificial raining sys.	1 1 1 1	1 1 1 1	Yes
8	Flashover test on insulator	As a study experiment	1	1	Yes

9	Double voltage Double freq. With stand test on transformer.	1. Double voltage, double freq. Kit 2. Transformer	1 1	1	Yes
10	Calibration of sphere gap	HV testing kit 0-50 KVAC HV transformer Sphere gap assembly	1 1 1	1 1 1	Yes
11	Study of 100KV high voltage testing set.	high voltage testing Kit	1	1	Yes

Name of Course: : Electrical Engineering **Class- BE** **Sem-I**
Subject:-Industrial Electrical Engineering.

Sr. No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt. can be conducted
			Required	Available	
1	Performance characteristics of DC Series motor by load test.	DC shunt generator as load on DC motor Voltmeter (0-300V) Ammeter (0-10A) tachometer	1 1 1 1 1	1 1 1 1 1	Yes
2	Performance characteristics of DC Series motor by Field Test.	Ammeter ((0-10A) Voltmeter (0-300V) Tachometer, Loading arrangement	1 1 1 1	1 1 1 1	Yes
3	Performance characteristics of DC Shunt motor by direct load test.	DC shunt generator as load on DC motor Voltmeter (0-300V) Ammeter (0-10A) tachometer	1 1 1 1 1	1 1 1 1 1	Yes
4	Performance characteristics of single phase induction motor by direct load test.	**Voltmeter (0-300V)** Ammeter (0-10A) 1ph auto Transformer(270 V,10A) Tachometer Load Balance	1 1 1 1 1	1 1 1 1 1	Yes

5	Performance characteristics of three phase induction motor by direct load test.	Voltmeter (0-600V) Ammeter (0-10A) Wattmeter(600v/10A) Tachometer **Loading arrangement** 3ph auto transformer.	1 1 2 1 1	1 1 2 1 1	Yes
6	Speed control of DC Series Motor	Voltmeter (0-300V) Ammeter (0-10A) Tachometer Rheostats (100,5A)	1 1 1 2	1 1 1 2	Yes
7	Speed control of three phase slip ring Induction Motor by rotor resistance method	Voltmeter (0-600V) Ammeter (0-10A) Tachometer	1 1 1	1 1 1	Yes
8	Rheostatic breaking of DC Shunt Motor	Voltmeter (0-300V) Ammeter (0-5A) Rheostat (200,5A) Change over switch Stop watch	1 1 1 1 1	1 1 1 1 1	Yes
9	Study of Air conditioning system.	By case study			Yes
10	Study of induction heating &Welding.	By case study			Yes
11	Study of Different type of Enclosures	Machine lab Enclosures			Yes

Name of Course: : Electrical Engineering **Class- BE** **Sem-II**
Subject:-Power system stability

Sr. No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt. can be conducted
			Required	Available	
1	Determination of Parameters and time constants of synchronous machines.	DC shunt motor coupled with synchronous alternator Voltmeter Ammeter Wattmeter	1 1 1 1	1 1 1 1	Yes
2	Synchronous machine of infinite bus: Effect of Excitation	DC shunt motor coupled with synchronous alternator Voltmeter Ammeter Wattmeter	1 1 1 1	1 1 1 1	Yes
3	Effect of saturation and & determination of equivalent reactance of synchronous machines.	DC shunt motor coupled with synchronous alternator Voltmeter Ammeter Wattmeter	1 1 1 1	1 1 1 1	Yes
4	Retardation test on synchronous machines to find moment of inertia of rotating part and angular momentum.	As a study experiment.			Yes
5	To obtain power angle characteristics of lossy & lossless lines.	Transmission line kit	01	01	Yes
6	To study transient stability by point by point method.	Kit	01	01	Yes
7	To determine the steady state stability limit of short transmission line.	Short Transmission line kit	01	01	Yes

8	To determine SSSL of long transmission line.	Long Transmission line kit	01	01	Yes
9	Study of Clerk diagram	As study experiment.	----	----	Yes
10	Study of different types of automatic voltage regulator	As study experiment.	-----	----	Yes

Name of Course: : Electrical Engineering **Class- BE** **Sem-II**
Subject:-Switch Gear Protection

Sr. No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt. can be conducted
			Required	Available	
1	To conduct and study of Arc extinction phenomenon: Application in air circuit breaker.	As a study experiment & Horn Gap Extincguisher kit	1	1	Yes
2	Study of relaying component and control circuit development	Switch gear testing kit MCB ,fuse wire	1	1	Yes
3	To conduct and plot the characteristic of rewirable fuses and MCB	Relay testing kit	1	1	Yes
4	To conduct and plot operating characteristics of Inverse time over current relay.	Microprocessor based over current relay	1	1	Yes
5	To conduct Over current & earth fault protection scheme for alternator.	Protection of three phase alternator kit	1	1	Yes
6	To conduct Protection of 3 phase transformer using differential relay (Merz-Price protection scheme)	three phase transformer protection kit	1	1	Yes
7	Study of MHO distance relay to plot. a) R- X diagram b) Relay voltage Vs Admittance characteristic.	As a study experiment & Kit	1	1	Yes
8	Study of Static relay.	As a study Experiment	1	1	Yes
9	Demonstration of microprocessor base protection.	As a study experiment	1	1	Yes

Name of Course: : Electrical Engineering Class- BE Sem-II
Subject:- Computer Aided Power System Analysis

Sr. No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt. can be conducted
			Required	Available	
1	Program for determination of the parameters of the equivalent circuit.breaker.	Computer Matlab Software Printer 2kVA Transformer	01 01 01 01	01 01 01 01	Yes
2	Program for building of Z Bus by addition of branch.	Computer Matlab Software Printer	01 01 01	01 01 01	Yes
3	Program for building of Z Bus by addition of link.	Computer Matlab Software Printer	01 01 01	01 01 01	Yes
4	Program for illustration of the Ferranti Effect.	Computer Matlab Software Printer Transmission line study unit	01 01 01	01 01 01	Yes
5	Program for the formation of Y Bus by Singular Transformation.	Computer Matlab Software Printer	01 01 01	01 01 01	Yes
6	Program for load flow by Newton Raphson Method.	Computer Matlab Software Printer	01 01 01	01 01 01	Yes
7	Program for Balanced Three phase short circuit.	Computer Matlab Software Printer	01 01 01	01 01 01	Yes
8	Program for Unbalanced short circuits.	Computer Matlab Software Printer	01 01 01	01 01 01	Yes
9	Program for Fault analysis of Power System network of an Electric Utility Company.	Computer Matlab Software Printer	01 01 01	01 01 01	Yes
10	Study of IEC and ANSI standards for Short circuit analysis.	AS a study practical	--	--	Yes
11	Introduction to PSCAD	Computer PSCAD Software Printer	01 01 01	01 01 01	Yes
12	Introduction to ETAP	Computer ETAP Software Printer	01 01 01	01 01 01	Yes

Name of Course: : Electrical Engineering **Class- BE** **Sem-II**
Subject:- Power System Design & Practice

Sr. No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt. can be conducted
			Required	Available	
1	Draw the substation layout for 400KV.and design the three phase transmission line with electrical consideration.	Study & Drawing Sheets	--	--	Yes
2	Sag-Tension calculation	Study & Problem solving	--	--	Yes
3	Different busbar arrangement and isolating switches.	Study & Drawing Sheets	--	--	Yes
4	Different types of circuit breaker..	Study & Drawing Sheets	--	--	Yes
5	Different types of Lightning Arresters	Study & Drawing Sheets	--	--	Yes
6	Design of Earthing system for 132/400KV substation	Study & Drawing Sheets	--	--	Yes

Item No.26

A) Facilities for conducting Practicals in the Laboratories

Name of Course:- E&TC Class:- F.E. Subject:- Elements of Electrical & Electronics Engineering.

Name of the Department / Section :- Electronics and Telecommunication

Subjectwise & laboratorywise Lists of material, machinery, equipment & Instrument required to perform prescribed Practicals

Sr.No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt can be conducted
			Required	Available	
1	KVL &KCL	• Multimeter • Power Supply	01 01	01 01	Yes
2	RLC	a. Function Generator b. Multimeter	01 01	01 01	Yes
3	Superposition Thm	a. Power Supply b. Multimeter	01 01	01 01	Yes
4	Thevinins Thm	c. Power Supply a. Multimeter	01 01	01 01	Yes
5	Component testing	a. Multimeter	01	01	Yes
6	Rectifier	a. Multimeter b. CRO	01 01	01 01	Yes
7	Op-amp Application	a. Function generator b. Power supply c. CRO	01 01 01	01 01 01	Yes
8	Logic gates	a. Power supply	01	01	Yes

A) Facilities for conducting Practicals in the Laboratories

Name of Course : E&TC Class:- S.E. Subject:- Solid State Devices & Circuits-I.

Name of the Department / Section :- Electronics and Telecommunication

Subjectwise & laboratorywise Lists of material, machinery, equipment & Instrument required to perform prescribed Practicals

SR No	Name of Experiment	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt can be conducted
			Required each	Available each	
1	To find load regulation of full wave Bridge wave rectifier circuit with capacitor filter.	a. Multimeter b. Power supply c. Function Generator	01 01 01	01 01 01	Yes
2	Plot I/P and O/P characteristics of BJT.	• Multimeter • Power supply • Function Generator	01 01 01	01 01 01	Yes
3	To Plot DC Load Line for BJT (Voltage Divider biasing circuit).	a. Multimeter b. Power supply c. Function generator	01 01 01	01 01 01	Yes
4	To plot regulation characteristics of Voltage doubler circuit	a. Power supply b. Multimeter c. Function generator d. CRO	01 01 01 01	01 01 01 01	Yes
5	Plot frequency response of CE-CE Cascade amplifier.	a. Multimeter b. Function generator c. CRO	01 01 01	01 01 01	Yes
6	Study the effect of bypass capacitor on frequency response of single stage CE amplifier	XI. DMM XII. Power supply	01 01	01 01	Yes
7	Plot characteristics of CSFET.	a. Power supply b. CRO c. Multimeter	01 01 01	01 01 01	Yes
8	To determine AV, Ri, Ro of Darlington amplifier.	a. Function generator b. Multimeter c. CRO	01 01 01	01 01 01	Yes

A) Facilities for conducting Practicals in the Laboratories

Name of Course : E&TC Class:- S.E. Subject:- Network Analysis & Synthesis.

Name of the Department / Section :- Electronics and Telecommunication

Subjectwise & laboratorywise Lists of material, machinery, equipment & Instrument required to perform prescribed Practicals

Sr. No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt can be conducted
			Required each	Available each	
1	Determine transfer / driving point Impedance function of given two port reactive network.	CRO Multimeters DRB Exprimental kit/Bread Board	01 02 01 01	01 02 01 01	Yes
2	Determine Pole-Zero plot of given one port reactive network.	a. CRO b. Multimeters c. Transformer d. DRB e. Exprimental kit/Bread Board	01 02 01 01 01	01 01 01 01 01	Yes
3	Study of Series and parallel resonance, find BW and Q- factor.	a. CRO b. Multimeters c. DRB d. Exprimental kit/Bread Board	01 02 01 01	01 01 01 01	Yes
4	Determine Z parameter of networks connected in series.	a. CRO b. Function generator c. Power supply d. Exprimental kit/BreadBoard e. Multimeters	01 01 01 01 02	01 01 01 01 02	Yes
5	Determine Y parameter of networks connected in parallel.	❖ CRO ❖ Function generator ❖ Power supply ❖ Exprimental kit/Bread Board	01 01 01 01	01 01 01 01	Yes
6	Determine transmission parameter of networks connected in cascaded form..	a. CRO b. Function generator c. Power supply d. Exprimental kit/Bread Board	01 01 01 01	01 01 01 01	Yes
7	Frequency response of constant k- low pass filters and find out cut of frequency.	❖ Function generator ❖ Power supply ❖ Exprimental kit/Bread Board ❖ Multimeters	01 01 01 02	01 01 01 02	Yes
8	Frequency response of constant k- high pass filters and find out cut of frequency.	a. CRO b. Function generator c. Power supply d. Exprimental kit/Bread Board e. Multimeter	01 01 01 01 01	01 01 01 01 01	Yes
9	Frequency response of band pass filter.	a. CRO b. Power supply c. Exprimental kit/Bread Board d. Multimeters	01 01 01 02 02	01 01 01 02 02	Yes

A) Facilities for conducting Practicals in the Laboratories

Name of Course: E&TC Class:- S.E. Subject:- Digital Techniques and Applications.

Name of the Department / Section :- Electronics and Telecommunication

Subjectwise & laboratorywise Lists of material, machinery, equipment & Instrument required to perform prescribed Practicals

Sr.No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt can be conducted
			Required each	Available each	
1	Boolean function using NAND gate	a. IC 7400 b. Power supply c. Bread board	01 01 01	01 01 01	Yes
2	Segement display using IC 7447.	a. IC 7447 b. Power supply c. Bread board	01 01 01	01 01 01	Yes
3	Binary- Gray code conv.	a. IC 7486 b. Power supply c. Bread board	01 01 01	01 01 01	Yes
4	Four bit binary adder using IC 7483	a. IC 7483 b. Power supply c. Bread board	01 01 01	01 01 01	Yes
5	Verification of Mux& Demux	a. IC 74151 & 74154 b. Power supply c. Bread board	01 01 01	01 01 01	Yes
6	Implementation of given expression by using MUX	➢ IC 74151 ➢ Power supply ➢ Bread board	01 01 01	01 01 01	Yes
7	Implementation of given expression by using Demux	a. IC 74154 b. Power supply c. Bread board	01 01 01	01 01 01	Yes
8	Decade Counter using IC 7490	a. IC 7490 b. Power supply c. Bread board	01 01 01	01 01 01	Yes

A) Facilities for conducting Practicals in the Laboratories

Name of Course: E&TC Class:- S.E.

Subject:- Electrical Circuits & Machines

Name of the Department / Section :- Electronics and Telecommunication

Subjectwise & laboratorywise Lists of material, machinery, equipment & Instrument required to perform prescribed Practicals

Sr.No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt can be conducted
			Required	Available	
1	Load test on DC Shunt motor	i. Motor generator set ii. Ammeter iii. Voltmeter iv. Load bank v. Techometer vi. Rheostat	01 02 02 01 01	01 02 02 01 01	Yes
2	Load test on DC Series motor	• Motor generator set • Ammeter • Voltmeter • Load bank • Techometer • Set series • Rheostat	01 02 02 01 01 - 1	01 02 02 01 01 - 1	Yes
3	Load test on 3 phase I.M.	a. Motor generator set b. Ammeter c. Voltmeter d. Load bank e. Techometer f. Watt meter g. Rheostat	01 02 02 01 01 02 1	01 02 02 01 01 02 1	Yes
4	Speed control of DC shunt motor.	a. Motor generator set b. Ammeter c. Voltmeter d. Techometer e. Rheostat	01 01 01 01 02	01 01 01 01 01	Yes
5	Measurement of active power by 2 watt meter method	a. Watt meter b. Ammeter c. Voltmeter d. Load bank e. Rheostat	02 01 02 01 1	02 01 02 01 1	Yes
6	Study of starters	a. Starter	01	01	Yes
7	Open circuit & short circuit test on 1-phase Xmer	a. Transformer b. Ammeter c. Voltmeter d. Wattmeter	01 01 01 01	01 01 01 01	Yes
8	Study of Single Phase Motor	a. Induction Motor b. Universal Motor	1 1	1 1	Yes

A) Facilities for conducting Practicals in the Laboratories

Name of Course : E&TC Class:- S.E. Subject:- Communication Systems-I.

Name of the Department / Section :- Electronics and Telecommunication

Subjectwise & laboratorywise Lists of material, machinery, equipment & Instrument required to perform prescribed Practicals

Sr.No	Experiment Title Group A	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt can be conducted
			Required each	Available each	
1 2	AM Modulator & AM Demodulator	a. Exp. Kit, b. CRO, c. Function Generator, d. Power Supply (Optional)	01 01 02 01	01 01 02 01	Yes
3	FM Transmitter	a. Exp. Kit, b. CRO, c. Function Generator, d. Power Supply (Optional)	01 01 02 01	01 01 02 01	Yes
4	FM Reciver	a. Exp. Kit, b. CRO, c. Power Supply (Optional)	01 01 01	01 01 01	Yes
5	BJT Mixer	a. Exp. Kit, b. CRO, c. Function Generator d. Power Supply (Optional)	01 01 01 01	01 01 01 01	Yes
6	Super Heterodyne receiver	a. Exp. Kit, b. CRO, c. Function Generator, d. Power Supply (Optional)	01 01 01 01 01	01 01 01 01 01	Yes
7	IF Amplifier	a. Exp. Kit, b. CRO, c. Function Generator, d. Power Supply (Optional)	01 01 01 01 01	01 01 01 01 01	Yes
8	Calculation of Gain for RF amplifier	a. Exp. Kit, b. CRO, c. Function Generator, d Power Supply (Optional)	01 01 01 01	01 01 01 01	Yes
9	Study of TV system	a. Exp. Kit b. CRO c Function Generator, d Power Supply (Optional)	01 01 02 01	01 01 02 01	Yes

A) Facilities for conducting Practicals in the Laboratories

Name of Course : E& TC **Class:- S.E.**

Subject:- Microprocessors.

Name of the Department / Section :- Electronics and Telecommunication

Subjectwise & laboratorywise Lists of material, machinery, equipment & Instrument required to perform prescribed Practicals

Sr.No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	**Quantity**		**Whether expt can be conducted**
			Required each	**Available each**	
1	Addition of two 8 bit numbers.	a. CRO, b. Function Generator, c. Power Supply, d. Multimeter	01 01 01 01	01 01 01 01	Yes
2	Addition of two 16 bit numbers.	a. CRO, b. Function Generator, c. Power Supply,	01 01 01	01 01 01	Yes
3	Multiplication of two 8 bit numbers.	a. CRO, b. Function Generator, c. Power Supply, d. Multimeter	01 02 02 02	01 02 02 02	Yes
4	Division of two 8 bit numbers	a. CRO, b. Function Generator, c. Multimeter,	01 02 02	01 02 02	Yes
5	Program for block transfer of data bytes.	a. CRO, b. Function Generator, c. Decade box, d. Power Supply	01 01 01 01	01 01 01 01	Yes
6	Program to implement decimal up/down counter	a. CRO, b. Power supply	01 01	01 01	Yes
7	BCD to Hex / Hex to BCD Conversion	a. CRO, b. Function Generator, c. Power Supply	01 01 01	01 01 01	Yes
8	Interfacing of 8253/54 Timer with 8085 Microprocessor and generate the square wave.	a. CRO, b. Function Generator, c. Power Supply,	01 01 01	01 01 01	Yes

A) Facilities for conducting Practicals in the Laboratories

Name of Course : E.& TC Class:- S.E.

Subject:- Solid State Devices & Circuits -II

Name of the Department / Section :- Electronics and Telecommunication

Subjectwise & laboratorywise Lists of material, machinery, equipment & Instrument required to perform prescribed Practicals

Sr.No	Experiment Title GROUP A	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt can be conducted
			Required each	Available each	
1	Emitter Coupled Differential Amplifiers Calculation of CMRR using emitter resistance	a. CRO, b. Function Generator, c. Dual Power Supply, d. Kit e. Digital multimeter	01 01 01 01 01	01 01 01 01 01	Yes
2	Emitter Coupled Differential Amplifiers Calculation of CMRR using Constant current source	a. CRO, b. Function Generator, c. Dual Power Supply, d. Kit	01 01 01 01	01 01 01 01	Yes
3	Plot frequency response of single tuned amplifiers	➢ CRO, ➢ Function Generator, ➢ Power Supply, d. kit.	01 01 01 01	01 01 01 01	Yes
4	Measure the response of Schmitt trigger circuit for a sine wave input observe Hysteresis characteristics, calculation of UTP, LTP	a. CRO, b. Function Generator, c. Power supply d. Kit	01 01 01 01	01 01 01 01	Yes
5	Line and Load regulation of a series regulator	a. CRO, b. Auto transformer, c. Decade box, d. Power Supply e. multimeter	01 01 01 01 02	01 01 01 01 02	Yes
6	Plot frequency response of voltage series / voltage shunt feedback amplifiers calculation of bandwidth with and without feedback	CRO, Function Generator, Power supply Kit	01 01 01 01	01 01 01 01	Yes
7	Study of oscillators circuits L C oscillators, Hartley, Clapp/Colpitts	CRO, Power Supply, Kit	01 01 01	01 01 01	Yes
8	Determination of frequency and output voltage of crystal oscillator	a. CRO, b. Power Supply, c. Kit	01 01 01	01 01 01	Yes
9	Effect of feedback on Ri, Ro and Av for voltage series feedback amplifier	a. CRO, b. Function Generator, c. Power Supply, d. Kit	01 01 01 01	01 01 01 01	Yes
10	To observe and elimination of crossover distortion in complimentary symmetry class B amplifier	a. CRO, b. Function Generator, c. Power Supply, d. Kit	01 01 01 01	01 01 01 01	yes

11	Q point, Ad, Ac and CMRR measurement for BJT differential amplifier	• CRO, • Function Generator, • Power Supply, • Digital multimeter • Kit	01 01 01 01 01	01 01 01 01 01	yes
12	Low and High voltage measurement and regulation characteristics using LM723	a. CRO, b. Auto transformer, c. Decade box, d. Power Supply e. multimeter	01 01 01 01 02	01 01 01 01 02	Yes
13	IC 317 for fixed o/p & Adj voltage Regulator	• Auto transformer, • Decade box, • Power Supply • multimeter	1 1 1 1	1 1 1 1	Yes
14	Voltage Doubler Circuit	➢ Function Generator, ➢ DRB ➢ Digital multimeter	1 1 1	1 1 1	Yes

A) Facilities for conducting Practicals in the Laboratories

Name of Course : E&TC Class:- S.E.

Subject:- Application Software – I.

Name of the Department / Section :- Electronics and Telecommunication

Subjectwise & laboratorywise Lists of material, machinery, equipment & Instrument required to perform prescribed Practicals

Sr.No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	**Quantity**		**Whether expt can be conducted**
			Required each	**Available each**	
1	Bisection method, Newton Raphson method using users defined functions	C-language software,PC	01	01	Yes
2	Solve differential equations by Euler's modified method	C-language software,PC	01	01	Yes
3	Simpson's 1/3 and 3/8 rule	C-language software,PC	01	01	Yes
4	Two stage amplifiers	Or-CAD,PC	01	01	Yes
5	RLC Series Resonancs	Or-CAD,PC	01	01	Yes
6	Full Adder using Or-CAD	Or-CAD,PC	01	01	Yes
7	Study of MATLAB	MATLAB Software ,PC	01	01	Yes

A) Facilities for conducting Practicals in the Laboratories

Name of the Course : E & TC Class:- T.E.

Subject:- Communication System – II.

Name of the Department / Section :- Electronics and Telecommunication

Subjectwise & laboratorywise Lists of material, machinery, equipment & Instrument required to perform prescribed Practicals

Sr.No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt can be conducted
			Required	Available	
1	Sampling Thm	a. CRO b. Kit c. Functional Generator	1 1 1	1 1 1	Yes
2	Delta Modulation	a. CRO b. Kit c. Functional Generator	1 1 1	1 1 1	Yes
3	Adaptive Delta Modulation	a. CRO b. Kit c. Functional Generator	1 1 1	1 1 1	Yes
4	Line Coding & decoding	a. Kit b. Functional Generator	1 1	1 1	Yes
5	Frequency Shift keying	a. Kit b. Functional Generator	1 1	1 1	Yes
6	Binary Phase Shift Keying	a. Kit b. Functional Generator	1 1	1 1	Yes
7	Quadrature Phase Shift Keying	a. CRO b. Kit c. Functional Generator	1 1 1	1 1 1	Yes
8	Quadrature Amplitude Modulation	a. CRO b. Kit c. Functional Generator	1 1 1	1 1 1	Yes

A) Facilities for conducting Practicals in the Laboratories

Name of the Course : E & TC Class:- S.E.

Subject:- Linear Integrated Circuits.

Name of the Department / Section :- Electronics and Telecommunication

Subjectwise & laboratorywise Lists of material, machinery, equipment & Instrument required to perform prescribed Practicals

Sr.No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt can be conducted
			Required	Available	
1	Op-amp Integrator /Differentiator	a.Function Gen b.Dual P/S c.CRO d.Kit	1 1 1 1	1 1 1 1	Yes
2	Precision Half Wave Rectifier & Full Wave Rectifier	a. Function gen b. Dual P/S c. CRO d. Kit	1 1 1 1	1 1 1 1	Yes
3	Op-amp Clamper Circuit	a. Function gen b. Dual P/S c. CRO d. Kit	1 1 1 1	1 1 1 1	Yes
4	Square Wave/ Traingular Wave Generator	a. Dual P/S b. CRO c. Kit	2 1 1	2 1 1	Yes
5	Schmitt Trigger using OP-amp	a. Function Gen b. Dual P/S c. CRO d. Kit	1 1 1 1	1 1 1 1	Yes
6	IC-555 as a Astable & Monostable Multivibrator	a. Function Gen b. Dual P/S c. CRO d. Kit	1 1 1 1	1 1 1 1	Yes
7	To design & test second order Butterworth LP/HP filter.	a. Function Gen b. Dual P/S c. Multimeter d. CRO e. Kit	1 1 1 1 1	1 1 1 1 1	Yes
8	To study Op-amp parameters	a. Function generator b. Dual Power supply c. Multimeter d. CRO e. Kit	1 1 1 1 1	1 1 1 1 1	Yes

A) Facilities for conducting Practicals in the Laboratories

Name of the Course : E & TC Class:- T.E.

Subject:- Microcontroller & Peripheral Interface Controller.

Name of the Department / Section :- Electronics and Telecommunication

Subjectwise & laboratorywise Lists of material, machinery, equipment & Instrument required to perform prescribed Practicals

Sr.No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt can be conducted
			Required	Available	
1	Write and Execute program to flash LED.	➢ Computer with 8051 Simulator ➢ Kit with RS 232C ➢ Power Supply	1 1 1	1 1 1	Yes
2	Write and Execute program to display 0 to 9 continuously on 7-Segment display	a. Computer with 8051 Simulator b. Kit with RS 232C c. Power Supply	1 1 1	1 1 1	Yes
3	Write and Execute program to demonstrate interfacing of 4 X 4 matrix Key-Board.	a. Computer with 8051 Simulator b. Kit with RS 232C c. Power Supply	1 1 1	1 1 1	Yes
4	Write and Execute program to demonstrate interfacing of multiplexed 7-Segment display.	a. Computer with 8051 Simulator b. Kit with RS 232C c. Power Supply	1 1 1	1 1 1	Yes
5	Write and Execute program to demonstrate interfacing of Liquid Crystal display.	a. Computer with 8051 Simulator b. Kit with RS 232C c. Power Supply	1 1 1	1 1 1	Yes
6	Write and Execute program to demonstrate interfacing of DAC.	a. Computer with 8051 Simulator b. Kit with RS 232C c. Power Supply	1 1 1	1 1 1	Yes
7	Write and Execute program to demonstrate interfacing of ADC.	a. Computer with 8051 Simulator b. Kit with RS 232C c. Power Supply	1 1 1	1 1 1	Yes
8	Write and Execute program to demonstrate interfacing of Stepper Motor.	➢ Computer with 8051 Simulator ➢ Kit with RS 232C ➢ Power Supply	1 1 1	1 1 1	Yes
9	Write and Execute program to demonstrate Serial data Transmission.	a. Computer with 8051 Simulator b. Kit with RS 232C c. Power Supply	1 1 1	1 1 1	Yes
10	Write and Execute program to demonstrate Serial data Reception.	a. Computer with 8051 Simulator b. Kit with RS 232C c. Power Supply	1 1 1	1 1 1	Yes

A) Facilities for conducting Practicals in the Laboratories

Name of the Course : E & TC Class:- T.E. Subject:- Application Software – II.

Name of the Department / Section :- Electronics and Telecommunication

Subjectwise & laboratorywise Lists of material, machinery, equipment & Instrument required to perform prescribed Practicals

Sr.No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt can be conducted
			Required	Available	
1	To find voltage & current of given network using simulation tool.	PC, ORCAD Software.	01	01	Yes
2	To find transfer / driving point impedance of two port network.	PC, ORCAD Software.	01	01	Yes
3	To design & test active filter.	PC, ORCAD Software.	01	01	Yes
4	To find the pole zero plot of the given network.	PC, MATLAB Software.	01	01	Yes
5	To find the polar / Nyquist plot of the given network.	PC, MATLAB Software.	01	01	Yes
6	To obtain transient response & characteristics of any given network.	PC, ORCAD Software.	01	01	Yes
7	To find the Radiation pattern of antenna &study the effect of varying parameters.	PC, MATLAB Software.	01	01	Yes

A) Facilities for conducting Practicals in the Laboratories

Name of Course : E.& TC Class:- T.E.

Subject:- Electronics Measurement.

Name of the Department / Section :- Electronics and Telecommunication

Subjectwise & laboratorywise Lists of material, machinery, equipment & Instrument required to perform prescribed Practicals

Sr.No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt can be conducted
			Required	Available	
1	LCR Q-Meter	a. LCR Q meter Kit. b. Components.	01	01	Yes
2	Study of Digital Multimeter	a. DMM Kit. b. Power Supply. c. Function Generator& Componenets	01 01 01	01 01 01	Yes
3	Frequency Counter	a. CRO. b. Digital Freq Counter. c. Function Generator.	01 01 01	01 01 01	Yes
4	Study of Digital Tachometer	a. Digital Tachometer. b. AC/DC Motor.	01	01	Yes
5	Harmonic Distortion factor meter	a. Distortion factor meter. b. CRO. c. Function Generator	01 01 01	01 01 01	Yes
6	Study of Spectrum Analyzer	a. Spectrum Analyzer. b. Function Generator.	01 01	01 01	Yes Yes
7	To study CRO	a. CRO. b. Function Generator. c. Components.	01 01	01 01	Yes
8	Digital storage oscilloscope	a. DSO. b. Function Generator.	01 01	01 01	Yes

A) Facilities for conducting Practicals in the Laboratories

Name of the Course : E & TC Class:- T.E.

Subject:- Electronic Circuit Design.

Name of the Department / Section :- Electronics and Telecommunication

Subjectwise & laboratorywise Lists of material, machinery, equipment & Instrument required to perform prescribed Practicals

Sr.No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt can be conducted
			Required	Available	
1	Design & implementation of series regulated power supply	a. Designed Components b. Multimeter c. CRO	- 1 1	- 1 1	Yes
2	Design &Implementation of single stage inverting amplifier using BJT	a. Function gen b. Single P/S c. Multimeters d. CRO	1 1 1 1	1 1 1 1	Yes
3	Design &Implementation of Class B push-pull Amplifier	a. Single P/S b. CRO c. Function Generator d. Multimeter	1 1 1 1	1 1 1 1	Yes
4	Design &Implementation of Astable Multivibrator	a. Single P/S b. CRO c. Multimeter	1 1 1	1 1 1	Yes
5	Design &Implementation of Single Tuned amplifier using BJT	a. Designing Component b. Single P/S c. Multimeter d. Function Generator e. CRO	- 1 1 1 1	- 1 1 1 1	Yes
6	Design &Implementation of Sallen Key 2^{nd} order LPF	a. Designing Component b. Dual P/S c. Multimeter d. FG e. CRO	- 1 1 1 1	- 1 1 1 1	Yes

Note :- For all above practical consumable component like capacitor, Inductor , Resistor, BJT,IC etc are required which is available as per requirement & the practicals are performed on Bread board

A) Facilities for conducting Practicals in the Laboratories

Name of the Course : E&TC **Class: - T.E.**

Subject:-Power Electronics

Name of the Department / Section :- Electronics and Telecommunication

Subjectwise & laboratorywise Lists of material, machinery, equipment & Instrument required to perform prescribed Practicals

Sr.No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt can be conducted
			Required	Available	
1	Triggering circuits for SCR using R, RC, UJT firing	a. Kit b. Multimeter c. Powerscope	1 1 1	1 1 1	Yes
2	Driver circuit for IGBT/MOSFET	a. Kit b. Multimeter c. Powerscope	1 1 1	1 1 1	Yes
3	Study of 1- ϕ full controlled bridge converter with R & R-L load	a. Kit b. Multimeter c. Powerscope	1 1 1	1 1 1	Yes
4	Study of I- ϕ Half controlled Bridge with R & R-L Load	a. Kit b. Multimeter c. Powerscope	1 1 1	1 1 1	Yes
5	Study of step-up dc-dc converter	a. Kit b. CRO	1 1	1 1	Yes
6	Study of step-down dc –dc converter	a. Kit b. CRO	1 1	1 1	Yes
7	Study of parallel inverter	a. Kit b. Multimeter c. CRO d. load(25W)	1 1 1 1	1 1 1 1	Yes
8	Study of series inverter	a. kit b. CRO	1 1	1 1	Yes
9	Study of 1- ϕ AC controller	a. kit b. CRO c. Load(200 W)	1 1 1	1 1 1	Yes
10	Line and load regulation of SMPS	a. kit b. Dimmerstate C. DMM	1 1 1	1 1 1	Yes

A) Facilities for conducting Practicals in the Laboratories

Name of the Course : E&TC Class:- T.E.

Subject:- Feedback Control Systems.

Name of the Department / Section :- Electronics and Telecommunication

Subjectwise & laboratorywise Lists of material, machinery, equipment & Instrument required to perform prescribed Practicals

Sr.No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt can be conducted
			Required	Available	
1	AC position control of servomotor	a. Experimental kit	1	1	Yes
2	DC position control of servomotor	a. Experimental kit	1	1	Yes
3	Study of synchros to observe angular displacement	• Experimental kit • Multimeter	1 1	1 1	Yes
4	Transient response of RLC electrical network	a. Experimental kit b. CRO c. Multimeter	1 1 1	1 1 1	Yes
5	Study of stepper motor	a. Experimental Kit	1	1	Yes
6	Study of Tachometer	a.Experimental Kit	1	1	Yes
7	Determine the magnitude & phase plot of electrical network	a. Matlab software	-	-	Yes
8	Study of flow control using PID controller	a. Experimental kit b. Multimeter	1	1	Yes

A) Facilities for conducting Practicals in the Laboratories

Name of Course: E&TC **Class:- B.E.**

Subject:- VLSI Design.

Name of the Department / Section :- Electronics and Telecommunication

Subjectwise & laboratorywise Lists of material, machinery, equipment & Instrument required to perform prescribed Practicals

Sr. no.	NAME OF PRACTICALS	Name of equipments	Quantity		Whether conducted
			Required	available	
1	**Simulation and Implementation** Write VHDL code to realize all the logic gates.	a. Computer b. kit	01	01	Yes
2	**Simulation and Implementation** Write a VHDL program for the following combinational designs a. 2- bit comparator b. 3 to 8 decoder c. 4 to 1 multiplexer d. 4 bit binary to gray converter	a. Computer b. kit	01	01	Yes
3	**Simulation and Implementation** Write a VHDL code to describe the functions of a Full Adder Using all modeling styles.	a. Computer b. kit	01	01	Yes
4	**Simulation and Implementation** Develop the VHDL codes for the following flip-flops, SR, D, JK, T.	a. Computer b. kit	01	01	Yes
5	**Simulation and Implementation** Design 4 bit binary, BCD counters	a. Computer b. kit	01	01	Yes
6	**Simulation and Implementation** 8 – Bit Left / Right Shift Register.	a. Computer b. kit	01	01	Yes
7	**Simulation and Implementation** Write a model for 4 bit ALU using the schematic	a. Computer b. kit	01	01	Yes
8	**Interfacing** : Write VHDL code to control speed, direction of DC and Stepper motor	a. Computer b. kit	01	01	Yes

A) Facilities for conducting Practicals in the Laboratories

Name of Course: E&TC Class:- B.E.

Subject:- Digital Signal Processing.

Name of the Department / Section :- Electronics and Telecommunication

Subjectwise & laboratorywise Lists of material, machinery, equipment & Instrument required to perform prescribed Practicals

Sr.No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity each		Whether expt can be conducted
			Required Each	Available Each	
1	To determine the response of the given system for step input signal.	a. Computer b. Code Composer Studio Software	01	01	Yes
2	To determine the response of the given system for Ramp input signal.	c. Computer d. Code Composer Studio Software	01	01	Yes
3	To determine the response of the given system for Impulse input signal.	e. Computer f. Code Composer Studio Software	01	01	Yes
4	To determine the response of given system for linear convolution between two sequences.	g. Computer h. Code Composer Studio Software	01	01	Yes
5	To determine the response of given system for Circular convolution between two sequences.	i. Computer j. Code Composer Studio Software	01	01	Yes
6	To determine the response of given system for discrete fourier transform	k. Computer l. Code Composer Studio Software	01	01	Yes
7	To determine the response of given system for Inverse discrete fourier transform	m. Computer n. Code Composer Studio Software	01	01	Yes
8	To determine the response of given system for Z-transform	o. Computer p. Code Composer Studio Software	01	01	Yes
9	To study the DSP processor & generate the sinusoidal signal by using DSP Processor	a. Computer b. DSP Kit	01	01	Yes

A) Facilities for conducting Practicals in the Laboratories

Name of Course: E&TC Class:- B.E.

Subject:- Radiation & Microwave Technique.

Name of the Department / Section :- Electronics and Telecommunication

Subjectwise & laboratorywise Lists of material, machinery, equipment & Instrument required to perform prescribed Practicals

Sr.No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity each		Whether expt can be conducted
			Required	Available	
1	Active device (Gunn diode) characteristics measurement	a. Gunn diode set up b. VSWR meter	01	02	Yes
2	Active device (Reflex klystron) characteristics measurement	a. Reflex klystron set up b. CRO c. VSWR meter	01	02	Yes
3	Study of fixed and variable Attenuator	- Reflex klystron set up - Fixed & variable attenuator - VSWR meter	01	02	Yes
4	Study of circulator and isolator	a. Reflex klystron set up b. Circulator c. Isolator d. VSWR meter	01	02	Yes
5	Study of Microwave junction	a. Reflex klystron set up b. Magic Tee c. VSWR meter	01	02	Yes
6	Study of directional coupler	a. Reflex klystron set up b. Directional coupler c. VSWR meter	01	02	Yes
7	Radiation pattern & Beamwidth of Horn Antenna	a. Horn antenna set up b. VSWR meter	01	02	Yes
8	Frequency &wavelength measurement of reactangular waveguide	a. Reflex klystron set up b. VSWR meter c. CRO	01	02	Yes
9	VSWR Measurement using Double Minima Method	a. Reflex klystron set up b. VSWR meter c. CRO	01	02	Yes

A) Facilities for conducting Practicals in the Laboratories

Name of Course : E&TC Class:- B.E.

Subject:- Fiber Optic Communication.

Name of the Department / Section :- Electronics and Telecommunication

Subjectwise & laboratorywise Lists of material, machinery, equipment & Instrument required to perform prescribed Practicals

Sr.No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity each		Whether expt can be conducted
			Required	Available	
1	Electrical characteristics of LED/ID	a. Power supply b. OFC Kit c. CRO d. Ammeter e. voltmeter	01	01	Yes
2	Photometrics characterics of LED/ID	a. Power supply b. OFC Kit c. CRO d. Ammeter e. voltmeter	01	01	Yes
3	Numerical aperture measurment of GI fibre.	a. Power supply b. OFC Kit c. CRO d. Ammeter e. voltmeter	01	01	Yes
4	Attenuation measurment of Fibre.	a. Power supply b. OFC Kit c. CRO d. Ammeter e. voltmeter	01	01	Yes
5	Spectral characteristics of LED/ID	a. Power supply b. OFC Kit c. CRO d. Ammeter e. voltmeter	01	01	Yes
6	Fibre Optics transmitter receiver parameter measurment.	a. Power supply b. OFC Kit c. CRO d. Ammeter e. voltmeter	01	01	Yes
7	Study of fibre optic connectors.	a. Power supply b. OFC Kit c. CRO d. Ammeter e. voltmeter	01	01	Yes
8	Study of PWM	a. OFC Kit b. CRO	01	01	Yes

A) Facilities for conducting Practicals in the Laboratories

Name of Course : E&TC **Class:- B.E.**

Subject:- Telematics.

Name of the Department / Section :- Electronics and Telecommunication

Subjectwise & laboratorywise Lists of material, machinery, equipment & Instrument required to perform prescribed Practicals

Sr.No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity each		Whether expt can be conducted
			Required	Available	
1	Study of Telephone Exchange	Visit to BSNL	--	--	Yes
2	Study of Mobile Hand Set Demonstrator Model.	Block diagram study	--	--	Yes
3	Study of Teleprinter Demonstrator Model.	Visit to BSNL	--	--	Yes
4	Study of FAX Machine Demonstrator Model.	Fax machine	01	01	Yes
5	Study of EPABX system	EPBX system	01	01	Yes
6	Study of subscriber Instrument set.	Subscriber Instrument set CRO	01	01	Yes
7	Study of cordless Telephone set Demonstrator Model.	Block diagram	--	--	Yes
8	Modem Demonstrator Model.	FSK Modeus kit CRO	01	01	Yes

A) Facilities for conducting Practicals in the Laboratories

Name of Course : E&TC **Class:- B.E.**

Subject:- Embedded Systems.

Name of the Department / Section :- Electronics and Telecommunication

Subjectwise & laboratorywise Lists of material, machinery, equipment & Instrument required to perform prescribed Practicals

Sr.No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity each		Whether expt can be conducted
			Required	Available	
1	C-programs for interrupts	a. Computer b. ARM 7 Kit	01 01	01 01	Yes
2	Program to demonstrate I2C Protocol.	a. Computer b. ARM 7 Kit	01 01	01 01	Yes
3	Program to interface LCD	a. Computer b. ARM 7 Kit	01 01	01 01	Yes
4	Program to demonstrate RF communication OR Program to implement AT commands and interface of GSM modem	❖ Computer ❖ ARM 9 Kit	01 01	01 01	Yes
5	Writing a scheduler / working with using RTOS for 4 tasks with priority. The tasks may be keyboard, LCD, LED etc. and porting it on microcontroller/ microprocessor.	a. Computer b. ARM 7 Kit	01 01	01 01	Yes
6	Create two tasks, which will print some characters on the serial port, Start the scheduler and observe the behavior.	a. Computer b. ARM 7 Kit	01 01	01 01	Yes Yes
7	Program for exploration of (Process creation, Thread creation) using Embedded Real Time Linux	a. Computer b. ARM 7 Kit	01 01	01 01	Yes
8	Program for exploring Message Queues using Embedded Real Time Linux.	a. Computer b. ARM 9 Kit	01 01	01 01	Yes

List of Experimental Setup – Term-I

Name of Lab: - Lab No.6/ Computer Network Lab

Name of Course: Information technology **Class: BE IT**
Subject: Advanced Unix Programming

Sr. No.	Experiment Title	Name of Equipment/ Software available to Conduct the Experiment	Quantity		Whether experiment can be performed
			Required	Available	
1	Implementation of file management in UNIX.	Ubuntu 14.4, GCC Compiler	17	24	Yes
2	A Program for Simulation of Unix Commands	Ubuntu 14.4, GCC Compiler	17	24	Yes
3	Program to display user & system information in UNIX	Ubuntu 14.4, GCC Compiler	17	24	Yes
4	Program for process creation using fork() and vfork() function.	Ubuntu 14.4, GCC Compiler	17	24	Yes
5	Program for Inter process Communication using Pipe	Ubuntu 14.4, GCC Compiler	17	24	Yes
6	Program for catching of Signals	Ubuntu 14.4, GCC Compiler	17	24	Yes
7	Program for Daemon Process	Ubuntu 14.4, GCC Compiler	17	24	Yes
8	Program for Multithreading	Ubuntu 14.4, GCC Compiler	17	24	Yes

List of Experimental Setup – Term-II

Name of Lab: - Lab No.6/ Computer Network Lab

Name of Course: Information technology **Class: BE IT**
Subject: Advanced Unix Programming

Sr. No.	Experiment Title	Name of Equipment/ Software available to Conduct the Experiment	Quantity		Whether experiment can be performed
			Required	Available	
1	Develop a program to construct a multidimensional data model (Star, Snowflake or Fact constellations)	PC, MySQL Database	17	24	Yes
2	Implementation of Data Preprocessing Techniques	PC, MySQL Database	17	24	Yes
3	Implementation of Data Integration Techniques	PC, MySQL Database	17	24	Yes
4	Study and Implementation of Data Generalization and Summarization	PC, MySQL Database	17	24	Yes
5	Study of Extract Association Rule Mining	PC, MySQL Database	17	24	Yes
6	Study and Implementation of Data Classification Technique	PC, MySQL Database	17	24	Yes

List of Experimental Setup – Term-I
Name of Lab: - Lab No.6/ Computer Network Lab

Name of Course: Information Technology **Class: TE IT**
Subject: Computer Network

Sr. No.	Experiment Title	Name of Equipment/ Software available to Conduct the Experiment	Quantity		Whether experiment can be performed
			Required	Available	
1	Implementation of Bit-Stuffing	PC, openjdk 6	18	24	Yes
2	Socket programming for TCP.	PC, openjdk 6	18	24	Yes
3	Socket programming for UDP	PC, openjdk 6	18	24	Yes
4	Implementation of RLE data compression algorithm.	PC, openjdk 6	18	24	Yes
5	Encryption/Decryption using RSA asymmetric-key cryptography algorithm	PC, openjdk 6	18	24	Yes
6	Encryption/Decryption using XOR symmetric-key cryptography algorithm.	PC, openjdk 6	18	24	Yes
7	Simulate point to point wired network	PC, ns2	18	24	Yes
8	Simulate Ethernet LAN for wired network	PC, ns2	18	24	Yes

List of Experimental Setup – Term-I
Name of Course: Information Technology **Class: SE IT**
Subject: Information Theory Lab

Sr No.	Experiment Title	Name of Equipment/ Software available to conduct the experiment	Quantity		Whether experiment can be performed
			Required	Available	
1	Program for simple encryption and decryption of the message	PC, TC Compiler	18	24	YES
2	Program for Vernam Cipher (One-time Pad)	PC, TC Compiler	18	24	YES
3	Program for Simple Transposition Technique	PC, TC Compiler	18	24	YES
4	Program for Electronic Code Book (ECB) Mode	PC, TC Compiler	18	24	YES
5	Program for Diffie-Hellman Key Exchange Algorithm	PC, TC Compiler	18	24	YES
6	Study Digital Signature	PC, TC Compiler	18	24	YES
7	Program for Caesar Cipher	PC, TC Compiler	18	24	YES
8	Study of JPEG Standard	PC, TC Compiler	18	24	YES
9	Study of Adaptive Huffman Coding	PC, TC Compiler	18	24	YES
10	Program for RLE Encoding Technique	PC, TC Compiler	18	24	YES

List of Experimental Setup – Term-I

NAME OF LAB: - LAB NO.1/ : Digital Systems & Microprocessors Lab

Name of Course: Information technology **Class: SE IT**
Subject: Digital Systems & Microprocessors

Sr. No.	Experiment Title	Name of Equipment/ Software available to Conduct the Experiment	Quantity		Whether experiment can be performed
			Required	Available	
1	Verify the Truth table of logic gates and of De morgance Theorem	Breadboard, Logic Gates ICs, LEDs, Power Supply, Wires	16	20	Yes
2	Construction of basic gates using Universal gates	Breadboard, Logic Gates ICs, LEDs, Power Supply, Wires	16	20	Yes
3	Construct and Implement Half Adder & Full Adder Adder	Breadboard, Logic Gates ICs, LEDs, Power Supply, Wires	16	20	Yes
4	Construct and Implement Half Subtractor & Full Subtractor	Breadboard, Logic Gates ICs, LEDs, Power Supply, Wires	16	20	Yes
5	Construct and implement Gray to Binary & Binary to Gray code converters	Breadboard, Logic Gates ICs, LEDs, Power Supply, Wires	16	20	Yes

List of Experimental Setup – Term-I

NAME OF LAB: - LAB NO.4/: / Multimedia Techniques Lab

Name of Course: Information technology **Class: SE IT**
Subject: Digital Systems & Microprocessors

Sr. No.	Experiment Title	Name of Equipment/ Software available to Conduct the Experiment	Quantity		Whether experiment can be performed
			Required	Available	
1	ALP for MACRO	PC, MASM	16	20	Yes
2	ALP for NEAR and FAR Procedure	PC, MASM	16	20	Yes
3	ALP for Factorial of a Number	PC, MASM	16	20	Yes
4	ALP for Password Verification	PC, MASM	16	20	Yes
5	ALP for BCD Addition	PC, MASM	16	20	Yes

List of Experimental Setup – Term-II

NAME OF LAB: - LAB NO.4/: / Multimedia Techniques Lab
Name of Course: Information Technology **Class:** TE IT
Subject: Operating System Lab

Sr. No.	Experiment Title	Name of Equipment/ Software available to Conduct the Experiment	Quantity		Whether experiment can be performed
			Required	Available	
1	Study of commercial and open source operating system	PC, with internet	16	20	Yes
2	Program to implement memory management algorithms	Ubuntu 14.4	16	20	Yes
3	Program to implement command interpreter using system calls	Ubuntu 14.4	16	20	Yes
4	Program to implement concept of threading	Ubuntu 14.4	16	20	Yes
5	Program to implement CPU scheduling algorithms	Ubuntu 14.4	16	20	Yes
6	Program to implement page replacement algorithms	Ubuntu 14.4	16	20	Yes
7	Program for Bankers algorithm	Ubuntu 14.4	16	20	Yes
8	Program to demonstrate disk scheduling algorithms	Ubuntu 14.4	16	20	Yes

List of Experimental Setup – Term-I

NAME OF LAB: - LAB NO.6/ Computer Networks Lab
Name of Course: Information technology Class: TE IT
Subject: Linux Lab

Sr. No.	Experiment Title	Name of Equipment/ Software available to Conduct the Experiment	Quantity		Whether experiment can be performed
			Required	Available	
1	Installation of Latest Linux Operating Systems	PC,bootable CD of Ubuntu 12.04	17	24	Yes
2	Study and execution of various linux commands	PC, ubuntu 12.04	17	24	Yes
3	Study of Vi Editor	PC, ubuntu 12.04	17	24	Yes
4	Configuration of any two linux servers	PC, ubuntu 12.04	17	24	Yes
5	Shell script to find factorial of a number	PC, ubuntu 12.04	17	24	Yes
6	Shell script to find type of file	PC, ubuntu 12.04	17	24	Yes
7	Shell script to find largest among three given numbers	PC, ubuntu 12.04	17	24	Yes
8	Shell script to reverse a string	PC, ubuntu 12.04	17	24	Yes
9	Shell script to print date and time	PC, ubuntu 12.04	17	24	Yes
10	Shell script to perform basic arithmetic operations	PC, ubuntu 12.04	17	24	Yes

Name of Course: Information Technology **Class: TE**
Subject: Database Management System

Sr. No.	Experiment Title	Name of Equipment/ Software available to Conduct the Experiment	Quantity		Whether experiment can be performed
			Required	Available	
1	Creating a sample database using any client server RDBMS (Oracle/ Open Source Database) package using SQL DDL queries. This will include constraints (Primary key, Foreign key, Unique, Not Null, and Check) to be used while creating tables.	MySQL, Ubuntu 12.4	19	20	Yes
2	SQL DML queries: Use of SQL DML queries to retrieve, insert, delete and update the database created in experiment No. 1.	MySQL, Ubuntu 12.4	19	20	Yes
3	SQL Queries: The queries should involve SQL feature such as aggregate functions, group by, having, order by the database created in experiment No. 1.	MySQL, Ubuntu 12.4	19	20	Yes
4	SQL Queries: The queries should involve Set Operations and Set Comparisons the database created in experiment No. 1.	MySQL, Ubuntu 12.4	19	20	Yes
5	Screen design and Report generation: Sample forms and reports should be generated using any front end tools.	MySQL, Ubuntu 12.4,Open JDK 6	19	20	Yes
6	Write a program to demonstrate different types of JOIN.	MySQL, Ubuntu 12.4	19	20	Yes
7	Write a program to demonstrate view.	MySQL, Ubuntu 12.4	19	20	Yes
8	Write a program to demonstrate Trigger	MySQL, Ubuntu 12.4	19	20	Yes

List of Experimental Setup – Term-II

NAME OF LAB: - LAB NO.3: / Programming Lab
Name of Course: Information Technology **Class:** TE IT
Subject: Object Oriented Modeling and Design Lab

Sr. No.	Experiment Title	Name of Equipment/ Software available to Conduct the Experiment	Quantity		Whether experiment can be performed
			Required	Availabl e	
1	Designing a ATM System	Ubuntu 14.4, StarUml	16	20	Yes
2	Designing a college admission process system	Ubuntu 14.4, StarUml	16	20	Yes
3	Designing a Library Management System	Ubuntu 14.4, StarUml	16	20	Yes
4	Designing a Hospital Management System	Ubuntu 14.4 StarUml	16	20	Yes
5	Designing the Railway Reservation System	Ubuntu 14.4 StarUml	16	20	Yes
6	Designing the Hotel Management System	Ubuntu 14.4 StarUml	16	20	Yes

List of Experimental Setup – Term-I

NAME OF LAB: - LAB NO.3: / Programming Lab
Name of Course: Information Technology **Class:** TE IT
Subject: Software Engineering Lab

Sr. No.	Experiment Title	Name of Equipment/ Software available to Conduct the Experiment	Quantity		Whether experiment can be performed
			Required	Available	
1	Study of Unified Modeling Language (UML) and StarUML	PC, Internet	16	20	Yes
2	Designing an ATM System	Ubuntu 14.4, StarUml	16	20	Yes
3	Designing the Railway Reservation System	Ubuntu 14.4 StarUml	16	20	Yes
4	Designing a Library Management System	Ubuntu 14.4, StarUml	16	20	Yes
5	Designing a Hospital Management System	Ubuntu 14.4, StarUml	16	20	Yes
6	To design the College Management System	Ubuntu 14.4 StarUml	16	20	Yes

List of Experimental Setup – Term-I

NAME OF LAB: - LAB NO.5/ Operating Systems Lab

Sub: Java Programming Lab Class: TE IT

Sr. No.	Experiment Title	Name of Equipment/ Software available to Conduct the Experiment	Quantity		Whether experiment can be performed
			Required	Available	
1	Write a program that demonstrates string operations.	PC, openjdk 6	18	20	Yes
2	Write a program that demonstrate package creation and use in program.	PC, openjdk 6	18	20	Yes
3	Write a program to demonstrate the abstract class and abstract method.	PC, openjdk 6	18	20	Yes
4	Write a Java program to demonstrate inheritance by creating suitable classes.	PC, openjdk 6	18	20	Yes
5	Write a program to demonstrate Use of implementing interfaces. Use of extending interfaces.	PC, openjdk 6	18	20	Yes
6	Write a program to demonstrate the predefined and User defined exception handling.	PC, openjdk 6	18	20	Yes
7	Write a program using Applet to display a message in the Applet.for configuring Applets by passing parameters	PC, openjdk 6	18	20	Yes
8	Write a program in Java that demonstrates JDBC	PC, openjdk 6	18	20	Yes

List of Experimental Setup – Term-II

NAME OF LAB: - LAB NO.7/ Database management Lab
Sub:- Cryptography & Network Security **Class: BE IT**

Sr. No.	Experiment Title	Name of Equipment/ Software available to Conduct the Experiment	Quantity		Whether experiment can be performed
			Required	Available	
1	Program for Encryption / Decryption using RSA	PC, Open JDK	15	20	Yes
2	Program for Encryption / Decryption using Ceaser Cipher	PC, Open JDK	15	20	Yes
3	Program for Encryption / Decryption using Play Fair Cipher	PC, Open JDK	15	20	Yes
4	Program for Encryption / Decryption using Rail Fence Cipher	PC, Open JDK	15	20	Yes
5	Program for Diffie Hellman Key Exchange	PC, Open JDK	15	20	Yes

List of Experimental Setup – Term-I

NAME OF LAB: - LAB NO.5/ Operating System Lab
Sub:- Artificial Intelligence **Class: BE IT**

Sr. No.	Experiment Title	Name of Equipment/ Software available to Conduct the Experiment	Quantity		Whether experiment can be performed
			Required	Available	
1	Program for diagnosis System of Patient using Unification Algorithm	PROLOG	17	20	Yes
2	Program to search and display students details using dynamic database	PROLOG	17	20	Yes
3	Program to find the minimum distance route between two cities using A* algorithm	PROLOG	17	20	Yes
4	Program to develop the expert system for diagnosis of patient.	PROLOG	17	20	Yes
5	Program to develop the expert system for PC Troubleshooting	PROLOG	17	20	Yes
6	Program to play Tic-Tac-Toe game using Min/Max Search procedure	JAVA	17	20	Yes
7	program to create an auto associative network for given input vector using Hebb learning Rule.	SCILAB	17	20	Yes
8	Program to generate a set of random numbers distributed within the square in the XY plane using a perceptron learning rule	SCILAB	17	20	Yes

List of Experimental Setup – Term-II

NAME OF LAB: - LAB NO.4/ : Multimedia Techniques Lab

Name of Course: Information technology Class: SE IT

Subject: Microprocessor & Microcontroller Interfacing

Sr. No.	Experiment Title	Name of Equipment/ Software available to Conduct the Experiment	Quantity		Whether experiment can be performed
			Required	Available	
1	Program for mouse interfacing	PC, MASM	16	20	Yes
2	Program for graphics editor	PC, MASM	16	20	Yes
3	Program for PC to PC communication	PC, MASM	16	20	Yes
4	An assembly language program for parallel printer interface	PC, MASM	16	20	Yes

List of Experimental Setup – Term-II

NAME OF LAB: - LAB NO.1/ : Digital Systems & Microprocessors Lab

Name of Course: Information technology Class: SE IT

Subject: Microprocessor & Microcontroller Interfacing

Sr. No.	Experiment Title	Name of Equipment/ Software available to Conduct the Experiment	Quantity		Whether experiment can be performed
			Required	Available	
1	Program for digital to analog converter	8086 ANSHUMAN Kit, ADC kit, CRO, Keyboard, Adapter	16	20	Yes
2	An assembly language program to interface stepper motor with ANSHUMAN 8086 Kit.	8086 Microprocessor Kit, Stepper Motor Kit, Interfacing Cables, Keyboard, Adapter	16	20	Yes
3	An assembly language program for displaying alphabet “A” on 8*8 LED matrix.	8051 KIT (P89V51RD2), LED kit, Keil uVision3 software, Serial Communication Cable, flash Magic Software, Adapter	16	20	Yes
4	An assembly language program for displaying “ANSHUMAN” on 8 digit 7 Segment display.	8051 KIT (P89V51RD2), 7 Segment kit, Keil uVision3 software, Serial Communication Cable, flash Magic Software, Adapter	16	20	Yes
5	A program to demonstrate interfacing of 4*4 Keypad with 8051	8051 KIT (P89V51RD2), Keypad Kit, Keil uVision3 software, Serial Communication Cable, flash Magic Software, Adapter	16	20	Yes
6	A program to demonstrate interfacing of Stepper Motor with 8051	8051 KIT (P89V51RD2), Stepper Motor, Keil uVision3 software, Serial Communication Cable, flash Magic Software, Adapter	16	20	Yes

List of Experimental Setup – Term-II

Name of Course: Information Technology Class: BE IT

Subject: Internet Security Lab

Sr. No.	Experiment Title	Name of Equipment/ Software available to Conduct the Experiment	Quantity		Whether experiment can be performed
			Required	Available	
1	Implement Encryption/Decryption using Caesar Cipher	PC, jdk 1.6	15	20	Yes
2	Implementation of RSA algorithm	PC, jdk 1.6	15	20	Yes
3	Implement Diffie-Hellman Key Exchange algorithm	PC, jdk 1.6	15	20	Yes
4	Creation & export of digital certificates	PC, jdk 1.6, Mozilla Firefox browser	15	20	Yes
5	Implementation of digital signature	PC, jdk 1.6	15	20	Yes

List of Experimental Setup – Term-I

NAME OF LAB: - LAB NO.7/ Database Management Lab

Name of Course: Information Technology Class: TE IT

Sub: - System Programming Lab

Sr. No.	Experiment Title	Name of Equipment/ Software available to Conduct the Experiment	Quantity		Whether experiment can be performed
			Required	Available	
1	Pass-I of Two Pass Assembler	PC, Turbo C	18	21	Yes
2	Pass-II of Two Pass Assembler	PC, Turbo C	18	21	Yes
3	Pass-I of Two Pass Macro Processor	PC, Turbo C	18	21	Yes
4	Application to create simple Text Editor	PC, Turbo C	18	21	Yes
5	Lexical Phase of Compiler	PC, Turbo C	18	21	Yes
6	Recursive Descent Parser	PC, Turbo C	18	21	Yes

List of Experimental Setup – Term-I

NAME OF LAB: - LAB NO.7/ Database Management Lab
Name of Course: Information Technology
Sub: - Discrete Structures & Graph Theory Lab **Class: TE IT**

Sr. No.	Experiment Title	Name of Equipment/ Software available to Conduct the Experiment	Quantity		Whether experiment can be performed
			Required	Available	
1	Program for Logical Operatios using Bitwise Operators	PC, Turbo C	18	21	Yes
2	Program for Set Operations	PC, Turbo C	18	21	Yes
3	Program for generation of Permutations	PC, Turbo C	18	21	Yes
4	Program for generation of Combinations	PC, Turbo C	18	21	Yes
5	Program for Bubble Sort	PC, Turbo C	18	21	Yes
6	Program for Matrix Multiplication	PC, Turbo C	18	21	Yes
7	Program for Binary Search	PC, Turbo C	18	21	Yes
8	Program for Kruskal Algorithm	PC, Turbo C	18	21	Yes
9	Program for Prims Algorithm	PC, Turbo C	18	21	Yes
10	Program for Interconversion of Number System	PC, Turbo C	18	21	Yes

List of Experimental Setup – Term-II

NAME OF LAB: - LAB NO.6/ Computer Network Lab
Name of Course: Information Technology
Sub: - Data Structures Lab **Class: TE IT**

Sr. No.	Experiment Title	Name of Equipment/ Software available to Conduct the Experiment	Quantity		Whether experiment can be performed
			Required	Available	
1	Implementation of Stack using Linked List	PC, Text Editor, GCC compiler	16	24	Yes
2	Implementation of Queue using Linked List	PC, Text Editor, GCC compiler	16	24	Yes
3	Implementation of Circular Queue using Linked List	PC, Text Editor, GCC compiler	16	24	Yes
4	Conversion Infix to Postfix	PC, Text Editor, GCC compiler	16	24	Yes
5	Conversion Infix to Prefix	PC, Text Editor, GCC compiler	16	24	Yes
6	Program for addition of two single variable polynomial using Linked List	PC, Text Editor, GCC compiler	16	24	Yes
7	Implementation of Marge Sort	PC, Text Editor, GCC compiler	16	24	Yes
8	Implementation of Quick Sort	PC, Text Editor, GCC compiler	16	24	Yes
9	Creation of Binary Tree and perform all non-recursive traversals	PC, Text Editor, GCC compiler	16	24	Yes
10	Create Hash table using Linear Probing with chaining	PC, Text Editor, GCC compiler	16	24	Yes

List of Experimental Setup – Term-I

NAME OF LAB: - LAB NO.03/ Programming Lab
Name of Course: Information Technology
Sub: - Object Oriented Technology Lab **Class: SE IT**

Sr. No.	Experiment Title	Name of Equipment/ Software available to Conduct the Experiment	Quantity		Whether experiment can be performed
			Required	Available	
1	WAP for Parameterized Constructor& Overloading Constructor	PC, Text Editor, Turbo C++ Compiler	18	20	Yes
2	WAP to find Area of Triangle, Rectangle etc using Function Overloading	PC, Text Editor, Turbo C++ Compiler	18	20	Yes
3	WAP for array of pointers to objects.	PC, Text Editor, Turbo C++ Compiler	18	20	Yes
4	WAP for Multiple and Multilevel Inheritance	PC, Text Editor, Turbo C++ Compiler	18	20	Yes
5	WAP to perform file Operations using Class & Objects	PC, Text Editor, Turbo C++ Compiler	18	20	Yes
6	WAP to Add total time of workers using Concept of Operator Overloading	PC, Text Editor, Turbo C++ Compiler	18	20	Yes
7	WAP for Matrix Multiplication using New and Delete Operator	PC, Text Editor, Turbo C++ Compiler	18	20	Yes
8	WAP for Class to Basic and Basic to Class Type Conversion	PC, Text Editor, Turbo C++ Compiler	18	20	Yes
9	WAP for displaying Salary of Employees using Pure Virtual Functions	PC, Text Editor, Turbo C++ Compiler	18	20	Yes
10	WAP for Bubble Sort using Template Function	PC, Text Editor, Turbo C++ Compiler	18	20	Yes

List of Experimental Setup – Term-II

NAME OF LAB: - LAB NO.09/ Computer Graphics Lab

Name of Course: Information Technology

Sub: - Computer Graphics & Multimedia Lab **Class: SE IT**

Sr. No.	Experiment Title	Name of Equipment/ Software available to Conduct the Experiment	Quantity		Whether experiment can be performed
			Required	Available	
1	Study of various Graphics Commands and inbuilt functions	PC, Text Editor, Code Blocks	17	21	Yes
2	Line Generation using DDA	PC, Text Editor, Code Blocks	17	21	Yes
3	Different Line Generation using Bresenham's Algorithm	PC, Text Editor, Code Blocks	17	21	Yes
4	Circle Generation using Bresenham's Algorithm	PC, Text Editor, Code Blocks	17	21	Yes
5	Program for Polygon Filling using Flood Fill and Boundary Fill Algorithm	PC, Text Editor, Code Blocks	17	21	Yes
6	Program for 2D Transformation Techniques	PC, Text Editor, Code Blocks	17	21	Yes
7	Program for 3D Transformation Techniques	PC, Text Editor, Code Blocks	17	21	Yes
8	Program for Parallel Projection	PC, Text Editor, Code Blocks	17	21	Yes
9	Program for Perspective Projection	PC, Text Editor, Code Blocks	17	21	Yes
10	Animation using C	PC, Text Editor, Code Blocks	17	21	Yes

List of Experimental Setup – Term-II

NAME OF LAB: - LAB NO.09/ Computer Graphics Lab

Name of Course: Information Technology

Sub: - Web Programming Lab **Class: TE IT**

Sr. No.	Experiment Title	Name of Equipment/ Software available to Conduct the Experiment	Quantity		Whether experiment can be performed
			Required	Available	
1	Complete Web Page designing using HTML & CSS using Table & Layout	PC, Text Editor, Web Browser, XAMPP Server, Paint	17	21	Yes
2	Javascript to Demo if else, switch statement	PC, Text Editor, Web Browser, XAMPP Server, Paint	17	21	Yes
3	Javascript to Demo Alert Boxes	PC, Text Editor, Web Browser, XAMPP Server, Paint	17	21	Yes
4	Javascript to Demo Call of a function with Arguments and Return Value	PC, Text Editor, Web Browser, XAMPP Server, Paint	17	21	Yes
5	Javascript to Handle Onclick, Onblur, Mouseover, Onchange events	PC, Text Editor, Web Browser, XAMPP Server, Paint	17	21	Yes
6	Design a Web Page using PHP to Demo form Handling	PC, Text Editor, Web Browser, XAMPP Server, Paint	17	21	Yes
7	PHP Web Page to Demo Date, File , File Upload, Cookies, Sessions	PC, Text Editor, Web Browser, XAMPP Server, Paint	17	21	Yes
8	PHP to Demo Variables, Data Types and String Functions	PC, Text Editor, Web Browser, XAMPP Server, Paint	17	21	Yes
9	PHP to Demo Database Connectivity	PC, Text Editor, Web Browser, XAMPP Server, Paint	17	21	Yes
10	Web Page/ Web Site development using HTML/PHP.	PC, Text Editor, Web Browser, XAMPP Server, Paint	17	21	Yes

Facilities for conducting Practical's in the Laboratories
Name of Course : MECHANICAL ENGINEERING

Class: - F.E.
Sem - II
Subject: - **Engineering Drawing and Elements of mechanical Engineering**
Name of the Department / Section: - MECHANICAL ENGINEERING
Subject wise & laboratory wise Lists of material, machinery, equipment & Instrument required performing prescribed Practical's

S.N	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether experiment can be conducted
			Required	Available	
1	Study of Boiler Mountings	Models, charts	01	02	Yes
2	Study of Boiler Accessories	Models, charts	01	02	Yes
3	Study of Cochran & Lancashire Boiler	Models, charts	01	01	Yes
4	Study of Babcock & Wilcox Boiler	Models, charts	01	01	Yes
5	Study of Power transmission-Single plate clutch, old ham coupling, Hook's joint	Models, charts	01	01	Yes
6	Measurement of Energy consumption of Domestic Appliances	Chart	01	01	Yes
7	Measurement of Thermal Efficiency of Domestic cooking Devices	charts	01	01	Yes

SEM - III
Class: - S.E (Mechanical)
Subject: - **SS – III (TW – 50)**

Class: - S.E (Mechanical)
Subject: - **Engineering Thermodynamics Lab – TW - 50**

S.N	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether experiment can be conducted
			Required	Available	
1	Study and Demonstration of Pressure measuring devices.	Demo model/Apparatus	01		Yes
2	Study and Demonstration of Temperature measuring devices.	Demo model/Apparatus	01		Yes
3	Study and Demonstration of Centrifugal Pump.	Centrifugal pump	01	01	Yes
4	Study and Demonstration of Joule's paddle wheel experiment.	Demo model/Apparatus	01		Yes
5	Determination of Dryness fraction using separating throttling calorimeter.				No
6	Determination and Verification of SFEE for Nozzle.				No
7	Determination of actual Coefficient of performance of House hold refrigerator.	Vapour compression cycle	01	01	Yes
8	Numerical Assignment on Unit III (Minimum five Problems)	Study	01		Yes
9	Numerical Assignment on Unit IV. (Minimum five Problems)	Study	01		Yes
10	Numerical Assignment using steam table/Mollier chart on Unit V. (Minimum five Problems)	Study	01		Yes

Class: - S.E (Mechanical)
Subject: - **Fluid Mechanics – TW – 50**

S.N	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether experiment can be conducted
			Required	Available	
1	Experiment on Red wood viscometer	Red wood viscometer	01	01	Yes
2	Experiment on Reynolds's apparatus	Reynolds's apparatus	01	01	Yes
3	Experiment on Bernoulli's theorem	Bernoulli's apparatus	01	01	Yes
4	Experiment on flow measurement by orifice meter	orifice meter apparatus	01	01	Yes
5	Experiment on flow measurement by venturi meter	venturi meter apparatus	01	01	Yes
6	Experiment on determination of metacentric height of a floating body	Demo model	01	01	Yes
7	Trial on centrifugal pumps				N0
8	Experiment on determination of major and minor losses for flow through pipes	Demo model	01	01	Yes
9	Study of sharp edged circular orifice / mouthpieces				N0
10	Study of velocity distribution in boundary layer and its thickness.				N0
11	Study of Manometers.	Manometers	01	01	Yes

Class: - S.E (Mechanical)
Subject: - **Material Science and metallurgy - 25**

S.N	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether experiment can be conducted
			Required	Available	
	GROUP A				
1	Tensile test, to compare tensile strength, yield point and ductility of three Metallic materials.	U.T.M	01	01	Yes
2	Brinell or Poldi hardness test on steel, cast iron, brass.	Hardness Tester	01	01	Yes
3	Vickers hardness test on steel, cast iron, brass.		01		No
4	Rockwell and Rockwell superficial hardness measurement.	Hardness Tester	01	01	Yes
5	Izod or Charpy impact test to compare impact values of cast iron and mild steel Or alluminium and brass.	Impact machine	01	01	Yes
6	Erichsen Cupping Test				No
7	Measurement Non-destructive tests: Dye penetrant test, Magnetic particle testing , ultrasonic testing ,eddy current test.(any two)	Dye penetrate kit	01	01	Yes
	GROUP B				
8	Micro Specimen Preparation and use of metallurgical microscope	Sample Microscope	01	01	Yes
9	Study and drawing microstructure of mild steel, medium carbon, eutectoid Steel, hypereutectoid steel.	Sample Microscope	01	01	Yes
10	Demonstration of Annealing,Normalising and Hardening of medium carbon Steel specimens and measurements of hardness and drawing icrostructures.				No
11	Jominy Hardenability test.	Jominy Hardenability test.	01	01	Yes
12	Study and drawing microstructure of white, malleable, gray and ductile cast Iron or any four non-ferrous metals.	Sample Microscope	01	01	Yes
13	Observe and record the microstructures of heat affected zones of fusion welded Joint.	Sample Microscope	01	01	Yes

Class: - S.E (Mechanical)
Subject: - **Workshop Practice III - 25**

S.N	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether experiment can be conducted
			Required	Available	
1	Carpentry shop	Wood lathe M/c			Yes
2	Foundry Shop	Furnace			Yes
3	Welding Shop	Spot,M.I.G,welding transformer			Yes
4	Machine shop-I (Turning Shop)	Lathe m/c			Yes

SEM - IV
Class: - S.E (Mechanical)
Subject: - **Machine Drawing - TW – 50**

S.N	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether experiment can be conducted
			Required	Available	
1	Assembly and details of a machine unit.	Sample model	05		Yes
2	Assembly and details of a machine unit.	Sample model	05		Yes

Class: - S.E (Mechanical)
Subject: - **Basic Electrical Drives & Controls -TW -50**

S.N	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether experiment can be conducted
			Required	Available	
1	Speed control of DC Shunt motor by armature control and flux control Methods.	D.C .Ammeter, Multimeter	02,01	02,01	Yes
2	Load test on DC Shunt Motor.	Shunt motor	1	1	Yes
3	Load test on DC Series Motor.	Series motor	1	2	Yes
Yes 4	Measurement of active power in a three phase balanced inductive load Using two wattmeter methods.	Watt meter, Inductive load	02,01	4,2	Yes
5	Regulation of an alternator by synchronous impedance method.	Rheostat,Tachometer	1	1	Yes
6	Regulation of an alternator by Direct Loading method.	Watt meter	1	2	Yes
7	Load Test on three Phase Induction Motor	Ammeter, Voltmeter	2	2	Yes
8	Study of D.C. Motor Starters & Three Phase Induction Motor Starter.	Starters, & I.M	01	--	Yes

Class: - S.E (Mechanical)
Subject: - **Applied Thermodynamics Lab - 25**

S.N	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether experiment can be conducted
			Required	Available	
	Following Three Compulsory				
1	Determination of heating value of a solid / liquid fuel using Bomb Calorimeter.	Bomb Calorimeter.	01	01	Yes
2	Exhaust gas analysis using Gas Analyzer OR Orsat Apparatus.	Orsat Apparatus	01	01	Yes
3	Determination of Isothermal and Volumetric efficiency of reciprocating air Compressor.	Reciprocating air Compressor	01	01	Yes
	Following any Five				No
4	Study of boiler draught.	Sample model	01		Yes
5	Study of High pressure boiler.	Sample model	01		Yes
6	Study of Steam condensers and cooling towers.	Sample model	01		Yes
7	Study of Steam Nozzles and diffusers.	Sample model	01		Yes
8	Study of Steam Power Plant.				No
9	Visit to any thermal power plant, prepare a detailed visit report.	Sample model	01		Yes
10	Evaluation of Boiler efficiency by Direct and Indirect Method (Through Numerical).				No

Class: - S.E (Mechanical)
Subject: - **Theory of Machines-I - 25**

S.N	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether experiment can be conducted
			Required	Available	
1	Drawing sheets on ICR method (2 problems), relative velocity and acceleration method (4 problems) and Klein's construction (2 problems)	Transparency	01	01	Yes
2	To study the various inversions of kinematic chains. (Assignment)	Transparency	01	01	Yes
3	To determine slip and creep for a belt-pulley combination.	Test rig of sleep & creep of belt	01	01	Yes
4	To determine mass moment of inertia of compound pendulum.	Vibration Lab, Test rig	01	01	Yes
5	To determine mass moment of inertia of rigid body by using bifilar or trifilar suspension method	Working model	01	01	Yes
6	To study the different types of clutches.(Assignment)	Transparency	01	01	Yes

Class: - S.E (Mechanical)
Subject: **Workshop Practice IV - 25**

S.N	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether experiment can be conducted
			Required	Available	
1	Machine shop-II				
2	CNC Lathe				
3	VMC (CNC Milling)				

Facilities for conducting Practical's in the Laboratories
Name of Course : MECHANICAL ENGINEERING
Class: - T.E. Sem - V
Subject: **- Heat Transfer (25)**
Name of the Department / Section: - MECHANICAL ENGINEERING
Subject wise & laboratory wise Lists of material, machinery, equipment & Instrument required performing prescribed Practicals

S.N	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether experiment can be conducted
			Required	Available	
1	Determination of thermal conductivity of metal rod.	Thermal conductivity apparatus	01	01	Yes
2	Determination of thermal conductivity of insulating powder.	Insulating powder apparatus	01	01	Yes
3	Determination of thermal conductivity of composite wall.	Composite wall apparatus	01	01	Yes
4	Determination of heat transfer coefficient in natural convection.	natural convection apparatus	01	01	Yes
5	Determination of heat transfer coefficient in forced convection.	forced convection apparatus	01	01	Yes
6	Determination of temperature distribution, fin efficiency in natural and forced convection.	Pin.fin apparatus	01	01	Yes
7	Determination of emissivity of a test surface.	Emissivity measurement apparatus	01	01	Yes
8	Determination of Stefan Boltzmann constant	Stefan Boltzmann apparatus	01	01	Yes
9	Study of pool boiling phenomenon and determination of critical heat flux				No
10	Determination of LMTD, overall heat transfer coefficient and effectiveness of heat exchanger in parallel and counter flow arrangement.	Heat exchanger appratus	01	01	Yes
11	Determination of heat transfer from a heat pipe.				No
12	Calibration of thermocouple.				No

Class: - T.E (Mechanical, Term work)
Subject: - **Internal Combustion Engine**

S.N	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether experiment can be conducted
			Required	Available	
1	Study of cooling systems.	Model &chart	01	01	Yes
2	Study of lubrication systems	Model &chart	01	01	Yes
3	Study of simple and Solex carburetors.	Model &chart	01	01	Yes
4	Study of fuel pump and fuel injector.	Model &chart	01	01	Yes
5	Trial on a petrol engine and calculation of air/fuel ratio, volumetric, thermal and mechanical efficiencies.	Petrol Engine	01	01	Yes
6	6) Trial of a Diesel engine and calculation of air/fuel ratio, volumetric, thermal and mechanical efficiencies.	Diesel Engine	01	01	Yes
7	Morse test and determination of bsfc and isfc	Petrol Engine	01	01	Yes
8	Study of combustion chambers of SI engines.	Model &chart	01	01	Yes
9	Study of combustion chambers of CI engines.	Model &chart	01	01	Yes
10	Study and demonstration of mechanical and Pneumatic governors.				N
11	Study and analysis of exhaust emission from the engine (PUC).				N

Class: - T.E (Mechanical)
Subject: **- Machine Design – I (25)**

S.N	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether experiment can be conducted
			Required	Available	
1	Total five assignments (One on each unit - only Numerical)				
2	Design Report: - The design project shall consist of assembly drawing with a part list and overall dimensions and the other sheet involving drawing of individual components using AUTO CAD on A3 size paper. Manufacturing tolerances, surface finish symbols and geometric tolerances should be specified so as to make it working drawing.	Sample model	01		Yes

Class: - T.E (Mechanical)
Subject: - **Tom II Lab (25)**

S.N	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether experiment can be conducted
			Required	Available	
1	To determine the characteristic curves of the centrifugal governor and find its coefficient of insensitivity and stability.	Centrifugal governor	01	01	Yes
2	To study various types of gear boxes.	Sample model	01	01	Yes
3	To verify the principle of working of gyroscope.	Gyroscope	01	01	Yes
4	To study the static & dynamic balancing machine & balancing of masses in different planes	Balancing machine	01	01	Yes
5	To study graphical methods and prepare drawing sheets for – Drawing sheet 1:- Balancing of rotating masses and reciprocating masses. (2 Problems)				Yes
6	To study graphical methods and prepare drawing sheets for Drawing sheet 2: Draw cam profile for various types of follower motion.				Yes

Class: - T.E (Mechanical, Term work – 50) Subject: - **Computer Graphics**

Class: - T.E (Mechanical, Term work – 25) Subject: - Industrial Training / EDP / SS

SEM - VI
Class: - T.E (Mechanical) Subject: **MD-II LAB (25)**

S.N	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether experiment can be conducted
			Required	Available	
1	Total five assignments (One on each unit - only Numerical)				Yes
2	Design Report: - The design project shall consist of two imperial size sheets- one involving assembly drawing with a part list and overall dimension and the other sheet involving drawing with of individual components & also using AUTO CAD on A3 size paper. Manufacturing tolerances, surface finish symbols and geometric tolerances should be specified so as to make it working drawing.	Sample model	01		Yes

Class: - T.E (Mechanical) Subject: - MQC (25)

S.N	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether experiment can be conducted
			Required	Available	
1	Determination of linear/angular dimensions of part using precision & non precision instrument.	Vernier, micrometer, Height gauge, slip gauge, sine bar, bevel	01	01	Yes
2	Machine tool alignment tests on any machine tool likeLathe,Drilling,Milling	Dial gauge	01	01	Yes
3	Interferometer-Study of surfaces using optical flat.	Optical flat, Interferometer	01	01	Yes
4	Surface finish measurement	Surface finish measurement apparatus	01	01	Yes
5	Measurement of roundness/circularity using mechanical comparator.	Vee block, Dial gauge	01	01	Yes
6	Measurement of screw parameters	Floating carriage, micrometer	01	01	Yes
7	Measurement of Gear parameters i) gear tooth thickness ii)constant chord iii)PCD	Gear tooth, Vernier Caliper	01	01	Yes
8	Study and applications of tool makers microscope	Tool makers microscope	01	01	Yes
9	Use of profile projector	Profile projector	01	01	Yes
10	Study and use of control charts	Charts	01	01	Yes

Class: - T.E (Mechanical) Subject: - Turbo M/C Lab (25)

S.N	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether experiment can be conducted
			Required	Available	
1	Study of steam turbine power plant.	Charts	01		Yes
2	Study of steam turbine systems. a) Methods of compounding b) Methods of governing c) Losses in steam turbine d) Lubrication system.	Charts	01		Yes
3	Trial on steam turbine				No
4	Study of gas turbines	Charts	01		Yes
5	Study of hydraulic turbines.	Charts	01		Yes
6	Trial on pelton wheel.	Pelton turbine			Y
7	Trial on Francis turbine	Francis turbine			Y
8	Trial on Kaplan turbine.	Kaplan turbine			Y
9	Trial on gas turbine plant.				No
10	Study of various jet propulsion devices / engine.	Charts	01		Yes
11	Visit to hydraulic power plant.				No

Class: - T.E (Mechanical, Term work – 25)
Subject: **C/C++**

S.N	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether experiment can be conducted
			Required	Available	
1	One assignment on introduction to computer				Yes
2	To develop and Run "C/C++" programs for machine elements like (Any two on C and two on C++) a) Design of knuckle joint or turnbuckle joint b) Design of power screw c) Design of helical spring d) Design of spines e) Design of muff coupling f) Theories of failure etc.	Computers			Yes

Class: - T.E (Mechanical, Term work – 50)
Subject: - **Minor Project**

Class: - T.E (Mechanical, Term work - 25)
Subject: **Seminar-I**

Facilities for conducting Practical's in the Laboratories
Name of Course : MECHANICAL ENGINEERING

Class: - B.E.
Sem - VII
Subject: **-Computer Aided Design and Computer Aided Manufacturing (25)**
Name of the Department / Section: - MECHANICAL ENGINEERING
Subject wise & laboratory wise Lists of material, machinery, equipment & Instrument required performing prescribed Practicals

S.N	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether experiment can be conducted
			Required	Available	
1.1	Modeling of any three Machine Component.	Software	15	15	Yes
1.2	To draw any two assembly of Mechanical Component 1)Assembly of Tool Holder 2)Assembly of Milling Jig	Software	15	15	Yes

Class: - B.E (Mechanical, Term work – 25)
Subject: **Refrigeration and Air Conditioning**

S.N	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether experiment can be conducted
			Required	Available	
1	TRIAL ON AIR CONDITIONING TEST RIG	Test Rig	1	1	Yes
2	EVALUATION OF CHARGING OF REFRIGERATION PLANT	Chart (Visit	1	1	Yes
3	STUDY OF EXPANSION DEVICES SOLENOID VALVE AND SAFETY V/VS IN VAPOUR COMPRESSION SYSTEM.	Chart	1	1	Yes
4	TRIAL ON ICE PLANT	Test Rig	1	1	Yes
5	STUDY OF HERMETICALLY SEALED COMPRESSOR	Compressor Model	1	1	Yes
5	STUDY OF MEASURING IN STRUMENT'S AND VARIOUS TOOLS USED IN REFRIGERATION AND AIR CONDITIONING SYSTEMS	Chart	1	1	Yes
6	VAPOUR ABSORPTION REFRIGERATION SYSTEM	Test Rig	1	1	Yes
7	TRIAL ON VAPOUR COMPRESSION REFRIGERATION SYSTEM.	Test Rig	1	1	Yes

Class: - B.E (Mechanical, Term work – 25)
Subject: **Automobile Engineering – I**

S.N	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether experiment can be conducted
			Required	Available	
1	Study of layout of a chassis and it's different components of a vehicle	Chasis and Vehicle	1	1	Yes
2	To study modern trends in automobile	Automobile	1	1	Yes
3	Study of different types of Tyres, Tubes and their defects	Tyres	1	1	Yes
4	Study of troubleshooting in various suspension systems	Suspension System	1	1	Yes
5	Study of troubleshooting in various steering systems	Steering System	1	1	Yes
6	Study of impact on Steering geometry angle of vehicle	Steering System	1	1	Yes

Class: - B.E (Mechanical, Term work – 25)
Subject: Project-I

Class: - B.E (Mechanical, Term work – 25)
Subject: Seminar-II

Class: - B.E (Mechanical, Term work – 25)
Subject: Industrial Visit

Facilities for conducting Practical's in the Laboratories
Name of Course : **MECHANICAL ENGINEERING**

Class: - B.E.
Sem - VIII
Subject: **- Mechanical Vibration (25)**
Name of the Department / Section: - MECHANICAL ENGINEERING
Subject wise & laboratory wise Lists of material, machinery, equipment & Instrument required performing prescribed Practicals.

S.N	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether experiment can be conducted
			Required	Available	
1	To study the longitudinal vibrations of helical spring & to determine the frequency or period of vibration (oscillation) theoretically& actually by experiment.	Spring, Accessories Masses	1	1	Yes
2	Study the Undamped free vibration of equivalent spring mass system.	Springs, Beam, Rotor Exciter Accessories masses.	1	1	Yes
3	To study the torsional vibration (undamped) of single Rotor shaft system.	Torsion wire, Disc, Clamp	1	1	Yes
4	To study the free vibrations of two rotor system and to determine the natural frequency of vibration theoretically and experimentally.	Torsion wire, 2 Discs	1	1	Yes
5	To study the forced vibrations of equivalent spring mass system.	Damper, Viscous Damper, Beam, Rotor Exciter, Dimmer Paper Roller	1	1	Yes

Class: - B.E (Mechanical, Term work – 25)
Subject: **Finite Element Analysis and Simulation Techniques**

S.N	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether experiment can be conducted
			Required	Available	
1	Analysis of a Beam with a Distributed Load	Software			Yes
2	Analysis of a Truss	Software			Yes
3	Analysis of a Simple Cantilevered Beam with End Load	Software			Yes
4	2-D Static Stress Analysis in ANSYS	Software			Yes
5	Analysis of Box Beam	Software			Yes

Class: - B.E (Mechanical, Term work – 25)
Subject: **Tribology**

S.N	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether experiment can be conducted
			Required	Available	
1	Michell Tilting Pad Thrust Bearing	Test Rig	1	1	Yes
2	To study the effect of important variables such as speed, and load on pressure distribution in a journal bearing.	Test Rig	1	1	Yes
3	Pin On Disc Type Friction And Wear Apparatus.	Test Rig	1	1	Yes
4	Friction In Journal Bearing Apparatus.	Test Rig	1	1	Yes

Class: - B.E (Mechanical, Term work – 50)
Subject**: Industrial Lecture**

Class: - B.E (Mechanical, Term work – 75)
Subject: **Project-II**

DEPARTMENT OF BUSINESS ADMINISTRATION

Name of Course: MBA Class: First Year (SEM-I) Subject: IT for Managers

Sr. No.	Experiment Title	Name of Equipment, Machinery, Instrument Etc required to conduct experiment	Quantity		Whether Experiment can be performed
			Required	Available	
1	MS Word – Creation Of Document, Formatting, Editing	Computer	30 per Batch	30 per Batch	YES
2	Organizing Information With Tables And Outlines	Computer	30 per Batch	30 per Batch	YES
3	Mail Merge Application	LCD Projector	30 per Batch	30 per Batch	YES
4	MS-Access – Creating Database, Defining Primary Keys, Designing Query	LCD Projector	30 per Batch	30 per Batch	YES
5	MS-Access – Designing Reports, Labels And Forms	LCD Projector	30 per Batch	30 per Batch	YES
6	Creating And Editing Worksheet	Computer	30 per Batch	30 per Batch	YES
7	Creating And Using Formulae And Functions	Computer	30 per Batch	30 per Batch	YES
8	Sorting And Querying Data, Working With Graphs And Charts	Computer	30 per Batch	30 per Batch	YES
9	MS Power Point Slides, Use Of Templates And Slide Designs	Computer	30 per Batch	30 per Batch	YES
10	Developing A Professional Presentation On Business Plan	LCD Projector	30 per Batch	30 per Batch	YES

Dr.Saroj Patil
(Subject Teacher)

A) Facilities for conducting Practicals in the Laboratories

Name of Course : **FE Common** Class: - **F.E. Subject: - Workshop Practice -I**

Name of the Department / Section: - **Workshop**

Subject wise & laboratory wise Lists of material, machinery, equipment & Instrument required performing prescribed Practicals

Sr.	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt.can be conducted
			Required	Available	
1	Demonstration, handling measuring instruments like steel rule, measuring tape, try-square, vernier caliper, vernier height gauges, bevel protector etc. Fitting- one job finishing two sides and make right angles of square job by filling operation, one drilling and tapping operations.	1) Files (Flat, triangular, safe-edge) 2) Hack saw frame 3) Tap set 4) Combination set 5) Drilling machine 6) 'V' Block 7) Bench vice 8) Vernier caliper 9) Try square 10) Number/Letter punch 11) Hammer 12) Vernier height gauge 13) Tap wrench 14) Surface plate 15) bevel protector 16) Steel rule 17) Measuring Tape	20 20 04 01 01 01 24 11 20 02 10 02 02 01 01 01 01 01	170 38 07 01 01 01 43 19 41 02 08 02 03 02 01 02 02 02	Yes
2	Foundry Shop: a) Demonstration of preparation of molding, casting of any simple pattern	1) Moulding Boxes 300X300X100 m.m 2) Moulding Boxes 450X 450X100 m.m 3) Moulding Tool set 4) Moulding closing pin round 19 X 35 5) Moulding box bush round 6) Blow**er (**Air fan) 01 h.p.3 p.h. 2880 rpm and pi**t** furnace	10 10 2 20 40 1	10 10 2 20 40 1	Yes
3	Welding shop a) One job on T – joint: one side of T-joint welded by Gas welding and another by Electric Arc welding. b) Demonstration of brazing.	1) Hack saw frame 2) Flat file 3) Hammer 4) Measuring tape 5) Try square 6) Bench vice 7) Welding transformer 8) Hand screen 9) Hand gloves 10) Gas welding equipment 11) MIG Welding machine	20 20 05 03 20 16 03 18 12 01 set 01	24 20 05 02 20 16 03 16 12 01 set 01	Yes

4	Tin Smithy Shop One Job including Riveting, Soldering for example, letter box, waste paper basket, funnel, tray etc.	1) Smithy try square 2) Shearing Strips 3) Small shearing M/C 4) Bending M/C 5) Edge folding M/C 6) Hammer 7) Soldering Iron	04 20 2 1 1 8 1	04 23 2 1 1 8 3	Yes
5	Black Smithy Shop One job on black smithy including bending and flattening. etc for example S shape Hook Shape, U shape job.	1) Round Nose Tongs 2) Sledge hammer 3) Ball peen hammer 4) Anvil 100 kg 5) Furnace	15 09 09 04 04	26 10 10 04 04	Yes
6	Computer Hardware workshop: **a)** Introduction to personal computers, PC main parts: CPU, Input and Output devices **b)** Introduction to Floppy & CD Drives, HDD, CD, DVD, USB Flash Drives and Memory Cards **c)** Introduction of of motherboard, I/O connectors, Installations of cards, devices and connecting cables, Identification of cables of computers(Connecting Media)	**1)** Personal Computer **2)** Procellor **3)** Input (Keyboard) **4)** Monitor **5)** Floppy **6)** CD Drives **7)** Hard disk **8)** Memory Card **9)** Motherboard **10)** RS232 Cables **11)** N/W Card	01 01 01 01 02 02 02 02 01 01 01	01 01 01 01 02 02 02 02 01 01 01	Yes

Item No.26

A) Facilities for conducting Practicals in the Laboratories

Name of Course : **FE Common** Class: - **F.E. Subject: - Workshop Practice -II**

Name of the Department / Section: - **Workshop**

Subject wise & laboratory wise Lists of material, machinery, equipment & Instrument required performing prescribed Practicals

Sr.	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt. can be conducted
			Required	Available	
1	Plumbing Shop a) Introduction to the tools and equipments like pipe vice, pipe bending machine, pipe dies, cutting dies, pipe wrench etc. used for plumbing operations on G. I pipe. b) One Job having both sides threading and bending operation.	1) Pipe Vice 2) Die Set 3) Hand Hacksaw frame 4) Bending Machine	16 20 20 1	16 20 20 1	Yes
2	Carpentry Shop Introduction to carpentry operations, equipments and tools. One job involves Lap Joint, Bridle Joint.	1) Carpentry vice 2) Try Square 3) Marking Gauge 4) Mortise Gauge 5) Metal Jack Plane 6) Tenon Saw 7) Firmer Chisel 8) Mortise Chisel 9) Chisel ½” 10) Chisel 2” 11) Wooden Mallet 12) Marfa File 13) Wood Planer	20 20 20 20 20 20 20 20 20 20 20 20 01	28 53 21 24 36 48 63 63 25 24 30 30 01	Yes
3	Machine Shop One job on lathe machine involving operations like facing, plain turning, step turning, taper turning, chamfering and drilling	1) Lathe machine 2) Vernier caliper 3) HSS cutting tool 4) Hammer 5) Spanner (set) 6) drills	16 20 20 03 01 set 03	16 30 40 03 02 set 05	Yes
4	Electronics Workshop Types of PCB, PCB Making, soldering, testing of electronic component like diode, transistor, RLC etc and desoldering of a simple electronic circuit, probe making, one job on above, use of multimeter (each function)	1. Etching Machine 2.Drilling Machine 3.U V Explorer Machine 4.Shearing Machine 5.Soldering Gun 6.LCR Q meter 7.AVP microcontroller Kit 8.Post Beaking Machine 9.CRO 10.DMM 11.FG 12.Power Supply	01 04 01 01 04 01 01 02 03 03 03 05	01 04 01 01 04 01 01 02 03 03 03 05	Yes

5	Electrical Workshop Introduction and Difference between 1 Phase AC, DC Transformers, Repair and maintenance of domestic appliances like electric fan, tube light etc. MCB, ELCB Different types of wiring. One job on preparation of Extension boards, tube light wiring etc, demonstration of earthing and neutral	01 Types of switches 02 DMM 03 Megger 04 Switch boards 05 Types of wires 06 Transformers 07 Earthing Charts	05 02 01 03 05 03 02	05 02 01 03 05 03 02	Yes

Item No.26

A) Facilities for conducting Practicals in the Laboratories

Name of Course : **Mechanical** Class: - **S.E. Subject: - Workshop Practice -III**

Name of the Department / Section:- **Workshop**

Subject wise & laboratory wise Lists of material, machinery, equipment & Instrument required performing prescribed Practicals

Sr.No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt. can be conducted
			Required	Available	
1	Machine Shop I (Turning Shop) - One Job (by each student) consisting of turning, thread cutting (Internal, External), Facing, Plain Turning, Taper turning , Step turning, Chamfering, Grooving, Drilling, Boring, Reaming, Knurling etc. Operations.	1) Lathe Machine 2) Vernier caliper 3) H.S.S. cutting tool 4) Screw pitch gauge 5) Knurling tool 6) Drill (20 m.m.) 7) boring tool 8) V threading tool 9) Shaper machine 10) Drilling machine 11) Grinder	16 20 20 05 05 02 10 05 01 01 02	16 30 40 05 05 02 10 05 01 04 02	Yes
2	Carpentry shop: Preparation & Manufacturing of solid wooden pattern for foundry shop involving wood turning lathe machine.	1) Measuring Tape 2) Try Square 3) Marking Gauge 4) Metal Jack plane 5) Tenon saw 6) Mortise chisel 1” 7) Firmer chisel 25 mm 8) Chisel 1" & 2 1/2” 9) Chisel 2” 10) Wooden mallet 11) File 12) Carpentry Bench Vice 13) Screw driver 14) Hand drill M/C 15) Wood Turning Set 16) Wood Turning Lathe M/C. 17) Caliper (inside) 18) Caliper (outside) 19) Contraction slide rule	5 20 20 20 20 20 20 12 12 20 20 20 2 5 8 8 10 10 14	5 20 20 20 20 20 20 12 12 20 20 20 2 5 4 set 4 10 10 4	Yes

3	Foundry shop- Mold making Practice: Preparation of mould of above pattern, casting from this mould. Actual weight calculation, Yield & costing of item should be performed.	1)Moulding Boxes 300x300x100 mm 2) Moulding Boxes 450x450x100 mm 3) Moulding tool set 4) Moulding closing pin Round 5) Moulding Box bush round 6) Blower (Air fan) 01 h.p. 3 ph 2880 rpm & pit furnace	10 10 02 20 40 1	10 10 02 20 40 1	Yes
4.	Welding shop- One job on welding (fabrication) preparing a component comprising welding joints such as shoe rack, book rack, stands for flower pots, house hold applications, stools etc. (Group of 4 to 5 students)	1) Hack saw frame 2) Flat file 3) Hammer 4) Measuring tape 5) Try square 6) Bench vice 7) Welding transformer 8) Hand screen 9) Hand gloves 10) Chipping hammer 11) MIG Welding	20 20 05 03 20 16 03 18 12 06 01	24 20 05 02 20 16 03 16 12 06 01	Yes

Item No.26

A) Facilities for conducting Practicals in the Laboratories

Name of Course : **Mech.** Class: - **S.E.** Subject: - **Workshop Practice -IV**

Name of the Department / Section:- **Workshop**

Subject wise & laboratory wise Lists of material, machinery, equipment & Instrument required performing prescribed Practicals

Sr. No	Experiment Title	Name of Equipment, Machinery Instrument etc. Required to Conduct Experiment	Quantity		Whether expt. can be conducted
			Required	Available	
1	Machine Shop II (Turning Shop) - One composite job by each student involving different machining operations on lathe, Milling, Drilling, Shaper, Grinding machines.	1) All geared lathe M/C 2) Milling M/C 3) Machine Vice 4) Power hack saw M/C 5) Verniner caliper 6) Drilling M/C 7) Dial test indicator 8) Cutters 9) HSS tool 10) Spanner set 11) Shaper machine 12) Grinder	16 02 04 01 20 02 03 02 20 01 01 01	16 02 04 01 30 04 03 16 40 01 01 02	Yes
2	CNC Lab: CNC Lathe: One job for programming and manufacturing on CNC Lathe machine for each student consisting operations like Turning, Thread Cutting (Internal or External), Facing, Plain Turning, Taper Turning, Step Turning, Chamfering, Grooving, Drilling etc. operations.	1) CNC lathe machine 2) Vernier caliper 3) Spanner set	01 05 01	01 10 01	Yes
3	VMC (CNC Milling) One job of programming and manufacturing on VMC ,CNC milling machine for each student performing drilling, tapping, milling etc.	1) CNC milling machine 2) Vernier caliper 3) Spanner set 4) End Mill cutter	01 05 01 01	01 10 01 04	Yes

COLLEGE OF ENGINEERING AND TECHNOLOGY,
BAMBHORI POST BOX NO. 94, JALGAON – 425001. (M.S.)

(With NBA Accredited Programmes)

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Mandatory Disclosure

Part-II

August 2016

Shram Sadhana Bombay Trust's
COLLEGE OF ENGINEERING AND TECHNOLOGY
BAMBHORI, POST BOX NO. 94, JALGAON – 425001. (M.S.)
Included under section 2 (f) & 12 (B) of the UGC Act, 1956
ISO 9001: 2008 certified

BAMBHORI,JALGAON
ISO 9001:2008

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Principal: Dr. K.S.Wani
M. Tech, DBM, Ph.D.

Phone No. (0257) 2258393
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Ref. No. COET/ AICTE/MD/ / 16 **Date: 20/08/2016**

C E R T I F I C A T E

Certified that all enclosures contained in PART-I, PART-II & PART-III bearing page no. **01** to page no. **2035** are pertaining to our institution which are being submitted in two separate above mentioned bound booklets/box file of Mandatory Disclosure. All xerox copies may be treated as original.

PRINCIPAL

Computing Facilities Existing for the existing Programmes

Sr. No.	Particulars	Availability
01.	No of Computer Terminals	1049
02.	Hardware Specification	P-IV and Higher Specifications = 1049
03.	No of Terminals on LAN/WAN	1049
04.	Relevant Legal Software	54 System software packages 69 Application software packages
05.	Peripherals / Printers	Printers= 85 Scanners = 9
06.	Internet Accessibility (in kbps & hrs)	Leased Line = 60 MBPS

College is having Wireless and OFC Connectivity through out the Campus

Central Computing Facility

1	Number of Systems available	37
2	Configuration of the Systems	HCL EZEEBEE, Intel Core 2 Duo Processor @2.93 GHz, 3GB DDR3 RAM, 320 GB SATA HDD, DVD Writer, 18.5“ TFT Monitor, G-41 Motherboard, Keyboard, Mouse
3	Total Number of Systems Connected in LAN	37
4	Total Number of Systems Connected in LAN	37
5	Internet band width	Leased Line = 60 MBPS

Department of Computer Engineering

Details of Licensed Softwares Year (2015-16)

Software	Total Investment
Microsoft Campus Agreement	3,68,386
MS WIN SL8.1	1,71,658
Net Protector	33,300
Quick Heal	32,000
Oracle	1,25,000
Linux	31,500
Windows Starter kit	2,55,300
Win NT 4.0	38,000
Novell Netware 5.12	1,30,500
Novel Small Business Suite 6	78,473
Novel Linux Desktop 9	13,000
MSDN Academic Alliance Software Product	39,900
Single User Operating Systems	
Tick RTOS with Compiler, debugger etc.	90,875
SUSE Linux Enterprises Server 9	12,480
Compilers	
VB 6.0 Pro.	20,000
Rational Rose	3,00,000
Borland TC++ Suite	2,850
Visual Studio .Net (Media kit)	61,500
i) ASP	
ii) VC++	
iii) VB++ 1.0	
iv) VJ++ 1.0	
v) C#	
Total	**17,64,822/-**

SSBT's College of Engineering and Technology, Bambhori

Details of Licensed Softwares Year (2015-16) in College

Software	Total Investment
Computer Department	
Microsoft Campus Agreement	3,68,386
MS WIN SL8.1	1,71,658
Net Protector	33,300
Quick Heal	32,000
Oracle	1,25,000
Linux	31,500
Windows Starter kit	2,55,300
Win NT 4.0	38,000
Novell Netware 5.12	1,30,500
Novel Small Business Suite 6	78,473
Novel Linux Desktop 9	13,000
MSDN Academic Alliance Software Product	39,900
• Single User Operating Systems	
Tick RTOS with Compiler, debugger etc.	90,875
SUSE Linux Enterprises Server 9	12,480
• Compilers	
VB 6.0 Pro.	20,000
Rational Rose	3,00,000
Borland TC++ Suite	2,850
Visual Studio .Net (Media kit)	61,500
i) ASP	
ii) VC++	
iii) VB++ 1.0	
iv) VJ++ 1.0	
v) C#	
Applied Science	
(Ore'll) English Language Software (Standard Edition)	1,86,000
E&TC Department	
MATLAB 7.5	4,68,027
MATLAB 6.5	6,16,064
ULTIBOARD	41,800
VLSI DESIGN SOFTWARE XILINX MAKE ISE SERIES-US-ISE-FND	40,000
Orcad 15.5	2,26,250
Electrical Department	
ETAP	1, 00,000
r Software	2,23,934
MATLAB/Simulink Ten User Software	5,20,313
Chemical Engineering	
Software Packge: - Sim 2k {Advance Distillation.}	59,600
Aspen Hysys Software	3,01,080
Civil Department	
SAP 2000 ultimate V-15(INDIAN CODE) 10 user EDUCATIONAL LICENCE	1,46,700
Mechanical Department	
I-Deas 11 Nx Series	2,80,000
AutoCAD 205	3,20,000
Autodesk Inventor Professional Suite 2010	1,82,000
MAT Lab Software	3,16,201
Ansys Software 10 Version	1,83,750
SOUL(Develop by INFLIBNET Ahmadabad)	20,000
Total	**6036441**

Sports Facilities Available

a) List of outdoor facilities

Sr. No	Games	Area	Facility
01	Football	102m*68m	Playground (01)
02	Cricket	50 Yards(45m radius)	Playground (01)
03	Volleyball	9m*18m	Playground (02)
04	Basketball	28m*15m	Basketball Court(01)
05	Kho-Kho	29m*16m, 25m*14m	Playground (01)
06	Kabaddi	13m*10m, 12m*10m	Playground (02)
07	Handball	40m*20m	Playground(01)
08	Athletics	300m Track	Playground(01)
09	Archery	50m Range	Playground(01)
10	Hockey	45m*90m	Playground(01)

b) List of indoor facilities

01	Badminton Court	13.40m *6.10m	Separate for Boys & Girls
02	Gymnasium	NA	Common for Boys & Girls
03	Table Tennis	NA	Separate for Boys & Girls
04	Chess	NA	Separate for Boys & Girls
05	Carom	NA	Separate for Boys & Girls
06	Billiards	NA	For staff
07	Fencing	NA	Yoga Hall

c) Total Ground Area

Details	Available Area
Play Ground	14,100 Sq.mtr.
Basket ball Court	1,000 Sq.mtr.
Gym building	1,230 Sq.mtr.
Bad Minton court	500 Sq.mtr.
Total	**16,830 Sq.mtr.**

Performance of Students:

Achievements at Intercollegiate Level

Year	No of Teams Played	No of Students Played	Events
2011-12	21	178	Football , Badminton, Table Tennis ,Chess, Basket Ball, Volley Ball, Cricket, Kabbadi, Fencing, Hockey, Handball, Boxing, Archery, Swimming, Athletics, Kho –Kho, Lawn-Tennis, Judo, Rifle, Pistol Shooting, Taekwondo.
2012-13	17	195	
2013-14	25	216	
2014-15	29	228	
2015-16	32	240	

Achievements at Inter Group Level

Year	No. of Students Selected	Participation in Events
2011-12	50	Football , Badminton, Table Tennis ,Chess, Basket Ball, Volley Ball Cricket, Kabbadi, Weight Lifting, Fencing
2012-13	68	Football , Badminton, Table Tennis ,Chess, Basket Ball, Volley Ball Cricket, Kabbadi, Weight Lifting, Fencing
2013-14	67	Football , Badminton, Table Tennis ,Chess, Basket Ball, Volley Ball, Cricket, Kabbadi, Fencing, Hockey, Handball, Boxing, Archery, Swimming, Athletics, Kho –Kho.
2014-15	69	Football , Badminton, Table Tennis ,Chess, Basket Ball, Volley Ball, Cricket, Kabbadi, Fencing, Hockey, Handball, Boxing, Archery, Swimming, Athletics, Kho –Kho.
2015-16	86	Football , Badminton, Table Tennis ,Chess, Basket Ball, Volley Ball, Cricket, Kabbadi, Fencing, Hockey, Handball, Boxing, Archery, Swimming, Athletics, Kho –Kho, Lawn-Tennis, Judo, Rifle, Pistol Shooting, Taekwondo.

Achievements at Inter University Level

Year	No. of students played at zonal level	No of Students Selected in university	Event
2011-12	50	12	Basket Ball, kho-kho, Fencing, Table Tennis, Badminton, Hockey,
2012-13	68	12	Chess, Basket Ball, Archery, Kho Kho, Fencing, Rifle Shooting
2013-14	67	21	Football , Table Tennis , Basket Ball, Volley Ball, Cricket, Fencing, Archery, Swimming, Kho-Kho.
2014-15	69	21+ 07 (Ashwamedh)	Football , Table Tennis , Basket Ball, Volley Ball, Fencing, Archery, Swimming, Kho-Kho, Chess
2015-16	85	16+02 (Ashwamedh)	Chess, Table Tennis, Football , Swimming, Lawn-Tennis, Kabbadi, Badminton, Handball, Basket Ball, Archery, Volley Ball, Boxing, Judo, Athletics, Kho –Kho, Cricket, Fencing, Rifle, Pistol Shooting, Taekwondo, Hockey.

Host for Intercollegiate Tournament

Year	Event	Number of Teams Participated	
		Boys	Girls
2011-12	Table tennis	04	02
	Hockey	05	--
2012 -13	Foot Ball	07	--
	Basket Ball	07	03
2013-14	Table Tennis	05	03
	Hockey	03	-
2014-15	Hockey	03	-
	Football	04	-
2015-16	Hockey	03	-

Annual Sports

Year	No. of Students participated	Participation in Events
2011-12	**Boys – 486** **Girls - 198**	Football , Badminton, Table Tennis ,Chess, Basket Ball, Volley Ball Cricket, Kabbadi, Weight Lifting, Fencing' cross country
2012-13	**Boys – 608** **Girls - 226**	Football , Badminton, Table Tennis ,Chess, Basket Ball, Volley Ball Cricket, Kabbadi, Weight Lifting, Fencing , cross country
2013-14	**Boys- 618** **Girls-230**	Football , Badminton, Table Tennis ,Chess, Basket Ball, Volley Ball Cricket, Kabbadi, Weight Lifting, Fencing , cross country
2014-15	**Boys-621** **Girls-228**	Football , Badminton, Table Tennis ,Chess, Basket Ball, Volley Ball Cricket, Kabbadi, Weight Lifting, Fencing , cross country
2015-16	**Boys-569** **Girls-221**	Badminton, Table Tennis ,Chess, Basket Ball, Volley Ball Cricket, Kabbadi, Hand Ball, Archery, Snookar, 100mtr. Running.

Achievements in sports (Year 2015-16)

1) Organize Intergroup event of Hockey for first time in our College.
2) In 2015-16, sports activities such as Judo and Taekwondo were introduced for the first time.
3) Miss. Jadhav Mayuri Devendrasing B.E. (Bio-tech) has participated in North Maharashtra University Lawn Tennis selection trial Competition organized by B.P. Arts, Commerce and Science College at Chalisgaon.
4) S.S.B.T's Kabbadi women team first time participated in North Maharashtra University Erandol zone in inter-collegiate level sports event 2015-16 organized by D.D.S.P Arts, Commerce & Science College, Erandol.
5) S.S.B.T's Lawn Tennis men team first time participated in North Maharashtra University Erandol zone in inter-collegiate level sports event 2015-16 organized by B.P. Arts, Commerce & Science College, Chalisgaon.

Participation of Students in University Sports activities (2015-16)

Sr. No.	Events	Inter collegiate		Intergroup		Inter University	
		Boys	Girls	Boys	Girls	Boys	Girls
1.	Chess	05	-	02	-	--	--
2.	Table Tennis	05	05	03	02	01	01
3.	Swimming	06	01	04	01	02	01
4.	Lawn Tennis	02	01	01	01	--	--
5.	Kabaddi	12	12	--	01	--	--
6.	Badminton	07	05	03	03	--	--
7.	Hand Ball	12	12	01	05	--	--
8.	Basket Ball	12	12	03	04	--	--
9.	Archery	09	06	09	06	02	01
10.	Volley Ball	12	12	01	04	--	01
11.	Boxing	02	--	02	--	--	--
12.	Judo	01	--	01	--	--	--
13.	Athletics	05	--	--	--	--	--
14.	Kho-Kho	12	12	--	04	--	01
15.	Cricket	16	--	02	--	--	--
16.	Fencing	04	01	04	01	02	01
17.	Rifle, Pistol Shooting	03	03	03	03	02	01
18.	Taekwondo	01	--	--	--	--	--
19.	Hockey	16	--	06	--	01	-
20.	Foot Ball	16	--	06	--	-	-
Total		**158**	**82**	**51**	**35**	**10**	**07**
		240		**86**		**15+2 (Ashwamedh)**	
Grand Total		**344**					

Extra Curriculum Activities

1) Cultural activity committee :

Name	Designation	Department	Post
Mr. M.V. Rawlani	Asso. Prof.	Mechanical Engg.	Chairman
Ms.A.K.Bhavsar	Asso. Prof.	Information Technology	Member
Mr. J.N. Kale	Asst. Prof.	Civil Engg.	Member
Dr. Richa. Modiyani	Asst. Prof.	M.B.A	Member
Mr. Dhanesh Patil	Asst. Prof.	Electrical Engg.	Member
Mr. N.Y.GHARE	Asst. Prof.	Chemical Engg.	Member
Mr. S.S.Bahekar	Asst. Prof.	Computer Engg.	Member
Ms Jagruti Surange	Asst. Prof.	Mechanical Engg.	Member
Mr. G.D. Khodape	Asst. Prof.	Biotechnology	Member
Mr. A.R.BARI	Asst. Prof.	Electronics & Telecomm.	Member
Mr. M.B. Patil	Asst. Prof.	Applied Science	Member

2) A/C Seminar Hall 01 Nos. Seating capacity 166 and Open Air Theater -
A theater having seating arrangement of 2000 people & well equipped stage of 2400 sq.ft.

3) Audio Video facilities including mike system, LCD, OHP, Computer Camera recording system.

4) Funds available

5) List of activities carried out in each year
   a) Sketching
   b) Debate
   c) Quiz
   d) Group Discussion
   e) Elocution
   f) Traditional Day
   g) Celebration Independence Day
   h) Celebration Republic Day
   i) Ganesh Utsav
   j) Arranging Workshop like Personality development
   k) Fashion Show
   l) Dance Competition
   m) Singing Competition
   n) Rangoli Competition
   o) Annual Gathering
   p) Personality Contest
   q) Ad Mad Show
   r) Dum Charad Competition

Soft Skill Development Facilities

The soft skill development facilities are provided at the college level through training and placement cell which is headed by Training and Placement Officer. Two faculty members of each department are the member of the cell. They are provided with computer tools such as scanner, Internet etc.

We are planning to do MOU with GATI, Jalgaon for skills & personality development and aptitude test for success in professional & personal life.

The college is the member of the federation of the engineering colleges under North Maharashtra University, Jalgaon and the soft skills facilities are also provided at the federation level. The Training and Placement Cell caters to soft skill development in the following areas:

a) Work ethic
b) Courtesy
c) Teamwork
d) Self-discipline and self confidence
e) Conformity to prevailing norms pertaining to dress, body language, tone of voice and vocabulary according to the particular culture of the given work place
f) Language Proficiency and environmental awareness

APPENDIX - 1

LAND

Enclose with appendix 01, 7/12 extracts or other documents showing ownership of land on which the buildings are constructed.

Particulars of ownership of land of Engineering college only do not club with polytechnic or otherst

Sr.No	Date of Purchase or Acquisition	Gut No.or Survey No	Area in Hacters	Present ownership title
01	**The Collector, Jalgaon vide letter No.3-RR4431, dated 17/10/1984**	**280**	**9.56**	**Shram Sadhana Sadhana Bombay Trust**
02	**The Collector, Jalgaon vide letter No.3-RR4431, dated 17/10/1984**	**290**	**0.44**	**Shram Sadhana Sadhana Bombay Trust**
	Total Area		**10.00**	

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

Department: - 1) **Civil Engineering**

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum m x m	Carpet Area in Sq m.	Remarks
1	Departmental Office	102	4.5 x 6	27	Administrative
2	HOD Cabin	102A	4.5 x 6	27	Administrative
3	Staff Cabin	G16A,13B 104A, 108B 105(A) 105(B) G20 (B) 102 A	2x3x4 2x3x4 4.5 x 4.5 6 x 3 3 x 3 7.5x3	24 24 20 18 09 22	Administrative 180
4	Class Room Class Room Class Room Class Room Class Room Temp. Tutorial P G Tutorial P G Tutorial UG	203 205 212 305 C01 G13A 104B G10A	12 x 9 15 x9 12x9 12x9 11 x 7.3 4.5 x 7.5 6 x 5.5 6x5.65	108 135 108 108 80 34 PG 33 PG 34	Instructional 506 UD furniture
5					Instructional
	Seminar Hall	G14	18x9	162	
6	Laboratories				**UG PG1388**
	1) Engg. Geology Lab	108	10.5 x 9	95	Instructional
	2) TOM I Lab Concrete	G9 + G10	12 x 9-6x5.5	74	UG
	3) TOM II lab	G10	9X9	81	
	4) Engineering Mechanic I	109	9 x 9	81	PG
	5) Engg. Mechanics II	110	9 x 9	81	12 labs 1068
	6) Geotechnical Lab	G13	18 x 9+9 x 3-3x3-4.5x7.5	147	
	7) Survey Lab	108 (A)	7.5x9	68	
	8) Fluid Mechanics I	G19	12 x 9-3x4	96	
	9) Fluid Mechanics II	G20	9x9+3x3	90	
	10) Comp lab UG & PG	101	12 x 9	108	
	11) Environmental Lab/ Research Lab	103+104	12 x 9-3x3-6x5.5	66	PG Shared UG
	12) Transportation Lab	105	9 x9	81	
	13) Dept. Library	102C	3x7.5	23	UG
7	Store	G 20 (A)	3 x 3	09	Administrative
8	Toilet	G11+G12 106+107 206+207	3 x 6 3 x 6 3 x 6	18 18 18	Amenities 54
9	Passage, Passage GF, FF, SF Stair	G8 205 212	1.5 x 5.5 6 x 1.5 6 x 1.5 3x51x3 3x 3x4.5	8.25 09 09 459 40.5	Circulation & Other 525
	Total			2803	

Total Instructional area =1893

Total Administrative area = 180

Total Amenities area= 54

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

Department: - 2) **Computer Engineering**

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maxim m x m	Carpet Area in Sq m.	Remarks
1	Departmental Office	G22A	6 x 3	18	Administrative
2	HOD Cabin (Computer)	G22 (B)	(6 x6)+ 1.5x3	40	Administrative
3	Staff Cabin	B2 G22C G22D G22F G25A G28 G30A 115A2 115B2 115C2 115D1 115D2 129 314 G31 B1A B3A	6X3 3.2X3.2 3.2X3.2 3.2X3.2 3X4.5 3.0X4.5 3X7.5 3.2X3.2 3.2X3.2 3.2X3.2 3.2X3.2 3.2X3.2 6X3 6X3 6X3 3X3 3X3	18 10 10 10 13 13 22 10 10 10 10 10 18 18 18 09 09	Administrative 303
4	Class Room Class Room Class Room Class Room Class Room Class Room temp Tutorial Room **U G** Tutorial Room **U G** Tutorial Room **P G**	303 309 316 320 115 C02 310 315 115A1	12 x 9 12 x 9 12 x 9 12 x 9 12 x 9 11 x 7.3 6X9 6X9 6 x 5.5	108 108 108 108 108 80 54 54 33	Instructional 510 UD, Furniture UG UG
5	Seminar Hall	317	18 x 9	162	Instructional
6	Laboratories				Instructional
	1) Lab 1/ Data Structure Lab	B2A	15 x 6	90	UG
	2) Lab 2/Embedded System Lab	B1	9 x 7.5	68	UG
	3) Lab 3/M.E.(CSE) Computer Lab	115A	12x9-3x3-6X5.5	66	PG-Renovation
	4) Lab 4/ Digital & Microprocessor Lab	B3	9 x 9	81	UG
	5) Lab 5/Software Engg. Lab	G25	9 x 7.5	68	UG
	6) Lab 6/Programming Lab-I	G25B	9 x 9-3 x 4.5	67	UG
	7)Lab 7/Database Lab	G28	9 x 7.5	67	UG
	8)Lab 8/System Programming Lab	G28A	7.5 x 9	67	UG
	9)Lab 9/Project Lab	G29	9 x 9	81	UG
	10) Lab 10/ Linux Lab	115D	18x9-6x3	144	UG
	11) Lab 11/Programming Lab-II	115C	9 x9-3X3.	71	UG
	12) Lab12 /ME(CSE) Research Lab	115B	9 x9-3X3.	71	PG
	13) Departmental Library	G30	6 x 3	18	

7	Toilet	G26,G27 318,19	3 x 6 3x6	18 18	Amenities
	Passage, Store Server Room UPS Room UPS Room1 Passage GF Passage Basement Stair GF , Basement	B2(C) B1 G28 G25 B2 (D) G22 (A) B4A B5 GF SF	3 x 3 12 x 3 3 x 3 9 x 1.5 9 x 1.5 3 x 3 3 x 3 3 x 3 9x3 50x3 21x3 12x3 2x3x4.5	09 36 09 13.5 13.5 09 09 09 27 150 66 36 27	Circulation & Other 387 Administratio n Administratio n Administratio n
	Total				

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

Department: - 3) **Biotech**

Building wise / Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum m x m	Carpet Area in Sq m.	Remarks
1	Departmental Office	236A	6 x 3	18	Administrative
2	HOD Cabin	234	6 x 3+6x2	30	Administrative
3	Staff Cabin	238A 239 A 227A	3x4 3x4 2.7x3	12 12 8	80
4	Class Room Tutorial room Tutorial room	223 224 225 226 111A	6x9 6x9 6x7.5 4x9 5.5x6	54 54 45 36 33	Instructional 222
5	Seminar Hall with chemical	308	18 x 9	162	Instructional
6	Laboratories				Instructional
	1) Microbiology Lab	238	9 x 9-3x4	69	UG 913
	2) Biochemistry Lab	239	9 x 9-3x4	69	
	3) Bio process Engg	242	4.8 x 9+ 3x7.5	66	
	4) Fermentation	241	9 x 7.3	66	
	5) Bioinformatics Lab	244	4.8 x 9+ 3x7.5	66	
	6) Plant tissue culture	245	9 x 7.3	66	UD
	7) Project lab	235	9x9-2x6	69	UD
	8) Immunology MBGE	236	9X9-6X2	69	UD
	9) Research lab	227	6.2x9+3.5x3	66	UD
	10) Fluid Mech. Lab	111	12x5.5	66	
	11)Heat Transfer Lab	M001A	7.5 x8.8	66	Mechanical
7	Toilet	240	3 x 3	09	Amenities
	Passage SF Stair		66x3 1x3x4.5	198 13.5	Circulation 212
	Total			**1442**	

Total Instructional area = 1135

Total Administrative area = 80

Total Amenities area= 09

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

Department: -4) **Mechanical Engineering**

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum m x m	Carpet Area in Sq m.	Remarks
1	**Departmental Office**	M108	7.5 x 7.6	57	Administrative
2	HOD Cabin	M107	7.5 x 3.6	27	Administrative
3	Staff Cabin	M 2,3,5,6 M109 M110,111 M201 M202 M207 M208 M209 M214	4x3.7x3.7 3.4x3.7 2x3x3.7 3.75x3.5 3X3.5 4.5x3.75 5.75x3.5 3.5x1 4.5x3.75 2.5x3.75	56 13 22 13 10.5 17 20 3.5 17 9	Administrative 295
4	MESA Office	M310	7.5x4	30	Administrative
5	Class Room **SE (A)** **TE (A)** **TE (B)** **BE (A)** **BE (B)** **SE (B)** Tutorial Room U G* Tutorial Room U G* Tutorial Room **P G*** Tutorial Room **P G***	M301 M302 M303 M304 M306 M309 M306 A M309 A M102 A M 103 A	7.5x11 7.5x11.3 7.5x11.3 7.5x11.3 9.5x7.5 9.5 x 7.5 9.5 x 3.8 9.5 x 3.8 7.5 x4.5 7.5 x 4.5	82 85 85 85 71 71 36 36 34 P G 34 P G	Instructional 619 NR NR PG PG
6	Drawing Hall	M305	9.7x7.5	73	Instructional
7	Seminar Hall	M104	7.5x18.75	141	214
8	Laboratories				Instructional
	1)Heat Transfer Lab	M001	7.5x10.00	75	UG PG 1298
	2) Heat Power Lab	M004	7.5 x18.75	141	UG
	3) RAC lab 4) Turbo Machine lab	M007 M007A	**7.5x11.25** **7.5x7.5 +** **2.25x7.5**	85 73= **158**	PG Renovation
	5) Computer Lab	M102	7.5x14.5	109	
	6) CAD CAM Lab/ Research Lab	M103	7.5x14.25	107	PG shared by UG
	7) Tribology Lab	M204	9.5x11.3	107	PG
	8) Materials Science Lab	M203	9.5x11.2 7.5x1	114	
	9) Mechanical Measurement & Metrology Lab	M205	9.5x11.3	107	
	10) Mechatronics Lab	M213	9.5x11.3	107	
	11) Theory of Machine	M210	9.5xx11.3	107	
	12) Model & project Lab	M206	9.5x11.3 7.5x1	114	
	13) Automobile lab	M005	10.5x18.75	196	
	12) Dept library	M101	7.5x7.25	54	

9	Toilet	M105,106, 211,212 307,308	6x3.8x3.8	87	Amenities 87
10	Passage, Passage FF,SF& TF Passage FF & TF Passage SF Stair	GF	2.75x20 3x12.75 x3.75 3x42x2.75 3x4x10.5	55 143 346 126	Circulation & Other 670

Total Instructional area = 2079
Total Administrative area = 349
Total Amenities area=87

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

Department: - 5) **Chemical Engineering**

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum m x m	Carpet Area in Sq m.	Remarks
1	Departmental Office	139	6 x 4.5	27	Administrative
2	HOD Cabin	139 (A)	6 x 3	18	Administrative
3	Staff Cabin	G42 (A) G42 (B) 134 138A 140 A	3 x 3 3 x 6 3 x 6 3 x 6 3x6	09 18 18 18 18	Administrative 126
4	Class Room Tutorial Room	122 123 124 125	6 x 9 6 x 9 6x7.5 4x9	54 54 45 36	Instructional 306
5	Seminar Hall with Biotech	308	18 x 9	162*	Instructional
6	Laboratories				820
	1) Mass transfer I	G42A	7.5 x 9	68	Instructional
	2) M T II	G42B	7.5 x 9	68	
	3) U. O. I	G44 A	4.8x9+3x7.5	66	
	4) U O II	G 44 B	9x7.3	66	
	5) Instrumentation lab	G 45 A	4.8x9+3x7.5	66	
	6) Process Control	G 45 B	9x7.3	66	
	7) C. R. E. Lab	138	12 x 9-3x6	90	
	8) C. T. Lab	140	12 x 9-3x6	90	
	9) Computer Lab	136	9 x 9	81	
	10) Project Lab	135	9 x 9	81	
	11) **Research Lab**	126	8x9	72	
	Compressor room		2x3	6	
8	Toilet	137 G43	3 x 3 3 x 3	09 09	Amenities 18
9	Passage GF,FF Passage GF,FF Stair GF'FF'		2x54x3 2 x 6x3 3x3x4.5	324 36 40.5	Circulation & Other 406
	Total			1676	

Total Instructional area = **1169**
Total Administrative area =**126**
Total Amenities area=**18**

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

Department: - 6) **Electrical Engineering**

Building wise / Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum m x m	Carpet Area in Sq m.	Remarks
1	HOD Cabin	E110	7.60x3.8	29	
					Administrative
	Staff Cabins	E002B E006A E007A,B E105A E111 E112	3.8x3.8 3.8x 3.8 2x3x3.8 3x3.8 3.8x2.8 3.8x3.8	14 14 22 11 11 14	
2	Class Room Class Room* Class Room* **Tutorial UG** **Tutorial PG** **Tutorial PG** **Seminar Room**	E104 E107 E108 E002A E102 E 009 A310	6x11.4 7.3x11.4 7.3x11.4 4.4x7.7 5.5 x7.5 8.0x7.6 9.10x17	68 83 83 33 40 61 155	Instructional 529
3	Laboratories				Instructional
	1) Measurement Lab1	E002	10.8x7.6 - 3.8x3.8	68	UG+PG 927
	2) Control System lab2	E003	10.8x7.6	82	UG 728
	3) Electrical Machine Lab I Lab 3	E004	15.2 x 4.5 + 3.8 x 1.8	75	PG 184
	4) Machine lab II / PSS	E005	7.6 x 10.7	81	
	5) Power System lab	E006	7.6x10.7 - 3.8x3.8	67	
	6) Switch Gear Lab SGP	E007	7.6 x9	68	
	7) **P G Lab**	E001	7.6 x9	68	
	8) High voltage lab	E008	7.6 x 8.7	68	
	9) Research lab PG	E 101	6x11.4	68	
	10) Electronic Lab	E105	7.6x9.0	68	
	11) Control System	E106	9 x 7.6	68	
	12) Computer Lab	E109	7.30 x 11.4	83	
	13) Library	E 003A	7.6X4.4+ 1.8x3.8	40	
5	Toilets	E114	3.65x3.65	13	Amenities 13
6	Circulation Paved passage	stair GF	2x12 3 x 46 3 x 23	24 138 69	231
	Total			**1786**	

Total Instructional area = 1431
Total Administrative area = 115
Total Amenities area=**13**

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

Department: - 7) **Electronics & Telecommunication Engineering**

Building wise/Department wise space allocation 31.07.13 SAR

Sr. No.	Particulars/Details	Room No.	Size Max. m x m	Carpet Area in Sq m.	Remarks
1	Departmental Office	202A	3x6	18	Administrative
2	HOD Cabin	202	6 x 6	36	Administrative
3	Staff Cabin	119A 121B 202B,C 209A B 210 211 213ABC 214 215A 216 A 217A1 217B1 201B 311	3.2x3.2 2.4x2.4 2x3 x 7.5 2x3.2x3.2 3 x 3 3 x 3 3 x 2.5x2.5 6 x 3 3.2 x 3.2 3.2x3.2 2.8x2.8 3.2x3.2 3.2x3.2 6.0x3.0	10 6 45 20 9 9 18 18 10 10 8 10 10 18 – 211	Administrative
4	Class Room Tutorial Room **P G** Tutorial Room **U G** Tutorial Room U **G** Tutorial Room **P G**	301 302 312 313 322 325 119B 220A 220 B 221 A	12 x 9 12 x 9 12 x 9 12 x 9 12X9 12x9 6 x5.8 9 x 3.8 9X 3.8 9X 3.8	108 108 108 108 108 108 35 PG 34 UG 34 UG 34 PG	Instructional UD*
5	Seminar Hall	208	18x9	162	Instructional
6	Laboratories 1) Computer lab	119	9 x 9	81	Instructional
	2) EDC Lab	121	12x9- 2.4x2.4	102	**UG**
	3) EM / EI Lab	201	9 x 9-3.2x3.2	71	**PG**
	4) NAS / FOC Lab	213	12x9-3x9	81	
	5) Communication Lab	215	9 x 9-3.2x3.2	71	
	6) RMT Lab	216	9 x 9-3.2x3.2	71	
	7)TV & CE Lab	217(B)	9 x 9-3.2x3.2	71	
	8) E D / TM Lab	217(A)	9.3 x8-2.8x2.8	67	
	9)Basic electronics &project Lab	220	9 x 7.5	68	12 lab 896
	10) EE E/P E Lab	221	12 x 9 -9X3.8	75	*
	11) Comp lab **PG**	209 A	9x9-3.2x3.2	67	PG
	12) Research lab **PG**	209 B	9 x 7.5	71	PG
	13) Library	201(A)	3 x 7.5	22	

7	Toilet	117+118 218+219	3 x 6 3 x 6	18 18	Amenities 36
	Passage Passage GF, FF, SF Passage FF, SF Passage SF Stair Stair	201	3 x 1.5 3x12x3 2x27x3 18x3 3x4.5x4.5 3x3x4.5	4.5 108 162 54 60.75 40.5	Circulation 430
	Total			2416	

Total Instructional area = **1830**
Total Administrative area =275
Total Amenities area=**36**

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI,

JALGAON.

Department: - 8) **Information Technology**

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum m x m	Carpet Area in Sq m.	Remarks
1	HOD Cabin	E210	3.65x5 3.80x1.80	25	Administrative
2	Departmental Office	E209	3.5x7.3	26	Administrative
3	Staff Cabins Staff Cabins **Proposed cabins**	E211-213 E 203 A E 204 A E 205 A E 303A*	3x3x3.65 4x3 7.6 x 3.8 9.1 x 3.5 3.5x3.8	33 12 20 32 **13**	Administrative 206
4	Class Rooms Tutorial Room	E 305 E 311 E 312 E308A	10.80x7.60 11.40x7.60 11.40x7.60 7.8x5.2	82 87 87 40	Instructional 256
5	Seminar Hall	310	18.30x7.60	139	139
6	Laboratories				Instructional
	1)Programming lab / lab3	E 201	9.50 x 7.60	72	723
	2) Digital & micro processor / lab 1	E202	9.50 x 7.60	72	
	3) Computer Network / lab 6	E203	11.4 x 7.60	86	
	4) Data base & management / lab 7*	E204	7.60 x 9	68	
	5) Lab 8	E205	9.10 x 9.30	84	
	6) Operating System / lab 5	E 206	7.30 x9.50	69	
	7) Data Structure / lab2	E 207	7.30 x 9.20	67	
	8) Multimedia / lab 4	E 208	7.30 x 9.20	67	
	9)Lab 9 undeveloped	E303	7.60 x 10.80 – 3.5x3.8	69	
	10)Lab 10 undeveloped	E304	7.60 x 8.80	67	
	11) Dept. Library	E205B	9.1x3.5	32	
7	Toilet		2x7.65x3.8	58	Amenities 58
8	Passage SF Stair	SF SF SF TF	11.5x1.80 30.5x1.8 46x2 7.5x2 2x7.5x3.75 41x1.8 3.65x9 2x9.5x3.8 2x6.2x1.9	21 55 92 15 56 74 33 +11 72 24	Circulation 453

Total Instructional area = 1118

Total Administrative area = 206

Total Amenities area= 58

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

Department: - 9) **MBA**

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum m x m	Area Sq m.	Remarks
1	HOD Cabin	A209	3.00x6.65	20	Administrative
	Department Office/ Lib.	A208	6.00x 6.65	20+20=40	Administrative
2	Staff Cabin	A203 A204A A212	3.0x4.00 3x3.0x3.0 3x4	12 27 12	Administrative 91
3	Class Room Class Room	A202 A213	9.1x7.4 9.1x7.4	67 67	Instructional 456
4	Seminar Hall*	A211	7.9x17.0	134	Instructional
5	Computer Lab	204	7.3x14.0	102	Instructional
	Tutorial room I	A206	4.5x7.4	33	
	Tutorial room II	A207	4.5x7.4	33	
6	Girl's Common Room	A306	7.4x9.1	67	Amenities
	Boy's Common / GD	A309	7.4x9.1	67	Amenities
	Toilets	A203,12A A205,10	2x1.2x1.8 2x2.9x3.3	4 19	157
7	Passage Stair	FF SF	19.5x2.4 19.5x2.4 3x3.2x6.7	47 47 64	Circulation 158
	Total			862	

Total Instructional area = 456
Total Administrative area = 91
Total Amenities area= 157

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

Department: - 10) **Library**

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum m x m	Carpet Area in Sq m.	Remarks
1	Reading Room PG / staff Reading Girls Students Reading Boys	323 A 323 B 323 D	6 x 7.5 12 x 9 18x9	45 108 162	Instructional 927
2	Entrance Lobby	323 F	6 x9	54	
	Counter Clock room	323 E	6 x3	18	Administrative
	Issue Counter	323 H	9 x 3	27	Administrative
3	Liberian, room	323 G	3x9	27	Administrative
4	Stack Room	323 I	27x 9	243	
5	Reference Section	323 J	18 x 9	162	
	E lib	323 L	9 x 9	81	
6	Book Bank	323 M	3 x 9	27	
	Magazine	323 N	6 x 7.5	45	
7	Store	323 O	12 x3	36	Administrative
8	Pantry for library Staff	323 P	3x6	18	Amenities
9	Xerox	323 Q	3x3	9	Amenities
10	Toilets	323c,k	2x3x3	18	Amenities
11	Drinking water	323	3x3	9	Amenities
12	Passage		54x3	162	Circulation
	Total			1251	

Total Instructional area = 927

Total Administrative area = 108

Total Amenities area=54

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI,JALGAON.

Department: - 11) **Applied Science**

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum m x m	Carpet Area in Sq m.	Remarks
1	HOD Cabin	G41	3 x 6	18	Administrative
	Dept office	G40A,B	3x9	27	
2	Staff Cabin	B14(A) B15 G 34A,B G35 A,B G37A,B G38 G39A,B 320A	3 x 6 3x3 3x7.5 3x7.5 3x9 3 x6 3x9 3x7.5	18 9 22 22 27 18 27 22 – 165	Administrative 210
3	Class Room	130 131 132 133 229 230 232 233 114 321	9 x 9 9 x 9 9 x 9 9 x 9 9 x 9 9 x 9 9 x 9 9 x 9 12 x 9 12 x 9	81 81 81 81 81 81 81 81 108 108	Instructional 999
4	Drawing Hall/ class Room Drawing Hall 01 Drawing Hall 02	G37 C 02 CB 04	15x9 18.1x7.1 14.6 x 11	135 128 161	
5	Laboratories				Instructional
	1) Physics Lab	B14	15 x 9+3 x 3	144	522
	2) Chemistry Lab	G 40	15 x 9	135	
	3) Environment lab	G 34	12 x 9	108	NR
	4) Language & audio visual lab	G 39	15 x 9	135	NR Furniture
6	Toilet	228 306	2x3 x 3 2x3x6	18 18	Amenities
	Passage Stair		54x3 3x4.5	162 13.5	Circulation & other 175
	Total				

Total Instructional area =1816
Total Administrative area = 210
Total Amenities area= 36

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

Department: - 12) Computer Centre

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum m x m	Carpet Area in Sq m.	Remarks
1	I/C Cabin	128(A)	3 x 3	09	Administrative
2	Computer Centre	128	15 x 9 3 x 3	135 09	Instructional
3	UPS Room	128(B)	3 x 3	09	Administrative
4	Central server room	E01	7.5 x7.5	56	Administrative
	Total				

Total Instructional area = **162**
Total Administrative area = 56

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

13) Workshop

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum M x m	Carpet Area in Sq m.	Remarks
1	Main Work shop	CB0	21.7x18.1 +11.0x18.10 +7.3x14.4 -14	683	
2	Black Smithy	W1	15 x 6.7	101	
3	Foundry Shop	W2	4.65 x 9	42	
	Staff Cabin	CB A	3.7x 3.7	14	
	Total				

Total Instructional area = 826
Total Administrative area = 14
Total Amenities area= ---

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

Department: - 14) **Tutorial Rooms U G**

Sr. No.	Particulars/Details	Room No.	Size Maximum m x m	Carpet Area in Sq m.	Remarks
1	Tutorial Rooms 08 Nos.	A301AB	9.1x7.4	67	Instructional
		A302AB	9.1x7.4	67	
		A303AB	9.1x7.4	67	
		A304AB	9.1x7.4	67	
2	Main Bldg 3 Nos.	B16A, B	2 x 6 x 9	108	
		B13	6 x 7.5	45	
03	New Academic	C 06	7.1x7.1	50	
		11			

Total Instructional area =

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

15) Administrative

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum M x m	Carpet Area in Sqm	Remarks
1	Conference Room old	G02	9 x 4.5	40.5	co
2	Anti Chamber old	G03(A)	4 x 4.5	18	co
3	Principal old	G7	6 x 5.25	31.5	co
4	Dy. Registrar old	G4 A	3 x 3	09	co
5	Director's Cabin	G6(A)	6 x 3	18	co
6	E.D.P. Office	G17	3 x 3	09	co
7	O.S	G31	3 x 6	18	co
8	Training & Place. Office	G08	9 x 6	54	
9	Maintenance Office	B11	9x6	54	
10	Main Office	G4 G5	6 x 9+ 6 x 6	90	co
11	A/C Office A.O	G32	3 x 6	18	co
12	Caretaker Room	G15	2 x 3	06	co
13	Waiting + Pantry Room	G3	4.5 x 4.5	20	co
14	Reception cum waiting	G01	3 x 9	27	co
15	Xerox Room	G18	1.2 x 3	3.6	
16	**Security Office**	B12	9 x 6	54	
17	General Store	B6	9 x 9-3x3	72	
18	Garden Maintenance Store	G23	2 x 3	06	co
19	Exam Record Room	211+210	3 x 3+3 x 3	18	co
20	**Exam office**	212 B	9 x 6	54	co
22	Office Store	CB06	11 x 7.3	80	co
23	Account office Store	CB 07	11x7.3+4.5x3.7	97	co
23	Maint. Store Electrical	B09	3x3	9	
24	Maint. Store Plumbing	CB03	11x3.7	41	
25	Maint. Store furniture	CB 05	11x7.3	80	
26	Rector office Hostel 1	OBHOO	3.66x4.57	17	
27	Warden Office		2.43x2.82	7	
28	U P S Room	G17 (A)	1.2 x 3	3	
29	Electrical Maint Room	B4	3 x 3	09	
30	House keeping	B10	3.2x3.2	10	
31	Reception/waiting	A101	2x3+1.2x6	13	
32	O S Main office	A102	9x6.3	57	
33	Office Record room	A103	6x5.4	32	
34	Account Office cash	A104A	3.65x17	62	
35	Exam Academic office	A104 B	3.65x17	62	
36	Directors Cabin Board Room	A107	9x5.4	49	
37	Principle/ Director meeting	A108	5.1x6.5	33	
38	Principle/ Director	A109	4.0x6.5	26	
39	Conference room	A111	7.3x17.0	124	
40	Pantry Office	A112	3x4.3	13	
41	AO office Other office	A113	6x5.4	32	
42	Dy. Registrar Other office	A115	3x5.4	16	
43	Maint. Garden	CO01	4.5x3.7	15	
	Total			**1508**	

16) Amenities

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum M x m	Carpet Area in Sq m.	Remarks
	Girls common room	G35,	15 x 9+9x3	162	
	Boys common room	B17	12 x 9	108	
	Canteen Boys Hostel	CNTN	4.27x4.27	18	
	College **Canteen** **Near Gate**	CNTN2	11.30x5.80 7.50 x 15.50	65 116	
	Student activity center	G24	18x9	162	
	Dinning Hall No 1	DH1		184	
	Dinning Hall No 2	DH2		247	
	Dinning Hall for Girls	DHGH		143	
	T V Room (Girls)	TVGH	7.24 x 7.66	56	
	Medical Room Boys Hostel	MEDICL	3.73 x 4.57	17	
	Medical Room Girls hostel	MEDI1	3.66 x 4.57	17	
	S T D Room Canteen	CNTN2	3.66x3.05	11	
	Generator Room	GENTOR	5.0x6.0	30	
	Transformer	TRANS	7x8	66	
	Meter room	MTR RM	3x3	9	
	Electric Room	ELE RM	2Nosx3x3	18	
	Generator	GENTOR2	3x6	18	
	Pump House	PUMPS	5 nosx2x2	20	
	Gymnasium TF	GYM	12.25x15.25	187	
	Yoga Gym	YOGA	12.25x15.25	187	
	Bus Stop	BUSSTP	7.5x10.	75	
	Cycle Stand	CYCLST	18.20x35	637	
	Parking 4 wheeler Class I	PARKN1		348	
	ATM	ATM	4.50 x 3.65	27	
	Bank	BANK	7.50 x 15.50	116	
	Stationary Store	B8-9	9 x 9-3x3	72	
	Toilets	A106	3x3.2	10	
	Toilet	A110	3x4.4	13	
	Toilet	AG1,2	2x3x3.2	19	
	Toilets Gym			40	
	Total			**3198**	

Sr. No.	Particulars/Details	Room No.	Size Maximum M x m	Carpet Area in Sq m.	Remarks
	Principal's Quarter	A8,9,10		169	
	Guest house	C1 to 8	8 x 32.2	258	
	VIP Guest house	VIP City	--	220	
				647	

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

17) Open-air theater

Open Air Theater		76 x 25		1900 Sq m
Central Canteen				2400 sq m

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

18) Residential

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum m x m	Carpet Area in Sq m.	Remarks
	Principal's quarter Staff quarter A Staff quarter B Renovated B Staff quarter (sweeper) Staff quarter IV New Staff quarter IV NMU		113+ 56 56.4 x 9 56.4x6 66.4 x 4 24.65x3 32.5x6 B/U	169 507 338 266 74 195 282	
	Guest house	A0, A4	56.4x2	113	
	Guest house Guest house VIP Guest House		32.2x4 32.2 x4	129 129 220	
	Hostel 1			1889 134	
	Hostel 2			2479	
	Girls Hostel 3rd floor	1087	660	1747	
	Girls Hostel / Class I staff Quarters		464x4	1856	
	Total			10528	

*Net residential area=10528 sq.m

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

19) **Sports**

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum m x m	Carpet Area in Sq m.	Remarks
	Sport Office	113	3x3	09	
	Sport store		2.44x3.43	8	
	Badminton (Girls)		15.24x15.24	233	
	Badminton (Boys)		30.87x24.47	755	
	Sport Bldg GF	TT	12.2x15.25	187	
	Gym office		2x1.2x 9.2	22	
	Total			**1004**	

20)Play field

	Basket ball	**BSKBAL**	**30x38**		**1140**
	Cricket, Football, Volleyball		160x66		10560
	Kabaddi ground		30x18		540
	Kho- Kho ground		29 x16		464
	Total				12704
	Total				13992

21**) Roads and Lawn in Campus**

A**) Roads**

(i) Black top road length: 2.10 km

B) Lawn:

(i) Central high land Lawn: 6000 Sqm.

(ii) Central low land Lawn: 1275 Sqm.

(iii) Main Building Lawn: 486 Sqm.

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON

Department wise **carpet area (Excluding Administrative, Amenities)** Summary

Dept.	C.R	T.R	S.R	D.H	Lab.	Comp. lab.	Library	Other	Total Acad. Area
1)Civil	539 (5)	101 (3)	162	---	960 (11)	108 (1)	18	--	1808
2)Comp.	620 (6)	141 (3)	162	--	941 (12)	--	18	--	1802
3)Mech.	479 (6)	140 (4)	141	73	1030 (10)	216 (2)	54	--	2133
4)Chem.	153 (3)	36 (1)	162	--	737 (10)	81	--	--	1169
5)Biotech	153 (3)	69 (2)	--	--	738 (11)	--	--	--	960
6)Elec.	198 (3)	128 (3)	155	--	817 (11)	66	44	--	1408
7)E&TC	648 (6)	137 (4)	162	--	745 (10)	138 (2)	22	--	1852
8) IT	256 (3)	35 (1)	139	--	723 (10)	--	--	--	1153
9) MBA	134 (2)	66 (2)	134	--	134 (2)	102	20	--	590
10)App Sci.	999 (11)	--	--	295 (2)	387 (3)	135	--	--	18 16
11) Library	--	--	--	--	--	--	927	--	927
12) Comp. Center	--	--	--	--	--	162	--	--	162
13)Work Shop	--	--	--	--	--	--	--	1024	1024
14) Tutorial	--	330 (08)	--	--	--	--	--	--	483
19)Sports									--
Total	**4019 (48)**	**1336 (31)**	**1217 (8)**	**368 (3)**	**7212 (90)**	**1010 (10)**	**1103 (7)**	**1024**	**17287**

Figures below area show numbers of rooms

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON

Department wise **carpet area** Summary for Instructional Administrative Amenities & other

	Requirement of area for total strength 0f 2664 Students	2664x6 = 15984	2664x1= 2664	2664x2= 5328	23976
Sr. No.	Department	Instructional	Administrative	Amenities	Total **Carpet Area**
01	Civil	1813	180	54	**2047**
02	Computer	1784	294	36	**2114**
03	Biotech	960	80	9	**1049**
04	Mechanical	2079	349	87	**2515**
05	Chemical	1169	126	18	**1313**
06	Electrical	1364	134	13	**1511**
07	E & TC	1830	275	36	**2141**
08	IT	1014	177	58	**1249**
09	MBA	570	111	23	**704**
10	Library	927	108	54	**1089**
11	App. Science	1816	210	36	**2062**
12	Comp Center	162	56	---	**218**
13	Workshop	1024	14	---	**1038**
14	Tutorials	483	---	---	**483**
15	Administrative	---	1508	---	**1508**
16	Principal qtr. Guest house	---	---	647	**647**
17	Amenities	---	---	3198	**3198**
18	Sport	---	---	1004	**1004**
19	Play field Basket Ball ground	---	---	1140	**1140**
20	Open air Theater			1900	**1900**
	TOTAL	**16995**	**3722**	**8313**	**29030**

Under construction area (Carpet Area)

Sr. No.	Department				Total Sq m
01	Building for First year GF	GF 2443	FF 2593		**5,036**
02	Electrical/ E&TC Dept.	SF 2593	TF 2593		**5,186**

Proposed Construction Built up area

Sr. No.	Department	Instructional	Administrative	Amenities	Total
01	Canteen & Guest house	---	---	2400	**2400**

Teaching Learning Process

Methodology

For effective teaching learning process good and adequate infrastructure facilities are available. The class rooms and labs / workshop are well lighted with natural light during day time with circulation of fresh air. Conventional methods is adopted where in black board, chalk and faculty are involved in teaching the students in conjunction with modern methods like charts, cut models, OHPS, LCD's , electronics media like e-books , educational CD's, VCD. TV's are adopted by the faculty . Course files for all the subject are available in each department. Each department is having a departmental library and computer lab connected with internet. The central library is computerized with Del Net facilities and has AC reference room in addition to a reading room and staff rooms.

A computer center having 40 terminals is independently available for the use of faculty and students. The computer center is provided with internet facility and is available both during working hours and in additional time also.

Effectiveness

To asses the effectiveness of learning process by the students, two class tests at each month end and an assignment week is conducted where in the students are given an assignment sheets in a period sometime during 5^{th} and 6^{th} week of the term as per notified schedule and the students who gets the maximum marks is given a book on subject as reward with intention of motivating him for better performance in forthcoming university examination. The answer papers are checked in time and are shown to students and are collected back for record duly singed by student concerned.

Internal continuous evaluation system is followed for evaluation of term work as per guidelines issued by the University.

Motivations and rewards

Gold medals are awarded by the Management who are University first position rank holder in branch of Chemical Engg., Production Engg., Computer Engg. and Electronics Engg. in the University convocation. The University toppers are also felicitated at the college level in the afternoon of University convocation day.

COET/GSH/1198/07/15

Shrama Sadhana Bombay Trust's

COLLEGE OF ENGINEERING & TECHNOLOGY, BAMBHORI, JALGAON

TENTATIVE ACADEMIC CALENDAR (TERM-I) 2015-16

Sr.No.	Activity	Day	Date / From -To
1	Opening of College (For Faculty Members)	Monday	06 July 2015
2	Opening of College for Students & their registration (S.E. to B.E.)	Monday	13 July 2015
3	Commencement of Classes (S.E. to B.E.)	Monday	14 July 2015
4	Induction Programme for F.E. Students	Sunday	26 July 2015
5	Opening of College &Commencement of Classes for F.E. Students	Monday	27 July 2015
6	Commencement of Classes (M.E.-I &II year)	Monday	03 Aug. 2015
7	Independence Day Celebration	Saturday	15 Aug. 2015
8	S.E., T.E. & B.E. : ISE-I	Monday, Wednesday & Thursday	17 Aug. 2015 19 Aug. 2015 20 Aug. 2015
9	F.E. : ISE-I	Friday, Monday & Tuesday	28 Aug. 2015 31 Aug. 2015 01 Sept. 2015
10	Lecture Series "FEAST"(College level)	Sunday, Monday & Tuesday	13 Sept. 2015 14 Sept. 2015 15 Sept. 2015
11	Engineer's Day	Tuesday	15 Sept. 2015
12	Alumina Meet	Wednesday	16 Sept. 2015
13	Feedback from Students	Monday to Friday	21 to 25 Sept. 2015
14	S.E., T.E. & B.E. : ISE-II	Saturday, Monday & Tuesday	26 Sept. 2015 28 Sept. 2015 29 Sept. 2015
15	F.E.: ISE-II	Saturday, Tuesday & Wednesday	10 Oct. 2015 13 Oct. 2015 14 Oct. 2015
16	S.E. To B.E. : ICA	Tuesday to Thursday	13 Oct. to 15 Oct. 2015
17	PR/OR Exam. (S.E To B.E.) (Tentatively)	Monday to Thursday	26 Oct. to 04 Nov. 2015
18	F.E. : ICA	Monday to Wednesday	02 Nov. 2015 03 Nov. 2015 04 Nov. 2015
19	University Theory Examination (Tentatively)	From Monday	16 Nov. to 15 Dec. 2015
20	PR/OR Exam. (F.E.) (Tentatively)	Tuesday to Sunday	17 Dec. to 22 Dec. 2015
21	Industrial Tour of All Dept. (Tentatively)	Tuesday to Sunday	22nd Dec.2015 to to 03rd Jan. 2016

Shrama Sadhana Bombay Trust's

COLLEGE OF ENGINEERING & TECHNOLOGY, BAMBHORI, JALGAON.

TENTATIVE ACADEMIC CALENDAR (TERM-II) 2015-16

Sr. No.	Activity	Day	Date / From -To
1.	Start of II Term: Registration of students & Commencement of Classes	Monday	04 Jan. 2016
2.	International Conference on "Global Trends in Engineering, Technology & Management." (All Depts.)	Friday to Sunday	08 Jan. to 10 Jan. 2016
3.	Republic Day Celebration	Tuesday	26 Jan.2016
4.	F.E. to B.E. : ISE-I	Saturday, Monday, Tuesday	13, 15, 16 Feb. 2016
5.	Entrepreneurship Awareness Camp. for F.E. to B.E. Students (By IEDC)	Sunday to Monday	21 Feb. to 22 Feb. 2016
6.	Parents Meet	Sunday	21 Feb. 2016
7.	Annual Gathering (Vasant Utsav) & Sports	Tuesday to Sunday	23 Feb. to 28 Feb. 2016
8.	Science Exhibition for FE (By Applied Science Dept.) Applied Science Dept. for FE	Sunday	28 Feb.2016
9.	Feedback from Students	Monday to Friday	29 Feb. to 04 Mar.2016
10.	F.E. to B.E.: ISE-II	Saturday, Monday, Tuesday	26, 28, 29 Mar.2016
11.	F.E. to B.E. ICA	Thursday, Saturday, Monday	07, 09, 11 Apr.2016
12.	End of Term	Saturday	16 Apr. 2016
13.	PR/Oral Exam., SE to BE	Monday to Tuesday	18 Apr. to 28 Apr. 2016
14.	Theory Exam., FE to BE & ME	Monday to Tuesday	02 May. to 31 May.2016
15.	Project Oral (BE) & FE (PR/Oral)	Thursday to Monday	02 June to 06 June.2016
16.	Commencement of Next Year	Monday	11 July. 2016

10.7.15

(Dr. K.S.Wani)
Principal

PRINCIPAL
SSBT's College of Engg. & Technology
Bambhori,Jalgaon-425001(M.S.)

Copy to:
1) Chairman, G.B. & L.M.C. 2) Managing Trustee Sh. Raosaheb R.D.Shekhawat 3) All H.O.Ds 4) DOAD, 5) DOA 6) Director, R&D, 7) TPO, 8) D.R. 9) A.R. 10) Exam. Office, 11) Chairman, Alumni Meet, 12) Store, 13) Library, 14) Chairman, Cultural Activities 15) Physical Director 16) Admission Office, 17) PRO & Coordinator, Parents Meet, 18) Student Welfare Officer, 19) Rector (Boys Hostel), 20) Rector (Girls Hostel), 21) Coordinator, ISTE & IE (I), 22) Principal Office

Shram Sadhana Bombay Trust's

COLLEGE OF ENGINEERING & TECDHNOLOGY ,BAMBHORI,JALGAON

TENTATIVE ACADEMIC CALENDAR (TERM-II) 2015-16

Sr. No.	Activity	Day	Date /From -To
1	International Conference on "Global Trends in Engingeering,Technology & Management " (All Departments)	Monday to Wednesday	4, 5, 6 Jan. 2016
2	Yuvarang	Thursday to Sunday	7 to 10 Jan. 2016
3	Start of II Term :Registration of Students and Commencemnet of Classes	Monday	11 Jan. 2016
4	Republic Day Celebration	Tuesday	26 Jan. 2016
5	FE to BE: ISE-I	Saturday, Monday, Tuesday	20, 22, 23 Feb 2016
6	Science Exhibition for FE Students (By Applied Science Dept.)	Sunday (National Science day)	28 Feb. 2016
7	Entrepreneurship Awareness Camp for FE to BE Students(By IEDC)	Saturday, Sunday	27, 28 Feb. 2016
8	Annual Gathering(Vasant Ustav)& Sports	Tuesday to Sunday	1 to 6 Mar. 2016
9	Parents Meet	Sunday	6 Mar. 2016
10	Feedback for Students	Tuesday to Saturday	8 to 12 Mar. 2016
11	FE to BE: ISE-II	Saturday, Monday, Tuesday	2, 4, 5 April 2016
12	FE to BE ICA	Monday to Wednesday	11, 12, 13 April 2016
13	End of Term	Saturday	16 April. 2016
14	PR/Oral Exam.,SE to BE	Monday to Tuesday	18 April to 28 April 2016
15	Theory Exam.,FE to BE & ME	Monday to Tuesday	02 May to 31 May 2016
16	Project Oral Exam(BE) & FE (PR/Oral)	Wednesday to Sunday	01 to 05 June 2016
17	Commencement of Next Year	Monday	11 July. 2016

(Dr. K.S.Wani)
Principal

Copy to:

1) Chairman, G.B. & L.M.C. 2) Managing Trustee Sh. Raosaheb R.D.Shekhawat
3) All H.O.Ds 4) DOAD, 5) DOA 6) Director, R&D, 7) TPO, 8) D.R. 9) A.R. 10) Exam. Office,
11) Store, 12) Library, 13) Chairman, Cultural Activities 14) Physical Director 15) Admission Office,
16) PRO, 17) Student Welfare Officer, 18) Rector (Boys Hostel), 19) Rector (Girls Hostel),
20) Principal Office

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Syllabus of First Year Engineering

(Common to all branches)

Faculty of Engineering and

Technology

SEMESTER-I

W.E.F 2012 - 2013

FE Semester – I

Course Code	Name of the Course	Group	Teaching Scheme				Theory		Practical		Total	Credits
			Theory Hrs / week	Tut. Hrs / week	PR. Hrs / week	Total	ISE	ESE	ICA	ESE		
FE 121	Engineering Physics – I	A	3	---	---	3	20	80	---	---	100	3
FE 122	Engineering Chemistry – I	A	3	---	---	3	20	80	---	---	100	3
FE 123	Engineering Mathematics - I	A	3	1	---	4	20	80	---	---	100	4
FE 124	Elements of Civil Engineering & Engineering Mechanics	B	3	1	---	4	20	80	---	---	100	4
FE 125	Computer Programming	B	3	---	---	3	20	80	---	---	100	3
FE 126	Engineering Science Lab - I	A	---	---	2*	2*	---	---	25	---	25	1
FE 127	Computer Programming Lab	B	---	---	2	2	---	---	25	25 **(PR)**	50	1
FE 128	Elements of Civil Engineering & Engineering Mechanics Lab	B	---	---	2	2	---	---	25	25 **(OR)**	50	1
FE 129	Workshop Practice – I	B	---	---	2	2	---	---	25	---	25	1
FE 130	Soft Skills – I	C	1	---	2	3	---	---	50	---	50	2
	Total		**16**	**2**	**10**	**28**	**100**	**400**	**150**	**50**	**700**	**23**

ISE: Internal Sessional Examination, **ESE:** End Semester Examination, **ICA :** Internal Continuous Assessment

Note: For Engineering Science Lab, practical of Engineering Physics and Engineering Chemistry shall be conducted in alternate week.

Engineering Physics - I
COURSE OUTLINE

Engineering Physics - I	**EP- I**	**FE 121**
Course Title	Short Title	Course Code

Course Description:
This course is aimed at introducing the fundamentals of basic sciences (Engineering Physics-I) to undergraduate students. The background expected includes a prior knowledge of physics from HSC (science) and familiarity with various laws, principles and theories. The goals of the course are to understand the basic principles of science (Engineering Physics -I) and their applications in different areas.

Lecture	**Hours / Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	15	40	03

Prerequisite Course(s): 11^{th}, 12^{th} Physics.

General Objective:

The objective of this course is to provide learner with basic concepts and knowledge of sciences (various principles, theories, laws etc.) and to analyze it from experiments. The learner can apply the same in various branches of Engineering and Technology.

Learning Outcomes:

After successful completion of this course the student will be able to:

a) Understand the concept of different Energy Sources, their production, advantages, disadvantages, applications etc
b) Understand the basic properties, mechanism, terminology etc of Laser and their types, Principles, construction and re-construction of Holography. Principle, structure, and propagation mechanism of Fiber optics communication and their Industrial application.
c) Understand the basic of crystal structure, its parameter.
d) Understand the production of X-rays, properties and applications in various fields.
e) Describe the classification of solid, its properties , formation of semiconductor diode, its application and concept of Hall effect and Hall coefficient.
f) Understand to know about the basic concepts of Interference, Diffraction Polarization, their production and various applications

COURSE CONTENT

Engineering Physics - I **Semester-I**

Teaching Scheme	**Examination Scheme**	
Lectures -3 Hrs/week	**End Semester Exams (ESE)**	**: 80 Marks.**
	Duration of ESE	**: 3 Hours.**
	Internal Sessional Exam (ISE)	**: 20 Marks.**

Unit –I- Environmental Science **No of Lecture: 8 Hours, Marks: 16**

A) Energy Sources (non conventional): Introduction to non-conventional energy sources, Solar cell (Principle- Construction- Working & Characteristics), Wind energy- Wind Mill, Biogas & Bio Mass (Brief Explanation about way of harnessing or utilization, advantages), Advantages of non-conventional energy.

B) Energy Sources (conventional): Introduction to Nuclear Fission, Fusion, Chain reaction Multiplication Factor, Nuclear Reactor (with Diagram and Working), Numericals.

Unit –II- Laser & Fiber Optics **No of Lecture: 8 Hours, Marks: 16**

A) Laser: Introduction, Laser beam characteristics -Coherence, Directionality, Intensity, Mono chromaticity. Mechanism of Laser- Stimulated absorption, Spontaneous emission, Stimulated emission, Laser Terminology- Active Medium, Population, Population Inversion, Pumping, and Metastable State. Types of Laser-Gas Laser (He-Ne Laser), Nd-Yag Laser, Applications of Laser, Holography – Introduction, Principle of Holography, Recording of 3 D Image using Hologram, Reconstruction of 3 D images, Comparison with ordinary photography.

B) Fiber Optics: Structure of optical fiber. Principle of optical fiber. Propagation Mechanism in optical fiber- Angle of acceptance, Numerical aperture, Critical angle. Optical fiber communication system (Only Diagram), Advantages of optical fiber, Applications of optical fiber.

Unit-III- Crystallography & X-ray **No of Lecture: 8 Hours, Marks: 16**

A) Crystallography : – Introduction , Space Lattice – Translation Vectors, The Basis and crystal structure, Unit cell & Lattice parameters, Bravais Lattices, The cubic crystal- The Simple Cube (SC), Body Centered Cube (BCC), Important Parameters of cubic lattice – Number of atom per unit cell, Coordination Number, Atomic Radius , Packing density OR

Packing Factor, Calculation of Lattice Constant. Miller indices – Rules for finding Miller Indices, Important features of Miller Indices, Miller Indices for cube crystal, Numericals.

B) X-Rays: Production of X –rays (Coolidge tube), Continuous and characteristic x – rays, Bragg's law, Properties & Applications of X-ray, Numericals.

Unit- IV -Physics of Semiconductor **No of Lecture: 8 Hours, Marks: 16**

Classification of solid on the basis of band theory, Fermi-level and position of Fermi level in intrinsic [With derivation i.e E_f =(Ec + Ev) /2] and extrinsic semiconductors, Conductivity in semiconductors, Formation of P-N junction, Diode under forward and reverse bias, Hall Effect, Determination Hall Coefficient.

Unit-V- Optics **No of Lecture: 8 Hours, Marks: 16**

Interference- Interference, Michelson's Interferometer, Applications of Michelson's interferometer- wavelength determination, Refractive index of thin film, thickness of transparent material.

Diffraction- Diffraction, Theory of plane transmission diffraction grating, Determination of wavelength by grating, Rayleigh's criteria of resolution, resolving power of grating.

Polarization-Polarization, Polarization by reflection, Brewster's law, law of Malus, Dichroism, Polaroid's, Engineering application of polarization

Reference Books:

1. R K Gaur, S L Gupta, "Engineering Physics", Dhanpath Rai Publications.
2. P S Aithal, H J Ravindra, "Engineering Physics", Acme Learning.
3. G Vijaya kumari , "Engineering Physics" , Vikas Publications.
4. M R Srinivasan, "Physics for Engineers", New Age International Publishers.
5. C S Solanki, "Solar Photovoltaic", PHI Learning Private Limited.
6. S O Pillai, "Solid state Physics", New Age International Publishers.
7. Ajay Ghatak, "Optics", TMH.
8. Hugh D Young, Roger A Freedman, "University Physics (With Modern Physics)", Pearson.
9. Hintendra K Malik, A K Singh, "Engineering Physics", Mc Graw Hill.
10. K Rajgopal, "Engineering Physics", PHI Learning Private Limited.
11. M N Avadhanulu, P G Kshrisagar, "Text book of Engineering Physics", S. Chand.
12. Uma Mukharji, "Engineering Physics" , Narosa Publishing House
13. S Deswal, A Deswal, "Basic Course of Environmental Pollution", Dhanpath Rai Publications.
14. N Subrahmanyam, Brijal, M N Avadhanulu, "Optics", S. Chand.
15. Sanjay Jain, "Engineering Physics", Universities Press (India) Pvt Ltd.

Engineering Chemistry – I

COURSE OUTLINE

Engineering Chemistry-I	**EC-I**	**FE 122**
Course Title	Short Title	Course Code

Course Description:

This course is aimed at introducing the fundamentals of basic sciences (Engineering Chemistry –I) to undergraduate students. The background expected includes a prior knowledge of chemistry from HSC (science) and familiarity with basic fundamental theories. The goals of the course are to understand the basic principles of Engineering Chemistry –I and their applications in different branches of engineering.

Lecture	**Hours / Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	15	40	03

Prerequisite Course(s): 11th, 12th Chemistry,

General Objectives:

To apply the knowledge of science in engineering and technology and also understand the basic concepts of chemistry and to analyze it from experiments.

Learning Outcomes:

After successful completion of this course the student will be able to:

a) Design and conduct experiments, analyze and interpret data.
b) Design a component, system or process to meet desired needs within realistic constraints.
c) An ability to function on multidisciplinary terms.
d) Identify, formulate and solve problems.
e) Understand the impact of engineering solutions in global, economic, environmental and societal context.
f) Ability to appreciate contemporary issues and engages in life-long learning.
g) Use the latest techniques, skills and modern tools necessary for engineering practices.

h) Understanding of the necessity to quantitatively balance the built environment with the natural world.
i) Understanding the basic parameters of water, different water softening processes and effect of hard water in industries.
j) Understanding the preparation, basic properties and applications of various polymers as an engineering material.
k) Understand the preparation, basic properties and applications of Portland cement.
l) Understand the synthesis, various properties and applications of ceramics as an engineering material.
m) Understand the classification, preparation, properties and applications of different alloys.

COURSE CONTENT

Engineering Chemistry-I **Semester-I**

Teaching Scheme	**Examination Scheme**	
Lectures -3 Hrs/week	**End Semester Exams (ESE)**	**: 80 Marks.**
	Duration of (ESE)	**: 3 Hours.**
	Internal Sessional Exam (ISE)	**: 20 Marks.**

Unit – I Water **No. of Lect. – 08, Marks: 16**

a) Introduction: Definition of water, impurities of water
b) Types of hardness – Units of hardness, causes of hardness of water
c) Analysis of water - Chloride contents by Mohr's method, Alkalinity along with numerical.
d) Water Softening Process:(i) Lime soda process by Hot continuous process (Numerical based on it) (ii) Zeolite process, (iii) Ion exchange method, (iv) Reverse Osmosis method
e) Effect of hard water in steam generation, priming, foaming, caustic embrittlement.

Unit – II Polymer **No. of Lect. – 08, Marks: 16**

a) Introduction , Definition, functionality
b) Classification: on the basis of chemical composition, synthesis, intramolecular forces.
c) Types of polymerization – addition &condensation polymerization with mechanism and examples.
d) Plastic – Types of plastic – Thermoplastic & thermosetting plastic.
e) Compounding of plastic & their functions.

f) Explanation & different types with their properties & applications(i) PVC (ii) Teflon (iii) Polyurethane (iv) Polycarbonate (v) Polystyrene
g) Rubber - Types of rubber- natural & synthetic
h) Vulcanization of rubber: drawbacks of natural rubber
i) Synthetic Rubber - Synthesis, structure, properties & applications of- (i) Styrene butadiene rubber (SBR) (ii) Neoprene rubber (iii) Nitrile rubber (iv) Butyl rubber

Unit – III Cement **No. of Lect. – 08, Marks: 16**

a) Definition, Classification and properties - Natural, Puzzolona & Port land
b) Chemical constituent of Portland cement.
c) Manufacture of Portland cement by wet process.
d) Manufacture of Portland cement by dry process (using flow sheet diagram)
e) Setting & Hardening of Portland cement with chemical reaction.
f) Heat of hydration of cement.

Unit – IV Ceramics **No. of Lect. – 08, Marks: 16**

a) Introduction, Definition Classification of ceramics such as functional & structural classification.
b) Basic raw materials for ceramic preparation – clays, feldspars and flint or sand
c) Manufacture of ceramic by flow sheet diagram
d) Drying of ceramic wares – mechanism of drying, drying rate & shrinkage, methods of drying such as drying shades, cross – circulating drying, hot floor drying.
e) Firing of ceramic wares - Effect of heat on ceramic ware, Effect of heat on shrinkage & porosity.
f) Properties of ceramic material –
   1. Mechanical Properties such as Tensile strength, compressive strength, torsional Strength, plastic deformation.
   2. Thermal properties such as thermal conductivity, thermal shock resistance.
   3. Electrical properties such as insulator, ceramic conductor, ceramic Semiconductors.
g) Application of ceramics.

Unit – V Alloys **No. of Lect. – 08, Marks: 16**

a) Introduction,
b) Necessity (Purpose) of making alloys
c) Classification of alloys
d) Preparation of alloys – Fusion method, Electro deposition method

e) Composition , properties & application of following -(i)Brass (ii) Bronze (iii) Duralumine (iv) Nichrome (v) Steel – Mild, Medium & High.

Reference Books:

1. B K Sharma, Krishna, "Engineering Chemistry", Prakashan Media (P) Ltd.
2. Suba Ramesh, "Engineering Chemistry", Wiley India Pvt. Ltd..
3. Jain & Jain, "Engineering Chemistry", Dhanpat Rai Publishing Co.
4. S S Dara, "A Text Book of Engineering Chemistry", S Chand & Co. Ltd.
5. R Gopalan, "A Text book of Engineering Chemistry", Vikas Publishing House Pvt. Ltd. Third Edition
6. B S Chauhan, "Engineering Chemistry", University Science Press, Third Edition.
7. Shashi Chawla, "A Text book of Engineering Chemistry", DhanpatRai Publishing Co.
8. V R Gowariker, "Polymer Science". New Age International.
9. Abhijit Mallick, "Engineering chemistry", Viva books.
10. Sunita Ratan, "Engineering chemistry", S K Kataria & Sons.
11. Das R K, "Industrial Chemistry", Asia Pub. House, New York, 1966

Engineering Mathematics - I

COURSE OUTLINE

Engineering Mathematics -I	**EM-I**	**FE 123**
Course Title	Short Title	Course Code

Course Description:

This course is aimed at introducing the fundamentals of basic Mathematics to undergraduate students. The background expected includes a prior knowledge of Mathematics from 12th science and familiarity with various laws, principles and theories. The goals of the course are to understand the basic principle of Mathematics and its application in different area.

Lecture	**Hours / Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	15	40	03
Tutorial	01	15	13	01

Prerequisite Course(s): 11^{th}, 12^{th} Physics.

General Objective:

The basic necessity for the foundation of Engineering and Technology being Mathematics, the main aim is to teach mathematical methodologies and models, develop mathematical skill and enhance thinking and decision making power of student.

Learning Outcomes:

After completion of this course learner will be able to:

a) Apply knowledge of mathematics in engineering and technology.
b) Identify, formulate and solve engineering problems.
c) Design Mathematical models for engineering problems and solve them.

COURSE CONTENT

Engineering Mathematics-I **Semester-I**

Teaching Scheme	**Examination Scheme**	
Lecture: 3 hours / week	**End Semester Examination (ESE)**	**: 80 Marks**
Tutorial: 1 hour / week	**Paper Duration (ESE)**	**: 03 Hours**
	Internal Sessional Exam (ISE)	**: 20 Marks**

Unit-I: Matrix Algebra **No. of Lect. - 08, Marks-16**

a) Definition of Elementary Transformations, Normal Form, Canonical Form & Rank of Matrix.
b) System of Linear Equations. (by using rank of matrix) for both Homogeneous & non-Homogeneous system.
c) Eigen values & Eigen vectors.
d) Orthogonal Matrix.
e) Introduction to Cayley-Hamilton's Theorem. (without proof)
f) Applications of Matrices (Translation, Scaling, Rotation).

Unit-II: Calculus of factions of single variable **No. of Lect. - 08, Marks-16**

a) Introduction to Successive Differentiation with standard formulae.
b) Leibnitz's theorem (without proof).
c) Taylor's & Maclaurin's theorems (without proof).
d) Expansion of Functions by using Taylor's theorem, Maclaurin's theorem & Leibnitz's theorem.
e) Applications of Taylor's theorem.

Unit-III: Integral Calculus (Some Special Functions) **No. of Lect. - 08, Marks-16**

a) Gamma Function.
b) Beta Function.
c) Differentiation under Integral Sign. (No Verification of Rule).
d) Error Function.

Unit-IV: Differential equation & its applications (1st order & 1st degree)
No. of Lect. - 08, Marks-16

a) Exact differential equation.

b) Non-exact differential equation. (reducible to exact differential equation by using integrating factor).
c) Linear differential equation.
d) Reducible to linear differential equation.
e) Applications of differential equation to simple electrical circuits & conduction of heat

Unit-V: Complex Number **No. Of Lect. - 08, marks-16**

a) Introduction to Circular functions, Hyperbolic functions & Inverse hyperbolic functions & their relations (without proof).
b) Hyperbolic functions.
c) Logarithm of a complex number.
d) Separation into real & imaginary parts.

Reference Books:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley Eastern Ltd.
2. C R Wylie, "Advanced Engineering Mathematics", TMH New Edition.
3. B S Grewal, "Higher Engineering Mathematics", Khanna Publication.
4. H K Das, "Advanced Engineering Mathematics", S. Chand & Company.
5. B V Ramana , "Engineering mathematics", (New Edition) TMH.
6. N P Bali, "A Text Book of Engineering Mathematics", Laxmi Publication.
7. Babu Ram, "Engineering Mathematics", Pearson Education.

Elements of Civil Engineering & Engineering Mechanics

COURSE OUTLINE

Elements of Civil Engineering & Engineering Mechanics **ECE&EM** **FE 124**
Course Title Short Title Course Code

Course Description:
This course provides the elementary level knowledge of civil Engineering and Engineering mechanics which includes-

a) Study of Forces and force systems.
b) Resultant and equilibrium of coplanar force systems.
c) Kinematics and kinetics of bodies which are in motion.
d) Scope of civil engineering and basic areas of civil engineering.
e) Types of civil engineering structures and important parts of buildings.
f) Principles of Planning and Building Byelaws.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	13	39	03
Tutorial	01	13	13	01

Prerequisite Course(s): Fundamental knowledge of Physics and mathematics of 11th and 12th std.

General Objective:

The general objective of course is to know the concepts of statics and dynamics. This includes application of math and physics principles to identify formulate and solve engineering problems. Also it aims to introduce the students the scope and basic areas of civil engineering.

Learning Outcomes:

Upon successful completion of this course the student will be able to:
(Engineering Mechanics):

a) Understand the basic physics concepts, such as force, weight, particle, and rigid body and SI system of units.
b) Compute the rectangular components of a force.
c) Identify and/or list the different types of force systems.
d) Define and calculate the resultant of coplanar force systems.
e) Define and calculate the moment of forces about any given point.

f) Draw free body diagrams of coplanar force systems.
g) Understand condition of equilibrium for coplanar forces
h) Solve for the forces and reactions in statically determinate coplanar force systems
i) Calculate the centroid of composite plane and curved figures.
j) Compute the tensile and compressive values of forces in truss members.
k) Define friction, friction force, static friction, kinetic friction,normal force, coefficient of static friction, angle of friction, and angle of repose.
l) Calculate the frictional force between two bodies in contact.
m) Find position, displacement, speed, velocity, acceleration, distance, and time of moving particle along the straight line and curved path.
n) Solve particle motion involving equation in 2D using rectangular and tangential/normal Coordinate systems.
o) Understand Newton's second law and D'Alembert's principle.
p) Understand principle of linear impulse and momentum.
q) Understand the principle of work and energy for particles.

(Element of Civil Engineering)

r) Understand of the role of the civil engineer
s) Know basic areas of civil engineering
t) Understand important civil engineering structures
u) Know principle of planning and building byelaws.
v) Understand use of the compass for angular measurement and calculation of included angles in a traverse

COURSE CONTENT

Elements of Civil Engineering & Engineering Mechanics **Semester-I**

Teaching Scheme	**Examination Scheme**
Lecture: 3 hours / week	**End Semester Examination (ESE) : 80 Marks**
Tutorial: 1 hour / week	**Paper Duration (ESE) : 03 Hours**
	Internal Sessional Exam (ISE) : 20 Marks

Unit I **No. of Lect. - 08, Marks-16**

A) Resultant of coplanar forces : Introduction, basic concepts, principle of mechanics, force systems, composition and resolution of forces, resultant of concurrent force system in plane, moment of forces, couples, Varignon's theorem, equivalent force couple systems, resultant of non-concurrent force system in plane.

B) Equilibrium of coplanar force system : Introduction, body constraints, types of supports and loads, free body diagram, conditions of equilibrium, equilibrium of forces in a plane , Lami's theorem, reactions of determinate beams, (simple and compound beams).

Unit II **No. of Lect. - 08, Marks-16**

A) Centre of Gravity: - Introduction, centre of gravity/centroid of composite plane figures and curves.

B) Analysis of Structure: - Plane trusses, method of joints and method of sections, cables subjected to point loads.

c) Friction: - Introduction, laws of friction, simple contact friction, ladder friction, application of friction on horizontal and inclined planes.

Unit III **No. of Lect. - 09, Marks-16**

A) Kinematics of rectilinear motion of particle: - Introduction, basic concepts, types of rectilinear motions, motion under gravity.

B) Kinematics of curvilinear motion of particle: - Introduction, basic concepts, motion along curved path, normal and tangential components of motion, rectangular and path coordinate systems, projectile motion.

Unit IV **No. of Lect. - 07, Marks-16**

A) Kinetics of rectilinear motion of particle: - D'Alembert's Principle, Newton's second law of motion, introduction to work and energy, impulse momentum principle. (No numerical on work and energy and impulse momentum principle).

B) Elements of Civil Engineering: Surveying: Compass: - Principles of surveying. Introduction to compass, bearing, Whole Circle Bearing and Reduced Bearing systems, local attraction, its detection and correction.

Note for unit 4: Out of three questions on unit 4; one question, consisting of 04 marks on Engineering Mechanics (EM), i.e. part A and 04 marks on Elements of Civil Engineering (ECE), i.e. part B is compulsory. Out of remaining two questions, one complete question should be on EM and one complete question should be on ECE.

Unit V **No. of Lect. - 07, Marks-16**

A) Basic Civil Engineering: - Introduction to various branches of civil engineering, introduction to various civil engineering structures such as buildings, highways, railways, bridges, dams, canals, elevated and ground storage reservoirs etc.

B) Building Construction: - Introduction to principles of planning, building rules and bye-laws, load bearing, framed and composite structures, introduction to various parts of buildings.

Reference Books:

1. Bhavikatti S S & K G Rajashekarappa, "Engineering Mechanics", New Age International (P) Ltd., Publishers.
2. Unadkat Sanju, "Engineering Mechanics", Tech-Max Publications, Pune.
3. Kanitkar T P and Kulkarni , "Surveying and Levelling, Part I", Pune Vidyarthi Graha Prakashan, 24th Edition
4. Bindra and Arora, "Building Construction", Dhanpatrai and Sons, Delhi.
5. N Kumara Swamy and A Ksmeswara Rao, "Building Planning and Drawing" ,Charotar Publishing House Pvt. Ltd.
6. Satish Gopi, "Basic Civil Engineering", Pearson Education, Delhi, 2008.
7. F P Beer and E R Johnson, "Mechanics for Engineers – Statics", McGraw-Hill Publication, 5th Edition
8. F P Beer and E R Johnson, "Mechanics for Engineers – Dynamics", McGraw-Hill Publication, 8th Edition.
9. S P Timoshenko and D H Young, "Engineering Mechanics", McGraw- Hill Publications, 4th Edition
10. R C Hibbeler "Engineering Mechanics statics and dynamics", Pearson Education, 11th Edition.
11. S R Bendale, "Engineering Mechanics", John Wiley & Sons, Delhi, 1st Edition
12. Jaget Babu, "Engineering Mechanics", Pearson Education, Delhi, 1st Edition.
13. Sushilkumar, "Building Construction", Standard Publishers, New Delhi, 2010.
14. M G Shah, Kale C.M. and Patki S.Y., "Building Drawing", Tata McGraw Hill Co. Ltd., New Delhi.

Computer Programming

Course Outline

Computer Programming	**CP**	**FE 125**
Course Title	Short Title	Course Code

Course Description:

The objective of this course is to introduce the students to the fundamentals of computers, the concepts of the C and C++ programming language and enable them to apply these concepts for solving real world problems.

Lecture	**Hours / Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	15	45	03

Prerequisite Course(s): Fundamental knowledge of Computers.

General Objective:

This course covers introduction to Computers, Algorithms and flowcharts, C and C++ programming concepts including variables, control structures, arrays and structures.

Learning Outcomes:

Upon successful completion of this course the student will be able to:

a) Understand the principles of designing structured programs.
b) Write and debug programs using an IDE.
c) Know use of the appropriate statements available in the C and C++ language.
d) Implement small to medium programs of varying complexity, using the most commonly used features of the language.
e) Employ good programming style, standards and practices, during program development.
f) Adapt programming experience and language knowledge to other programming language Contexts.
g) Explain the principles of structured program design.
h) Describe what is meant by a well designed program.
i) Describe when and how to use the standard C and C++ statement.

COURSE CONTENT

Computer Programming **Semester-I**

Teaching Scheme	**Examination Scheme**	
Lecture: 3 hours / week	**End Semester Examination (ESE)**	**: 80 Marks**
	Paper Duration (ESE)	**: 03 Hours**
	Internal Sessional Exam (ISE)	**: 20 Marks**

Unit- I: Program Development Concepts and Introduction to C

No of Lect. – 8, Marks: 16

a. Algorithms, flowcharts.
b. Types of programming languages.
c. Programming language tools.
d. History of C programming.
e. Data types in C.
f. Writing simple programs.

Unit- II: Control Structures and Basic Input/output

No of Lect. – 8, Marks: 16

a. C operators and expressions.
b. Introduction to decision control statements.
c. Conditional branching statements.
d. Iterative statements.
e. Nested loops.
f. Break, continue and goto statements.
g. Basic Input/output statements.

Unit- III: Arrays and Strings **No of Lect. – 8, Marks: 16**

a Declaration and initialization of arrays
b Accessing and storing values in arrays
c Operations performed on arrays
d One and Two- dimensional arrays
e Introduction to strings.
f Declaration and initialization of string.
g String operations with and without C library functions.

Unit- IV: Functions and Structures **No of Lect. – 8, Marks: 16**

a Introduction to functions.

b Function declaration and definition.

c Function call and parameter passing.

d Introduction to structures.

e Initializing and accessing members of a structure.

Unit- V: Introduction to C++ **No of Lect. – 8, Marks: 16**

a Limitations of procedure oriented programming.

b Object-oriented programming paradigm.

c Basic concepts of object-oriented programming.

d Classes and objects

e Defining member functions and scope resolution operator.

f Simple C++ program with class and object.

Reference Books:

1. E Balagurusamy, "Programming in ANSIC C", Tata McGraw Hill, 4/E, 2007.
2. E Balagurusamy "Object Oriented Programming with C++", Tata McGraw Hill, 4/E, 2008.
3. Yashavant Kanetkar, "Let Us C", BPB Publications ,10/E, 2010.
4. Reema Thareja, "Computer Fundamentals and Programming in C", OXFORD University Press, 2012.
5. Stephen G Kochan "Programming in C", Pearson Education , 3/E, 2004.
6. Ashok N Kamthane, "Computer Programming", Pearson Education , 2/E,2008.
7. Vikas Gupta, "Computer Concepts and C Programming", Dreamtech Press, 2009.
8. K R Venugopal and S R Prasad, "Mastering C", Tata McGraw Hill, 1/E, 2011.
9. Behrouz A Forouzan, Richard F Gilberg, "COMPUTER SCIENCE – A Structured Programming approach using C", Thomson, 3/E Indian Edition, 2007.
10. Kernighan, Ritchie, "The C Programming Language", Prentice Hall of India , 2/E, 1988.
11. Pradeep K Sinha and Priti Sinha, "Computer Fundamentals", BPB Publications , 4/E, 2007.
12. Robert Lafore, "Object Oriented Programming in Turbo C++", Galgotia Publication, 2003.

(Engineering Science Lab-I)

LAB COURSE OUTLINE

(Engineering Science Lab-I)

Engineering Science Lab-I	**ES-I LAB**	**FE 126**
Course Title	Short Title	Course Code

Laboratory (Alternate week)	**Hours/ Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	02	15	26	1

Engineering Physics – I

Course Description:

In this laboratory, course emphasis is on the understanding of basic principles, characteristic – properties for semiconductor diode, different instruments used in a field of optics, electronics, communication and metallurgy etc. The learner here can use this knowledge and apply in various branches of engineering as required.

Prerequisite Course(s): Course of Physics at HSC level.

General Objective:

The objective of the laboratory is to impart the fundamental knowledge of physics to the students and develop their ability to apply the specific procedures to analyze the experimental results.

In this lab, students will be familiar with the use of different equipments, basic principles, properties etc which they can apply in various disciplines of engineering during their studies and in future.

Learning Outcomes: After successful completion of this lab student will be able to:

a) Use the latest techniques, skills, and modern tools necessary for engineering practices.

b) Design a component, system or process to meet desired needs with in realistic constraints.

c) Understand classification of solid on the basis of band gap

d) Can analyze characteristic properties and determine the resistivity of semiconductor.

e) Analyze wavelength of Laser, working of Laser, various properties and applications.

f) Describe the use of fiber optics in communication.

g) Can study Hall effect & determine Hall coefficient.

h) Describe working of solar cell, its advantages, disadvantages and uses.

i) Describe the working of Michelson's Interferometer & find unknown wavelength of monochromatic light..

j) Can understand the phenomenon of diffraction & diffraction grating and determine wavelength of light using diffraction grating.

k) Can determine the polarizing angle & refractive index of glass by using Brewster's law.

l) Can study the law of Malus.

m) Can study the crystal structure.

LAB COURSE CONTENT

Practical -2 Hrs/Alternate weeks (Alternate with Engineering Chemistry- I)

(Note: Minimum FIVE Experiments from the following)

1. Semiconductor diode characteristics.

a) To determine forward and reversed characteristics of given semiconductor diode.

b) Analyze the knee voltage of given diode.

c) Compare analytical and the practical values.

2) Band gap in semiconductor material.

a) To determine forbidden energy gap of given semiconductor.

b) Compare analytical and the practical values.

3) To determine the resistivity of the given semiconductor by using four probe method.

a) To determine the resistivity of given semiconductor.

b) To study its variation with temperature.

4) To determine the wavelength of laser source

a) To determine wavelength of He-Ne Laser using diffraction grating.

b) Study the properties of Laser.

c) Compare analytical and the practical values.

5) Fiber Optics Communications.

a)Study of fiber optics communication

b) Describe the advantages of optical fiber over metallic cables.

6) Hall effect & determination of Hall coefficient.

a) A study of Hall Effect in semiconductors.

b) To determine Hall coefficient of semiconductor.

c) To determine the sign of majority charge carrier.

7) Solar cell Characteristics

a) To study the characteristics of solar cell

b) To find fill factor.

c) To determine its efficiency.

d) Measure intensity of source using Lux meter.

8) Spectrometer Grating

a) To understand diffraction phenomenon and diffraction grating.

b) To determine wavelength of light using diffraction grating

c) Compare analytical and the practical values.

9) Michelson's Interferometer

a) To determine unknown wavelength of monochromatic light.

b) Describe the operation of Michelson's Interferometer.

c) Compare analytical and the practical values.

10) Determination of polarizing angle for glass and to determine refractive index of glass using Brewster's law.

a) To determine polarizing angle and refractive index using Brewster's law.

11) Experimental verification of law of Malus

a) To study law of Malus (i.e.- Intensity of polarized light is proportional to $\cos^2\theta$)

12) Crystal structure

a) To Study the given crystal structure.

Reference Books:

1. M N Avadhanulu, A A Dani, P M Pokley, "Experimets in Engineering Physics", S.Chand.
2. S P Singh, "Advanced Practical Physics", Pragati Prakashan.

Engineering Chemistry-I

LAB COURSE OUTLINE

Course Description: In this laboratory course emphasis is on the understanding of basic principles, characteristic properties of water, polymers, and alloys as engineering materials. The learner here can use this knowledge and apply in various branches of engineering as required.

Prerequisite Lab Course(S): 12th Chemistry, Different laws, basic principles and theories.

General Objectives:

This course is intended to provide engineering students with a background in important concepts and principles of chemistry and emphasis on those areas considered most relevant in an engineering context, and practical applications in engineering and technology.

Learning Outcomes:

Upon successful completion of lab Course, student will be able to:

a) Analyze the total hardness of water sample by EDTA method.

b) Analyze the strength of dissolved oxygen from water sample by Winkler's Method.

c) Analyze the alkalinity of water sample by volumetric method.

d) Analyze the chloride content of water sample by Mohr's method.

e) Estimate the percentage of phenol iodometrically.

f) Determine the yield percentage of Polystyrene by bulk polymerization.

g) Determine the yield percentage of Phenol Formaldehyde Resin (Bakelite).

h) Analyze the percentage of copper in given Brass Sample.

i) Analyze the percentage of Zinc in given Brass Sample.

j) Analyze the percentage of Calcium in given Cement sample.

LAB COURSE CONTENT

Practical : 2 hour/ week (Alternate with Engineering Physics-I)

(Note: Minimum FIVE Experiments from the following)

1. Estimation of total hardness of given sample of water by EDTA Method.

a. Standardization of EDTA by using standard hard water.

b. To find the exact normality of EDTA solution.

c. Estimation of total hardness of given water sample.

2. Determination of Dissolved oxygen present in given water sample (Winkler's Method).

a. Standardization of Sodium Thiosulphate solution against std. $K_2Cr_2O_7$ solution using starch indicator.

b. Calculate exact normality of Sodium Thiosulphate solution.

c. Estimation of dissolved oxygen from given water sample.

d. Calculate the strength of dissolved oxygen from given water sample.

3. Determination of alkalinity of water sample.

a. To find the presence of OH^-, CO_3^{2-} and HCO_3^- ions in given sample of water by titrating against N/10 HCL using phenolphthalein indicator.

b. Using Methyl orange indicator in the same solution, to find out the methyl orange end point.

c. Calculate the amount of OH^-, CO_3^{2-} and HCO_3^- ions in given sample by end point results.

4. Estimation of Chloride content in a given water sample by Mohr's Method.

a. Standardization of $AgNO_3$ solution by using Standard NaCl solution.

b. To find the exact normality of $AgNO_3$ solution.

c. Estimation of Chloride ions in given sample of water.

d. Calculate the strength of Chloride ions in sample water.

5. Estimation of phenol by Iodometrically.

a. Dilution of Phenol solution.

b. Back titration of the above solution against standard 0.1 N Sodium Thiosulphate solutions.

c. Blank titration from brominating stock solution against 0.1 N Sodium Thiosulphate solutions.

d. Calculate the percentage of phenol.

6. Preparation of Polystyrene by bulk polymerization.

a. Add nitrogen to styrene in oil bath.

b. Cool the mixture and break it to give Polystyrene.

c. Dissolve the polystyrene in benzene, filter the precipitate and dry it.

d. Calculate the yield percentage.

7. Preparation of Phenol Formaldehyde Resin (Bakelite).

a. Dissolution of Glacial acetic acid, formaldehyde and phenol.

b. Acidifying the above solution.

c. Washing the residue obtained with distilled water and dry it.

d. Calculate of the yield of Phenol formaldehyde resin.

8. Estimation Copper in Brass Iodometrically.

a. Prepare given brass sample by acidifying, neutralizing and dilution in volumetric flask.

b. Determine the amount of Copper in diluted brass sample solution by volumetric titration.

c. Calculate the percentage of copper in given Brass Sample.

9. Estimation of Zinc from Brass Volumetrically.

a. Standardization of K_4 [Fe (CN) $_6$] by using Uranyl nitrate indicator.

b. Dilution of the brass sample.

c. By removing Sn, Pb, Cu, Fe from the solution.

d. Titrating the remaining solution against K_4 [Fe (CN) $_6$] and calculate the percentage of Zinc in Brass sample.

10. Determination of % of Ca in Cement.

a. Dilution of the cement sample in NH_4Cl Solution.

b. Distilled off and filter the solution with Whatmann paper No. 1.

c. To the above filtrate add NH_4NO_3 solution, keep the filtrate and washing for the estimation of Lime.

d. Estimation of Lime- Rectify the solution then add methyl red indicator along with ammonium oxalate solution.

e. Calculate the amount of Calcium using oven and estimate the percentage of lime from the sample.

f. Also find the percentage of calcium by volumetric analysis using $KMNO_4$ solution.

Reference Books:

1. Shashi Chawla, "Essentials of Experimental Engineering Chemistry", DhanpatRai Publishing Co.Pvt. Ltd.
2. Dr Sudha Rani, "Laboratory Manual on Engineering Chemistry", Dhanpat Rai Publishing Co.Pvt. Ltd.

Guide lines for ICA :

ICA (Internal Continuous Assessment) marks of 25 are for practicals in Engineering Physics - I & Engineering Chemistry – I.

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Computer Programming Lab

LAB COURSE OUTLINE

Computer Programming Lab	**CP LAB**	**FE 127**
Course Title	Short Title	Course Code

Course Description:

This laboratory provides students with a comprehensive study of the C and C++ programming language. Classroom lectures stress the strengths of C and C++, which provide students with the means of writing efficient, maintainable, and portable code.

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Laboratory	2	15	30	1

ESE Pattern: Practical (PR)

Prerequisite Course(s): Fundamental knowledge of Computers.

General Objective:

The objective of this laboratory is to introduce the students to the fundamentals of computers, the concepts of the C and C++ programming language and enable them to apply these concepts for solving real world problems.

Learning Outcomes:

Upon successful completion of the lab student will be able to

a) Program for basic arithmetic operations and expressions

b) Program for finding roots of a quadratic equation, square root of a number

c) Find area and volume of geometric objects

d) Find greatest and smallest of 2or 3 numbers

e) Generate odd / even numbers

f) Find factorial of a number

g) Check / generate prime numbers

h) Check for Armstrong numbers

i) Check a number for palindrome

j) Find GCD of two numbers

k) Generate sine /cosine series/value

l) Solve a linear equation

m) Print a number in words

n) Find Greatest / smallest/ sum /average of 'n' numbers

o) Convert Integer to binary / hex and octal

p) Find Greatest / smallest/ sum /average of 'n' numbers(Using arrays)

q) Apply Linear / binary search

r) Generate Permutation and Combination

s) Perform String processing / operations

t) Sort numbers and Strings

u) Perform Matrix operations

v) Record processing using structure

LAB COURSE CONTENT

(Note: Minimum SIX Experiments from group A and FOUR from group B.)

Group A

1. **Program for basic arithmetic operations and expressions.**
    a. Performing simple arithmetic operations like
    b. Addition,
    c. Subtraction,
    d. Multiplication,
    e. Division.
2. **Program for finding roots of a quadratic equation, square root of a number**

    Finding roots of any quadratic equation and square root of any given number.
3. **Find area and volume of geometric objects**

    Calculate area and volume of geometric objects (circle, square, triangle etc.)
4. **Finding greatest and smallest of 2 or 3 numbers**

    To find smallest and largest numbers from given 2 or 3 numbers.

5. **Generating odd / even numbers**

   To generate odd and even numbers.

6. **Finding factorial of a number**

   Calculate the factorial of any given number.

7. **Checking / generating prime numbers**

   Generate the prime numbers.

8. **Checking for Armstrong numbers**

   Generate the Armstrong numbers.

9. **Checking a number for palindrome**

   Check the given number for palindrome.

10. **Finding GCD of two numbers**

    Calculate GCD of any two numbers.

11. **Generating sine /cosine series/value**

    Generate the sine/cosine series.

12. **Solving a linear equation**

    To solve the linear equation.

13. **Printing a number in words**

    Print any given number in words.

14. **Greatest / smallest/ sum /average of 'n' numbers**

    Find the greatest/smallest/sum/average of any given n numbers.

15. **Integer to binary / hex and octal conversion**

    To integer to binary, hex and octal.

Group B

1. **Greatest / smallest/ sum /average of 'n' numbers**

   To find the greatest/smallest/sum/average of given n numbers using arrays.

2. **Linear / binary search**

   To search a number from given n numbers using linear and binary search.

3. **Permutation and Combination generation**

   Calculate the permutation and combination.

4. **String processing / operations**

Performing string operations using arrays.

5. **Sorting of numbers and Strings**

   Sorting any string and numbers ascending and descending order using arrays.

6. **Matrix operations**

   Performing matrix operation (addition, subtraction, multiplication etc.) using arrays.

7. **Record processing using structure**

   Processing student record using structures.

Reference Books:

1. E Balagurusamy, "Programming in ANSIC C", Tata McGraw Hill, 4/E, 2007.
2. E Balagurusamy "Object Oriented Programming with C++", Tata McGraw Hill, 4/E, 2008.
3. Yashavant Kanetkar, "Let Us C" , BPB Publications ,10/E, 2010.
4. Reema Thareja, "Computer Fundamentals and Programming in C", OXFORD University Press, 2012.
5. Stephen G Kochan "Programming in C",Pearson Education , 3/E, 2004.
6. Ashok N Kamthane, "Computer Programming", Pearson Education , 2/E,2008.
7. Vikas Gupta, "Computer Concepts and C Programming", Dreamtech Press, 2009.
8. K R Venugopal and S R Prasad ,"Mastering C", Tata McGraw Hill, 1/E, 2011.
9. Behrouz A Forouzan, Richard F Gilberg, "COMPUTER SCIENCE – A Structured Programming approach using C", Thomson, 3/E Indian Edition, 2007.
10. Kernighan, Ritchie, "The C Programming Language", Prentice Hall of India , 2/E, 1988.
11. Pradeep K Sinha and Priti Sinha, "Computer Fundamentals", BPB Publications , 4/E, 2007.
12. Robert Lafore, "Object Oriented Programming in Turbo C++", Galgotia Publication, 2003.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:

a. ESE will be based on the practical assignments submitted by the students in the form of journal.

b. In the ESE, the students may be asked to perform the practical assignment with minor modification.

c. Evaluation will be based on the paper work of flowchart and algorithm, understanding of the logic and the syntax, quality of program code, execution of the program code, type of input and output for the program code.

Elements of Civil Engineering and Engineering Mechanics Lab

LAB COURSE OUTLINE

Elements of Civil Engineering & Engineering Mechanics Lab	**ECE & EM LAB**	**FE 128**
Course Title	Short Title	Course Code

Course Description:

These laboratories cover experiments related to basic principles of Statics, Dynamics and Compass Surveying.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	13	26	1

ESE Pattern: Oral (OR)

General Objective:

In these laboratories students will be introduced to the applications of different theorems of mechanics to solve problems in statics and dynamics. Also students will get familiar with surveying with Compass. These include:

a) Concept of vectors.
b) Triangle law of forces.
c) Lami's theorem.
d) Conditions of equilibrium.
e) Laws of friction.
f) Laws of simple machines.
g) Angular measurement with Compass.

Objective to develop following Intellectual skills:

a) To understand basic laws of engineering mechanics & apply the same to solve problems.
b) To learn use of prismatic compass for angular measurements.
c) To identify principles and working of different apparatus in laboratories.

Objective to develop following Motor skills:

a) Ability to draw diagrams and graphs.
b) Ability to apply forces and measure the corresponding effects.
c) Ability to perform the experiments and record the observations.
d) Ability to apply the basic principles in various field conditions.

Learning Outcomes:

Upon successful completion of these experiments the student will be able to

a) Apply concept of vectors to solve problems in engineering.
b) Study and verify Lami's theorem and apply it to solve problems in engineering.
c) Understand and apply triangle law of forces for solving problems.
d) Understand the conditions of equilibrium of forces.
e) Describe efficiency, load, effort, velocity ratio, frictional effort and verify law of machines.
f) Describe frictional forces, limiting friction, coefficient of friction and verify law of friction.
g) Apply graphical method to solve problems.
h) Measure bearings of lines with prismatic compass and calculate included angles.

LAB COURSE CONTENT

Group A

1 Study of vectors.

a. To calculate resultant of coplanar and non coplanar (space) forces.
b. To calculate unknown force (reaction).

2 Verification of law of polygon of forces.

a. To verify law of polygon of forces.
b. To calculate analytically and experimentally resultant of concurrent force system.
c. To compare analytical values with measured ones.

3 Verification of Lami's theorem.

a. To Verify Lami's theorem.
b. To observe the ratios of $P/\sin\alpha$, $Q/\sin\beta$, $R/\sin\gamma$ and compare the same.

4 Forces in jib crane

a. To study law of triangle of forces analytically and graphically.
b. To apply conditions of equilibrium.
c. To calculate forces in members of jib crane.
d. To compare the theoretical results with experimental values.

5 Reactions of beam.

a. To verify conditions of equilibrium of a system of coplanar parallel forces using reaction of beam apparatus.
b. To understand active and reactive forces.

6 Simple friction on horizontal and inclined planes.

a. To describe frictional force, limiting friction, coefficient of friction, angle of

repose.

b. To know the concept that the Force Reaction.

c. To find coefficient of friction for bodies in equilibrium on inclined planes.

7 Study of simple machines and verification of law of machines

a. To describe efficiency, load, effort, velocity ratio, frictional effort and verify law of machines.

b. To establish the law of machine from graph.

8 Graphical work (Statics) – (minimum three problems on graphical solution of Static's problems).

To understand graphical method to solve the problems in statics.

a. To solve the problem on coplanar concurrent forces, parallel forces and reactions of beam by graphical method.

b. To describe Bow's notation, space diagram, vector diagram, polar diagram, funicular diagram and to draw the same.

9 Graphical work (Dynamics) – (minimum two problems on graphical solution of Dynamic's problems).

a. To draw the motion curve and understand the significance of the same.

b. To calculate displacement and distance travelled from V-T diagram.

Note: The laboratory journal should consist of six experiments/assignments from group A. Assignment no. 8 and 9 are compulsory. Any four out of remaining seven experiments/assignments are to be conducted.

Group B

1 Observations of bearings by using Compass and calculations of included angles.

a. Describe whole circle and quadrantal bearing system.

b. Calculate included angles from observed bearings in a closed traverse.

2 Assignment based on fifth unit. Any one of the following.

a. Write notes on the following: Various branches of civil engineering such as Structural Engineering, Water Resources Engineering, Geotechnical Engineering, Transportation Engineering, Environmental Engineering, Building Science and Construction Management.

b. Write notes on the following Civil Engineering structures such as buildings, highways, railways, bridges, dams, canals, elevated & ground storage reservoirs.

c. i) Explain principles of planning.

ii) Differentiate between load bearing and framed structures with neat sketches.

Note: The laboratory journal should consist of above two experiments/assignments from group B.

Reference Books:

1. Bhavikatti S S & K G Rajashekarappa, "Engineering Mechanics", New Age International (P) Ltd., Publishers.
2. Unadkat Sanju, "Engineering Mechanics", Tech-Max Publications, Pune.
3. Kanitkar T P and Kulkarni , "Surveying and Levelling, Part I", Pune Vidyarthi Graha Prakashan, 24th Edition
4. Bindra and Arora, "Building Construction", Dhanpatrai and Sons, Delhi.
5. N Kumara Swamy and A Ksmeswara Rao, "Building Planning and Drawing" ,Charotar Publishing House Pvt. Ltd.
6. Satish Gopi, "Basic Civil Engineering", Pearson Education, Delhi, 2008.
7. F P Beer and E R Johnson, "Mechanics for Engineers – Statics", McGraw-Hill Publication, 5th Edition
8. F P Beer and E R Johnson, "Mechanics for Engineers – Dynamics", McGraw-Hill Publication, 8th Edition.
9. S P Timoshenko and D H Young, "Engineering Mechanics", McGraw- Hill Publications, 4th Edition
10. R C Hibbeler "Engineering Mechanics statics and dynamics", Pearson Education, 11th Edition.
11. S R Bendale, "Engineering Mechanics", John Wiley & Sons, Delhi, 1st Edition
12. Jaget Babu, "Engineering Mechanics", Pearson Education, Delhi, 1st Edition.
13. Sushilkumar, "Building Construction", Standard Publishers, New Delhi, 2010.
14. M G Shah, Kale C.M. and Patki S.Y., "Building Drawing", Tata McGraw Hill Co. Ltd., New Delhi.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:

ESE will be based on practical assignments submitted by the student in the form of journal. In ESE the student may asked to answer questions based on experiments/assignments. Evaluation will be based on performance in oral examination.

Workshop Practice- I

LAB COURSE OUTLINE

Workshop Practice I	**WP-I**	**FE 129**
Course Title	Short Title	Course Code

Course Description:

Workshop Practice I covers the basic knowledge and practices on measuring instrument, fitting shop, welding shop, Tin smithy, Black smithy, foundry shop and computer hardware workshop in order to improve the practical skill of students in different workshops.

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Laboratory	2	11	22	1

Prerequisite Course(s): 11th, 12th Physics, Mathematics, Engineering Drawing, Engineering Materials.

General Objective:

In workshop practice, students will get familiar with use of different workshop practices like fitting, welding, tin smithy, black smithy, foundry and computer hardware workshop. Students will also get familiar with different tools, machines, equipments, job holding devices, job drawing, job material, job manufacturing operations and processes in different workshops.

Objective to develop following Intellectual skills:

a. Identification and selection of manufacturing processes/operations according to job requirement in different workshops.
b. Identification, selection and understanding of tools, equipments, machines and job material according to job drawing for different workshops.
c. Understanding working principle and construction of process planning sheet.
d. Identification, understanding of the working principle of computer hardware components.

Objective to develop following Motor skills:

a. Ability to handle measuring instruments.
b. Ability to read the job drawing.

c. Ability to understand the basic working principle of fitting operations, tools and equipments in fitting shop.
d. Ability to understand the basic working principle of welding operations, tools and equipments in welding shop.
e. Ability to understand the basic working principle of sheet metal operations, tools and equipments in tin smithy shop.
f. Ability to understand the basic working principle of black smithy operations, tools and equipments in black smithy shop.
g. Ability to understand the basic working principle of moudling and casting operations, tools and equipments in foundry shop.
h. Ability to understand working principle of computer hardware and its application.

Learning Outcomes:

Upon successful completion of these practical's the student will be able to hand

a) Measuring Instruments and fitting shop
b) Welding Shop
c) Tin smithy shop
d) Black smithy shop
e) Foundry shop
f) Computer Hardware Workshop

LAB COURSE CONTENT

1 Measuring Instruments

a. Demonstration of handling measuring instruments like steel rule, measuring tape, try- square, vernier caliper, micrometer, vernier height gauges, bevel protector etc.

b. **Fitting shop**

One job on finishing two sides and make right angles of square job by filling operation, one drilling and taping operations.

2 Welding Shop

a. One Job on T-joint: one side of T-joint welded by Gas welding and another by Electrical Arc Welding
b. Demonstration of Brazing.

3 Tin Smithy

One job including soldering, Riveting etc. For example- letter box, Waste paper basket, tray, Funnel etc.

4 Black Smithy

One job on black smithy including Bending and Flattening etc. For example: S-shape, hook shape, U shape job.

5 Foundry Shop

Demonstration of preparation of molding, casting of any simple pattern.

6 Computer Hardware Workshops

a. Introduction to Personal Computers, PC Main Parts: CPU, Input and Output devices.
b. Introduction of Floppy & CD drives, HDD, CD, DVD, USB Flash Drives, and Memory cards.
c. Introduction of Motherboard, I/O connectors. Installation of cards, devices and connecting cables, Identification of cables of computers (connecting media)

Reference Books

1. Hajara Chaudhary and Bose S K, "Element of Workshop Technology Volume I and II", Asia Publishing House.
2. P N Rao, "Production Technology Volume I and II", Tata McGraw Hill Publication.
3. R K Jain, "Production Technology", Khanna Publications.
4. P C Sharma, "Production Technology", Khanna Publication.
5. Chapman W A J, "Workshop Technology", ELBS Publication.
6. HMT, "Production Technology", Tata McGraw Hill Publication.
7. Kannaiah K L, Narayana, "Workshop Manual", Scitech Publications, Chennai, 2nd Edition.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Soft Skills - I

LAB COURSE OUTLINE

Soft Skills-I	**SS I**	**FE 130**
Course Title	Short Title	Course Code

Course Description:

Through this course we have tried to bridge the gap of industry and institution by bringing in an awareness and practical approach to soft skills such as communication skills, presentation skills and written language. This course stresses on ability to communicate, public speech, e-presentations and structure of English language.

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Lecture	1	15	15	2
Laboratory	2	15	30	

Prerequisite Course(s): Fundamental knowledge of English of 11th and 12th.

General Objectives:

We have tried to achieve the following objectives through this course:

a) To make the student industry ready in terms of his/her ability to communicate effectively

b) To augment the ability of the student to create, compose and render presentations with or without the help of media

c) To understand the importance of public speech and the role language plays in that

d) To enhance the ability of written communication by giving a primer on English

Learning Outcomes:

Upon successful completion of this course the student will be able to:

a) Understand the importance of communicating effectively

b) Communicate effectively by removing barriers

c) Address an audience effectively and deliver speeches without inhibition

d) Create and deliver effective e-presentations

e) Understand the meaning and utility of Active Listening in communication

f) Use the vocabulary more effectively

g) Expand and enrich grammatical structure and vocabulary in English

h) Comprehend thoughts through body language and use it as a tool to understand non-verbal signals for better communication

LAB COURSE CONTENT

1 Communicate With Confidence No of Lect. – 9, Marks: 16

a Communication Skills and Barriers to Communication

b Listening Skills

c Assertion Skills

2 Speaking to be Understood No of Lect. – 9, Marks: 16

a Basic Corpus for Formatted Feeding

b A Matter of Pronunciation

c Pattern Drills and Dialogues

3 Public Speech No of Lect. – 9, Marks: 16

a Influencing Others

b Speaking in Public

c Learning to Read Through Body and Voice

4 Effective Presentations No of Lect. – 9, Marks: 16

a Formulas and Advanced Techniques of Presentations

b E-Presentations

c The Fear Factor

5 Eloquent Writing - I No of Lect. – 9, Marks: 16

a Comprehension of Passages

b Understanding of English Language

c Vocabulary Enhancement Practice

Reference Books:

1. Allan and Barbara Pease, "A Definitive Book on Body Language", Publication Bantam Books.
2. Robert Bolton, "People Skills: How to Assert Yourself, Listen to Others and Resolve Conflicts", Publication Simon and Schuster.
3. R K Iyer, "Spoken English", IU Publications.
4. Sethi and Dhamija , "A Course in Phonetics and Spoken English", Prentice Hall of India.
5. Matthew McKay , "The Communication Skills", Publisher: New Harbinger Publications Inc.
6. Frank Paolo , " How to Make a Great Presentation in 2 Hours", Pustak Mahal.
7. Kaplan's GRE, Kaplan Publications.
8. Barron's GRE, Galgotia Publications.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and assignment submitted by the student in the form of journal.

New Proposed Syllabus

(With effect from 2013-14)

S.E. Biotechnology

Second Year Biotechnology

Faculty of Engineering and Technology

North Maharashtra University, Jalgaon

NORTH MAHARASHTRA UNIVERSITY, JALGAON
STRUCTURE OF TEACHING & EVALUATION
S.E. (BIOTECHNOLOOGY) W.E.F.2013-2014

Semester III

Course Code	Name Of The Course	Group	Teaching Scheme				Evaluation Scheme					Credits
							Theory		Practical		Total	
			Theory Hrs/Week	Tutorial Hrs/Week	Practical Hrs/Week	Total	ISE	ESE	ICA	ESE		
	Engineering Mathematics –III	A	3	1	--	4	20	80	--	--	100	4
BTL-301	Concepts in Biotechnology	B	3	--	--	3	20	80	--	--	100	3
BTL-302	Bioprocess Calculations	D	3	1	--	4	20	80	--	--	100	4
BTL-303	Unit Operations-I	D	3	--	--	3	20	80	--	--	100	3
BTL-304	Microbiology	D	3	--	--	3	20	80	--	--	100	3
	Soft Skills –III	C	1	--	2	3	--	--	50	--	50	2
BTP-305	LAB Microbiology	D	--	--	4	4	--	--	50	50	100	2
BTP-306	LAB Concepts In Biotechnology	B	--	--	2	2	--	--	50	--	50	1
BTP-307	LAB Unit Operations-I	D	--	--	2	2	--	--	25	25	50	1
TOTAL			**16**	**2**	**10**	**28**	**100**	**400**	**175**	**75**	**750**	**23**

Semester IV

Course Code	Name Of The Course	Group	Teaching Scheme				Evaluation Scheme					Credits
							Theory		Practical		Total	
			Theory Hrs/Week	Tutorial Hrs/Week	Practical Hrs/Week	Total	ISE	ESE	ICA	ESE		
BTL-401	Biochemistry	D	3	--	--	3	20	80	--	--	100	3
BTL-402	Immunology	D	3	1	--	4	20	80	--	--	100	4
BTL-403	Biostatistics	D	3	1	--	4	20	80	--	--	100	4
BTL-404	Unit Operations –II	D	3	--	--	3	20	80	--	--	100	3
BTL-405	Process Heat Transfer	D	3	--	--	3	20	80	--	--	100	3
BTP-406	LAB Computer Applications	B	1	--	2	3	--	--	50	--	50	2
BTP-407	LAB Biochemistry	D	--	--	2	2	--	--	25	25	50	1
BTP-408	LAB Immunology	D	--	--	2	2	--	--	25	25	50	1
BTP-409	LAB Unit Operations –II	D	--	--	2	2	--	--	50	--	50	1
BTP-410	LAB Process Heat Transfer	D	--	--	2	2	--	--	25	25	50	1
TOTAL			**16**	**2**	**10**	**28**	**100**	**400**	**175**	**75**	**750**	**23**

NOTE: As Microbiology practical requires 4 hrs workload for performance of practical hence two laboratory hours are merged to form four hours slot.

*Computer based numerical methods in Bioprocess Engineering.

S.E. Biotechnology

Semester-III

Second Year Biotechnology

Faculty of Engineering and Technology

North Maharashtra University, Jalgaon

Engineering Mathematics -III

Course Outline

Engineering Mathematics -III	**EM-III**	
Course Title	Short Title	Course Code

Course Description:

This course is aimed at introducing the fundamentals of basic Mathematics to undergraduate students. The background expected includes a prior knowledge of Mathematics from first year engineering or diploma and familiarity with various laws, principles and theories. The goals of the course are to understand the basic principle of Mathematics and its application in different area.

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Lecture	**03**	**15**	**40**	**03**
Tutorial	**01**	**15**	**12**	**01**

Prerequisite Course(s): EM-I, EM-II/ Diploma Mathematics.

General Objective:

The basic necessity for the foundation of Engineering and Technology being Mathematics, the main aim is to teach mathematical methodologies and models, develop mathematical skill and enhance thinking and decision making power of student.

Learning Outcomes:

After completion of this course learner will be able to:

1. Apply knowledge of mathematics in engineering and technology.

2. Identify, formulate and solve engineering problems.

3. Design Mathematical models for engineering problems and solve them.

Course Content

SE Biotechnology Engineering Mathematics-III Semester – III

Teaching Scheme
Theory : 3 hours/ week
Tutorial : 1 hour/ week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Examination (ISE) : 20 Marks

UNIT – I **No of Lecture: 8 Hours, Marks: 16.**

Linear Differential Equations:

- Solution of LDE of order n with constant coefficients.
- Method of variation of parameters (Only second order).
- Cauchy's linear equation.
- Legendre's linear equation.

UNIT – II **No of Lecture: 8 Hours, Marks: 16.**
Applications of Linear Differential Equations and Partial Differential equations

- Applications of linear differential equations to Chemical Engineering.
- Applications of Partial Differential equations to

  i) One dimensional heat flow equation $\frac{\partial u}{\partial t} = C^2 \frac{\partial^2 u}{\partial x^2}$

  ii) Two dimensional heat flow equation $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = 0$

UNIT – III **No of Lecture: 8 Hours, Marks: 16.**
Laplace Transform

- Definition and Existence of Laplace transforms.
- Laplace Transform of elementary/standard functions.
- Theorems & Properties of Laplace Transform (without proof).
- Inverse Laplace Transform.

- Laplace Transform of Unit step function.
- Solution of differential equations using LT.

UNIT – IV **No of Lecture: 8 Hours, Marks: 16.**
Statistics and Probability distributions

- Introduction to Mean, Mode, Median standard deviation, Variance, Coefficient of variation.
- Moments, Skewness and kurtosis.
- Correlation and Regression.
- Binominal Distribution.
- Poisson distribution.
- Normal distribution.

UNIT – V **No of Lecture: 8 Hours, Marks: 16.**
Vector Calculus

- Introduction to Gradient, Divergence, Curl, Solenoidal and Irrotational vector fields.
- Vector integration: Line Integral, Surface and Volume integrals.
- Gauss's, Stoke's and Green's Theorems (without proof).

Reference Books:

1. H.K. Dass - Advanced Engineering Mathematics (S. Chand Publication) New Delhi.
2. Erwin Kreyszig - Advanced Engineering Mathematics (Wiley Eastern Ltd.)
3. B.S. Grewal - Higher Engineering Mathematics, Khanna Publication, Delhi
4. Wylie C.R. & Barrett - Advanced Engineering Mathematics - McGraw Hill
5. B.V. Raman - Engineering Mathematics - Tata Mc- Graw – Hill.
6. A Text Book of Engineering Mathematics, By N. P. Bali, Laxmi Publication.

Concepts in Biotechnology

Course Outline

Concepts in Biotechnology	CB	BTL-301
Course Title	Short Title	Course Code

Course Description: This course is introduced for learning the basic fundamentals of Life sciences to undergraduate students. The prospectus includes a prior knowledge of Biotechnology. The goals of the course are to understand the basic principles of Biotechnology and its applications in different areas.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	15	40	03

Prerequisite Course(s): 10^{th}&12^{th} STD Zoology, Botany.

Objective of the Subject:

1. Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles.
2. Students will understand how these cellular components are used to generate and utilize energy in cells.
3. Students will apply their knowledge of cell biology to selected examples of changes or losses in cell function. These can include responses to environmental or Physiological changes, or alterations of cell function brought about by mutation.
4. Students will learn the basic principles of inheritance at the molecular, cellular and Organism levels.
5. Students will understand relationships between molecule/cell level phenomena ("Modern" genetics) and organism-level patterns of heredity ("classical" genetics).
6. Students will test and deepen their mastery of genetics by applying this knowledge in a variety of problem-solving situations.

Learning outcomes:

By completion of this course students will able:

1. To apply all knowledge about basic sciences such as mathematics, physics, chemistry and biology to all problems in molecular biology and genetics.
2. To be able to understand all knowledge about living organisms which is main subject of molecular biology and genetics.
3. To be able to use current techniques and analysis methods in molecular biology and genetics.
4. Understand the current concepts in Cell Biology, Stem Cell Biology and Development.
5. Know the basic cellular processes including heredity, transcription/translation (the central dogma), cellular replication and their role in development, physiology and higher level biological organization.
6. Know the structure/function of the basic components of prokaryotic and eukaryotic cells including macromolecules and organelles.
7. Demonstrate proficiency with at least one instrument commonly used in biological research (microscope, etc).

Course Content

SE Biotechnology Concepts in Biotechnology Semester - III

Teaching Scheme
Theory : 3 hours/ week
Practical: 2 hours/week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Examination (ISE) : 20 Marks
Internal Continuous Assessment(ICA) :50Marks

UNIT – I **No. of Lecture: 8 Hours, Marks: 16**

Cell Biology and Cell Theory

Structural organization of life, Concepts of modern cell, history of cell, Cell theory, Structure of cell:- Cell shape, size and cell number, Types of cells:- Prokaryotic cells and Eukaryotic cells, Chemistry of cells.

UNIT – II **No. of Lecture: 8 Hours , Marks :16**

Study of Intracellular Components of Cell

Cell organelles:-Structure & Functions of: Mitochondria, Plastids:- Chloroplast, Chromoplast, Nucleus, Ribosomes, Golgi complex, Endoplasmic Reticulum, Endosomes, Lysosomes, Peroxisomes.

UNIT – III **No. of Lecture: 8 Hours , Marks :16**

Cell Division

Cell cycle, mitosis, meiosis, genetic and biochemical approaches for the study of cell division, mitotic cell division, cell cycle check points, meiotic cell division, embryonic cell division, cell death, the cell cycle of cancer, central cell cycle control systems.

UNIT – IV **No. of Lecture: 8 Hours , Marks :16**

Basic Concepts in Genetics

Introduction to gene, Mendels law of segregation, Assumption involved in segregation, physical basis of segregation, Law of Independent Assortment: - Introduction, two characters of independent segregation, test cross of dihybrid & trihybrid, physical basis of independent assortment, Gene vs Allele: A modified concept, fine structure of gene.

UNIT – V **No. of Lecture: 8 Hours , Marks :16**

Elements of Genetics.

Chromosomes:- Introduction, chromosome number, size, morphology, chemical composition of chromosome and function, Structural chromosomal aberrations:- Introduction, origin of structural aberrations, structure of chromosomal aberrations, variation in chromosomal number, Mutation:- Introduction, characteristics of mutations, classification, spontaneous and induced mutations, Population genetics:- Introduction, gene frequency, genotype frequency, gene pool.

References:

1. B.D. Singh " Genetics" Kalyani Publications.
2. P.K.Gupta" Cell&MolegcularBiology"Rastogi Publications.
3. S.C. Rastogi" Cell& Molecular Biology" New Age International Publications.
4. C.B. Pawar" Cell Biology" Himalaya Publications.
5. C.B. Pawar" Cell and Molecular Biology" Himalaya Publications.

Bioprocess Calculations

Course Outline

Bioprocess Calculations	**BPCAL**	**BTL-302**
Course title	Short title	Course code

Course Description:

The goals of the course are to understand the basic principles of Bioprocess Calculations and their applications in different areas. It is highly essential to know the stoichiometry of the processes, conditions to achieve maximum product formation and recycle of the unused materials for better economy. Therefore, knowledge of process calculations is the first and foremost requirement for the success of a Biotechnology Engineering student

Lecture	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	**15**	**40**	**03**
Tutorial	**01**	**15**	**12**	**01**

Prerequisite Course(s):10th and 12th STD Chemistry, Biology, Mathematics.

Objective of the subject:

1. To make the student familiar with the basic chemical calculations
2. To study the material balance of unit operations used in process industries.
3. To study the material balance of bioreactions.
4. To understand the energy balance of physical operations.
5. To understand energy balance of bioreactions.
6. To make student familiar with psychrometric chart, steam table etc.
7. To make the student familiar with combustion of fuels.

Learning Outcomes:

After successful completion of this course the student will be able to:

1. Differentiate between different units and dimensions and solve relevant problems.
2. To have the ability to identify, formulate and solve engineering problems.

3. Have gained fundamental skills in solving material balance problems with and without bioreactions.
4. Have gained fundamental skills in solving energy balance problems with and without bioreactions.
5. Understand humidity, humid heat, humid volume, dry-bulb temperature, wet-bulb temperature, psychometric chart & steam table.
6. To find out the energy requirements for combustion of fuels.

Course Content

SE Biotechnology **Bioprocess Calculations** **Semester -III**

Teaching Scheme	**Examination Scheme**	
Theory : 3 hours/ week	End Semester Examination (ESE)	: 80 Marks
Tutorial : 1 hour/ week	Paper Duration (ESE)	: 03 Hours
	Internal Sessional Examination (ISE)	: 20 Marks

UNIT-I **No. of Lectures. – 08, Marks: 16.**

Units & Dimensions:

Basic & Derived Units, Dimensional Analysis, Dimensional & Empirical Equations. Different Ways of Expressing Units of Quantities & Physical Constants.

Properties of Gases, Liquids &Solids: Ideal & Real Gas Laws, Critical Properties, Properties of Mixtures & Solutions , Kay's Rule.

UNIT-II **No. of Lectures. – 08, Marks: 16.**

Material Balances without reaction:

Law of conservation of mass, Material balance of unit operations such as Distillation, Mixing, Evaporation, Leaching, Liquid -Liquid Extraction and Solid Liquid Extraction. Numerical based on bioprocesses.

UNIT-III **No. of Lectures – 08, Marks: 16.**

Material Balances with reaction:

Concept of limiting &excess reactants, conversion, yield and Selectivity . Material Balance of biochemical reactions & photochemical reactions. Material balance with recycle, by pass and purge stream of Bioprocesses.

UNIT-IV **No. of Lectures. – 08, Marks: 16.**

Energy balances:

Basic Energy Concept ,Units, Enthalpy, General Energy Balance equation ,Enthalpy Change in Non reactive Processes: sensible heat change, heat capacity, specific heat, sensible heat change with constant Cp, Change of Phase : Enthalpy of Condensations, Heat of solution, study of steam table, energy balance calculations without reaction, enthalpy change due to reaction, heat of combustion, heat of reaction for process with biomass production, heat of reaction with oxygen as electron acceptor, heat of reaction with oxygen not the electron acceptor, energy balance equation for cell culture, fermentation energy balance, Numericals based on above.

UNIT-V **No. of Lectures. – 08, Marks: 16.**

Humidity & Combustion

Humidity & saturation, Define Humid Volume, Humid Heat, Dry bulb temperature, Wet bulb temperature etc. Psychometric chart, solubility diagrams. Combustion: Introduction, fuels, calorific value of fuels, air requirements.

Reference Books:

1. Bhatt & Vora ,Stoichiometry :Tata McGraw Hill.
2. Pauline M. Doran, Bioprocess Engineering Principles, Academic Press an Imprint ofElsevier.
3. Durga Prasad Rao& DVS Murthy ,Process Calculations for Chemical Engineers:McMillanIndia, New Delhi .
4. K A Gavhane , Introduction to Stoichiometry : NiraliPrakashan.
5. Hougen O.A, Watson K.M, &Ragatz R.A. Chemical Process Principles Part-I Asia Publishing House, Mumbai.
6. Himmelblau D.M. Basic principles and calculations in Chemical Engineering, Prentice Hall Publication.
7. Shekhar Pandharipande and Samir Mushrif, Process Calculations. Pune Vidyarthi Griha Prakashan, Pune

Unit Operation –I

Course Outline

Unit Operation –I	**UO-I**	**BTL-303**
Course title	Short title	Course code

Course Description: The goals of the course are to understand the basic principles of fluid mechanics and their applications in different areas. The subject needs to be studied by the biotechnology students to understand the characteristics and properties of fluids as regards to the processing of raw ingredients in the industry.

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Lecture	03	15	40	03

Prerequisite Course(s): 10^{th} and 12^{th}Std Science, Mathematics.

Objectives of the Course:

1. To study dynamics of fluid flow.
2. To know the fluid properties and applications for energy conservation by studying fluid statics.
3. To make the students analyze the flow measurement principles and equipments.
4. To study and classify different types of pumps, blowers and compressors.
5. Student will be able to select right size pump for given pipeline or a system
6. To make the student familiar with boundary layer phenomenon.
7. To apply scientific method strategies to fluid mechanics, analyze qualitatively and quantitatively the problem situation, propose hypotheses and solutions.

Learning Outcomes:

After successful completion of this course the student will be able to:

1. Understand the following terms in relation to fluid mechanics: viscosity, density, specific gravity, and surface tension. Measure the properties listed above for any given fluids.
2. Apply their knowledge to minimize head losses and evaluate flow through a pipe system by using different types of flow meters.
3. Understand the principles of manometer to calculate pressure of the fluids.
4. Apply knowledge of pumps, blowers and compressors in different areas of engineering and technology for transportation of fluids and gases.
5. Understand the importance of boundary layer flow in engineering applications.

Course Content

SE Biotechnology Unit Operation –I Semester - III

Teaching Scheme
Theory : 3 hours/ week
Practical : 2 hour/ week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Examination (ISE) : 20 Marks
Internal Continuous Assessment (ICA) :25 Marks
End Semester Examination (ESE) (OR) :25 Marks

UNIT-I **No. of Lectures. – 08, Marks: 16.**

Properties of Fluid

Definition of fluid, mass density, specific weight, specific volume, specific gravity .viscosity concept, viscosity measurement: cone and plate viscometer, use of viscometer with fermentation broths, factor affecting broth viscosity, surface tension, capillarity. Types of fluid: ideal fluid, real fluid, Newtonian and non Newtonian, ideal plastic fluid etc. Numerical based on above.

UNIT-II **No. of Lectures. – 08, Marks: 16.**

Dynamics of Fluid Flow

Continuity equation, Euler's equation of motion, Bernoulli's equations for different conditions. pressure measurements: Hydrostatic law. Pascal law, principle and types of manometer, Numericals based on above.

UNIT-III **No. of Lectures. – 08, Marks: 16.**

Flow through Pipeline System

Major and minor losses, friction factor, friction factor chart, distribution of flowing fluids through branched pipe. Numerical based on above.

Boundary layers flow: Boundary layer flow, laminar boundary layer over a flat plate, turbulent boundary layer, laminar sub layer, boundary layer thickness: displacement thickness, momentum thickness, energy thickness.

UNIT-IV **No. of Lectures. – 08, Marks: 16.**

Flow measurement

Flow through Orifice meter, Nozzle meter, venturi meters, Rotameter and pitot tube. Reynolds experiment. Numerical based on above. Other flow measuring devices such as Ultrasonic flow meters, Anemometers, Electromagnet flow meters.

UNIT-V **No. of Lectures. – 08, Marks: 16.**

Pumping of Fluids

Pumping equipments: working and construction of the Reciprocating pump, Positive Displacement Pump, Centrifugal pumps, Peristaltic pump. NPSH calculations. Blowers & Compressors. Numerical based on above.

Reference Books:

1. Dr. R. K. Bansal, Fluid Mechanics: Laxmi Publications, New Delhi.
2. W.L. McCabe & J.C. Smith, Unit operations in chemical engineering: McGraw Hill/Kogakusha Ltd.
3. I P. Chattopadhaya Unit operations of chemical engineering-volume I: Khanna Publication New Delhi, 2nd edition 1996.
4. V.P. Gupta, Alam Singh and Manish Gupta Fluid Mechanics, Fluid mechanics and hydrostatics: CBS publishers New Delhi.
5. Pauline M. Doran, Bioprocess Engineering Principles, Academic Press an Imprint of Elsevier.

Microbiology

Course outline

Microbiology	**MB**	**BTL-304**
Course Title	Short Title	Course Code

Course Description:

This course is aimed at introducing the fundamentals of basic Microbiology to undergraduate students. The background expected includes a prior knowledge of Biology from HSC (science). The goals of the course are to understand the basic principles of life sciences and their applications in Engineering trade.

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Lecture	**03**	**15**	**40**	**03**

Prerequisite Course(s):11th, 12th Biology.

General Objective:

To build a necessary platform for analyzing the complex issues in microbiology, including the evolution and diversity of microbes; cell structure and function; metabolism; information flow and the role of microbes in ecosystems.

Learning Outcomes:

1. To apply their knowledge in research related to the use of microbes for human welfare like food production, pigment production, pharmaceutical products etc.
2. To communicate the fundamental concepts of microbiology, both in written and in oral format;
3. Should be able to analyze and simplify the complex issues in microbiology.

Course Content

SE Biotechnology **Microbiology** **Semester-III**

Teaching Scheme	**Examination Scheme**	
Theory : 3 hours/ week	End Semester Examination (ESE)	: 80 Marks
Practical : 4 hour/ week	Paper Duration (ESE)	: 03 Hours
	Internal Sessional Examination (ISE)	:20 Marks
	Internal Continuous Assessment (ICA)	:50 Marks
	End Semester Examination (ESE) (PR)	: 50 Marks

UNIT-I **No. of Lectures. – 08, Marks: 16.**

Introduction of Microbiology

Microbiology and its Scope; History of Microbiology: Contribution of Various Scientists in the Development of Microbiology, Incidences of Microorganisms in Environment, Classification of Microorganisms: Prokaryotes and Eukaryotes (Cell Structure), Morphology and Physiology of Bacteria, Yeast, Molds, Algae and Viruses

UNIT-II **No. of Lectures. – 08, Marks: 16.**

Techniques in Microbiology

Microscopy, nutritional requirements of microorganisms and microbial culture media, isolation, identification and maintenance of cultures (preservation), characteristics of pure culture, enumeration techniques.

UNIT-III **No. of Lectures. – 08, Marks: 16.**

Microbial Control

Basic terms: sterilization, disinfection, antiseptic, sanitizer, germicide, microbiostasis, antimicrobial agents, preservatives, factors influencing antimicrobial activity, mechanisms of cell injury, physical and chemical methods of control of microorganisms with principle, temperature, desiccation, osmotic pressure, surface tension, radiations, filtration, antiseptics and disinfectants, halogens, heavy metals, detergents, dyes.

UNIT-IV **No. of Lectures. – 08, Marks: 16.**

Microbial Growth

Modes of Cell Division, Microbial Growth Kinetics: Growth Rate & Generation, Mathematical expression for Growth, Growth Curve, Diauxic Growth Curve, Continuous Culture: Chemostat

and Turbidostat, Synchronous Culture: Selection by Size and Age, Selection by induction techniques.

UNIT-V **No. of Lectures. – 08, Marks: 16.**

Antibiotics & Other Chemotherapeutic Agents

Characteristics of Chemotherapeutic Agents, Antibiotics and their Mode of Action, Antifungal Antibiotics.

Reference Books:

1. M.J. Pelczar, Jr. E.C.S. Chan and N.R. Krieg, Microbiology 5th Ed. , TMH Book Company.
2. Powar and Daginawala, General Microbiology, Vol I and vol II , Himalaya Publishing House.
3. R.C.Dubey & D.K.Maheshwari, A Textbook of Microbiology, S. Chand Publications.
4. Stainer R.Y., Ingraharn J.L., Whoolis M.L. and Painter P.R. General Microbiology. The McMillan Press Ltd

Soft Skills – III

COURSE OUTLINE

Course Title	Short Title	Course Code
Soft Skills – III	**SK-III**	

Course Description: Through this course we have tried to prepare the students for the industry. Most companies test mathematical and logical ability through an aptitude test. This subject aims at working on these skills of a student through strategies formulae and practice exercises.

Lecture	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
	1	14	14	2

Prerequisite Course(s): Fundamental knowledge of High School Mathematics.

COURSE CONTENT

Soft Skills – III **Semester-III**

Teaching Scheme **Examination Scheme**

Lecture: 1 hour / week **Internal Continuous Assessment (ICA): 50 Marks**

Unit-I: Arithmetic-1 **No. of Lect. – 3, Marks: 10**

a. Basic Formulae

i. Divisibility Rules.
ii. Speed Maths.
iii. Remainder Theorem.
iv. Different Types of Numbers.
v. Applications.

b. HCF, LCM and Linear Equations

i. HCF – Successive Division and Prime Factorization Methods.
ii. LCM – Successive Division and Prime Factorization Methods.
iii. Applications.
iv. Linear Equations – Elimination Method.
v. Substitution Method.
vi. Applications.

c. Averages and Mixtures

i. Concept of Average.
ii. Faster Ways of Finding It.
iii. The Allegation Method.
iv. Applications.

Unit-II: Arithmetic–II **No of Lect. – 3, Marks: 10**

a. Percentages

i. Concept of Percentage.
ii. Working with Percentages.
iii. Applications.

b. Profit and Loss

i. Difference between Cost and Selling Price.
ii. Concept of Profit Percentage and Loss Percentage.
iii. Applications.

c. Time and Work

i. Basic Time and Work Formula.
ii. Relation between Time and Work.
iii. Applications.

Unit-III: Arithmetic–III **No of Lect. –3, Marks: 10**

a. Permutations and Combinations

i. Sum Rule of Disjoint Counting.
ii. Product Rule of Counting.

iii. Concept of Factorial.
iv. Permutations.
v. Linear Permutations.
vi. Combinations.
vii. Circular Permutations.
viii. Applications.

b. Probability

i. Definition and Laws of Probability.
ii. Mutually Exclusive Events.
iii. Independent Events.
iv. Equally Likely Events.
v. Exhaustive Events.
vi. Cards.
vii. Dice.
viii. Applications.

c. Time and Distance

i. Speed.
ii. Conversion Factors for Speed.
iii. Average Speed.
iv. Moving Bodies – Passing, Crossing and Overtaking.
v. Relative Speed.
vi. Boats and Streams.
vii. Applications.

Unit-IV: Non-Verbal Reasoning **No of Lect. 2, Marks: 10**

a. Analogies

i. Examples.
ii. Applications.

b. Classification

i. Examples.
ii. Applications.

c. Sequences

i. Examples.
ii. Applications.

Unit-V: Analytical Reasoning **No of Lect. – 3, Marks: 10**

a. Analytical Puzzles

i. Classification Puzzles.
ii. Ordering Puzzles.
iii. Assignment Puzzles.
iv. Applications.

b. Letter and Number Series

i. Different Types of Letter Series.
ii. Different Types of Number Series.
iii. Mixed Series.

c. Coding and Decoding

i. Letter Coding.
ii. Number Coding.
iii. Mixed Coding.
iv. Odd Man Out.
v. Applications.

Guide lines for ICA:

ICA will be based on credit tests and assignments submitted by the student in the form of journal.

Reference Books:

1. R. S. Aggarwal, "Quantitative Aptitude", S. Chand Publication, New Delhi, 2012.
2. R. S. Aggarwal, "A Modern Approach to Verbal Reasoning", S. Chand Publication, New Delhi, 2012.
3. R. S. Aggarwal, "A Modern Approach to Non-Verbal Reasoning", S. Chand Publication, New Delhi, 2012.

LAB Microbiology

Lab Course Outline

LAB Microbiology	LAB MB	BTP-305
Course Title	Short Title	Course Code

Laboratory	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	4	15	48	2

Course Description:

In this laboratory, course emphasis is on the understanding of basics of identification, isolation, cultivation of microorganisms from the enormous diversity found in environment and its application for the human welfare. The learner here can use this knowledge and apply in allied branches of Biotechnology as required.

Prerequisite Course(s): Course of Chemistry & Biology at HSC level and FE.

General Objective:

The objective of the laboratory is to impart the fundamental knowledge of biology at the microscopic level to the students and develop their ability to apply the specific procedures to analyze the experimental results.

In this lab, students will be familiar with the use of microorganisms as lab tools and various biological equipments which they can apply in research and Development in the field of Biotechnology

Learning Outcomes:

1. After successful completion of this lab student will be able to:
2. Use the microscope effectively and observe and identify the characteristics of microorganisms.
3. Stain the microbes for better visualization and characterization of cells and cell organelles
4. To identify and examine the microorganisms from the food sample and environment.
5. Enumerate the microbes by various methods including viable cell count, haemocytometer and turbidity measurement.
6. To prepare the media and cultivate the microorganisms by different methods.
7. Isolate the microorganisms by streak plate method, pour plate method, serial dilution method etc.
8. Different techniques for the maintenance and preservation of microorganisms.

9. To study the effect of antimicrobial agent , UV radiation & heat on microbial growth.
10. To examine the water samples microbiologically.

Lab Course Content

(Note: Minimum EIGHT Experiments from the following)

1. Study and use of microscope
    a. Examination of prepared slides
2. Preparation of laboratory media:
    a. Autoclaving,
    b. Preparation of agar slants and agar plates.
    c. Preparation of liquid media.
3. Isolation & Cultivation of microorganisms (Bacteria & Fungi) on solid and liquid media and observation of cells
    a. By streak plate method
    b. By pour plate method.
    c. By spreading
    d. Observation of cells:
        i. Cultural characteristics,
        ii. Biochemical characteristics
4. Staining techniques:
    a. Simple staining,
    b. Gram staining,
    c. Lactophenol cotton blue mounting of fungi.
5. Isolation by serial dilution method, maintenance & preservation.
6. Influence of antimicrobial agent, UV radiation & heat on microbial growth.
7. Study of bacterial growth curve. (Turbidity measurement as direct expression of growth)

LAB Concepts in Biotechnology

Lab Course Outline

LAB Concepts in Biotechnology	**LAB CB**	**BTP-306**
Course Title	Short Title	Course Code

Laboratory	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	2	15	20	1

Course Description:

Course emphasis is on the understanding of basic structure & identification and of Cell morphology. The learner here can use this knowledge and apply in allied branches of Biotechnology as required.

Prerequisite Course(s): Botany, Zoology

Course Objectives:

1. To study the cell morphology of animal, plant and bacterial cell.
2. To study mitosis of onion root tips.
3. To isolate different types of cell organelles: nucleus, mitochondria, lysosomes.

Course Outcomes:

By completion of this course students will able to:

1. To stain and distinguish animal, plant and bacterial cells.
2. To explain structure and functions of cell organelles.
3. To explain mitosis & meiosis in plant cell.
4. To isolate cell organelles by designing the specific protocol.
5. To identify different types of chromosomes.
6. To explain Karyotyping of animal, plant & bacterial cell

Lab Course Content

Practical 2 Hrs/ weeks
(Note: Minimum EIGHT Experiments from the following)

Practical Work:

1. Cell staining of Animal cell.
2. Cell staining of Plant cell.
3. Cell staining of Bacteria cell.
4. Mitosis of onion root tips
5. Meiosis of earthworm ovary
6. Microscopic identification of bacterial chromosomes.
7. Microscopic identification of Plant chromosomes.
8. Microscopic identification of Animal chromosomes.
9. Isolation of cell organelles: nucleus, mitochondria, lysosomes.
10. Karyotyping of animal, plant & bacterial cell.

LAB Unit Operation -I

Lab Course Outline

LAB Unit Operation -I	**LAB UO-I**	**BTP-307**
Course Title	Short Title	Course Code

Laboratory	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	2	15	20	1

Course Description: This course is intended to provide engineering students with a background in important concepts and principles of Unit operation –I.

Prerequisite Course(s): 10^{th} and 12^{th}Std Physics, Chemistry, Math's

General Objective: The objective of the laboratory is to impart the fundamental knowledge of Unit operations to the students and develop their ability to apply the specific procedures to analyze the experimental results.

Learning Outcomes:

After successful completion of this lab course the student will be able to:

1. Determine properties of Fluids .
2. Analyzed the characteristics curves of Centrifugal Pump.
3. Determine the coefficient of Venturi meter, Orifice meter, Nozzle meter.
4. Identify the fluids flow laminar , turbulent by Reynolds Experiment.
5. Estimate to minor losses in pipes.
6. Determine the fanning friction factor for given pipe.
7. Study of the different types of Fans, Blowers & Compressors.

Term Work Shall be based on any 08 experiments mentioned below.

List of the Experiments.

1. Determination of Viscosity.
2. Study of Manometers
3. Verification of Bernoulli's theorem.
4. To determine the coefficient of Venturi meter.
5. To determine the coefficient of Orifice meter.
6. To determine the coefficient of Nozzle meter.
7. Reynolds Experiment.
8. Minor losses in pipe.
9. To determine the fanning friction factor for given pipe.
10. Notches & Weirs.
11. To study the characteristics curves of Centrifugal Pump.
12. To study of the different types of Fans, Blowers & Compressors.

S.E. Biotechnology

Semester-IV

Second Year Biotechnology

Faculty of Engineering and Technology

North Maharashtra University, Jalgaon

Biochemistry

Course outline

Biochemistry	**BCH**	**BTL-401**
Course Title	Short Title	Course Code

Course Description:

This course is aimed at introducing the fundamentals of basic Biological chemistry to undergraduate students. The background expected includes a prior knowledge of Biology and chemistry from HSC (science) and first year engineering knowledge. The goals of the course are to understand the basic principles of life sciences and their applications in engineering trade.

	Hours/weeks	No.Weeks	Total Hours.	Semester Credits
Lecture	03	15	40	3

Prerequisite Course(s): 11th, 12th Biology, Chemistry

General Objective:

To build a necessary platform for analyzing the chemical basis of biological phenomenon, including the introduction to biomolecules and their role in biological systems, fundamentals of techniques used in biochemistry.

Learning Outcomes:

At the end of the course, students will be able to;

1. To identify the classes of biomolecules and their role in the biological system.
2. To explain the functions and properties of biomolecules
3. To explain the synthesis of biomolecules in biological system and how it directly relate the energy generation in body.
4. To separate biomolecules from the source by biochemical techniques and its application for human welfare

Course Content

SE Biotechnology **Biochemistry** **Semester-IV**

Teaching Scheme	**Examination Scheme**
Lectures :3 Hrs/week	End Semester Exams (ESE) : 80 Marks.
Practical : 2 Hrs/Week	Duration of Paper (ESE) : 3 Hours.
	Internal Sessional Exam (ISE) : 20 Marks.
	Internal Continuous Assessment (ICA) : 25 Marks
	End Semester Exam (ESE) (PR) : 25 Marks

UNIT –I **No of Lecture: 8 Hours, Marks: 16**

Carbohydrates & their Metabolism

Structure, Classification & Functions of Carbohydrates: Monosaccharides, Oligosaccharides, Polysaccharides. Metabolism: Glycolysis, Gluconeogenesis. TCA cycle, Pentose phosphate pathway , Glyoxylate cycle & Electron Transport Cycle (Brief), Regulation of glycolysis & TCA.

UNIT –II **No of Lecture: 8 Hours, Marks: 16**

Proteins & Amino Acids

Structure, Classification &Functions of Amino acids & Proteins. Metabolism: Amino acid degradation: Summary of amino acid catabolism, amino acid degradation to pyruvate, Acetyl COA, & α- ketoglutarate, Urea cycle. Biosynthesis: Amino acid synthesis overview, six essential amino acid synthesis, synthesis of glutamate, glutamine, proline & arginine.

UNIT –III **No of Lecture: 8 Hours, Marks: 16**

Lipids & their Metabolism

Structure & Functions of lipids: Triacyglycerols, Glycerophospholipids, sphingolipids, Cholesterol, phosphatidylinositols, eicosanoids. Oxidation of fatty acids. Biosynthesis: Fatty acids, Triacylglycerols, & Cholesterol, Glyceroneogenesis

UNIT –IV **No of Lecture: 8 Hours, Marks: 16**

Nucleotides & Vitamins

Vitamins: Introduction, Classification, Biochemical Functions, RDA, Dietary Sources, Deficiency. Structure & Functions of nucleotides. Biosynthesis of nucleotides: denovo synthesis of purine & pyrimidine synthesis and its regulation, salvage pathway.

UNIT –V **No. of Lecture: 8 Hours, Marks: 16**

Enzymes & Membrane transport

Enzymes: Introduction, Classification, mechanism of enzyme action, factors affecting enzyme activity (concentration of enzyme, substrate, temperature, pH), units of enzyme activity. Membrane transport: Architecture of membranes: Fluid mosaic model. Passive transport: Solutes, glucose, chloride-bicarbonate exchanger, Active transport: Na+. K+ ATPase, F-type ATPase, P-type ATPase.

Reference Books:

1. U Satyanarayana & U. Chakrapani, Biochemistry.
2. Donald Voet, Judith G. Voet, Charlotte W. Pratt, Principles of Biochemistry, International Student version
3. Lehninger A.L., Neston D.L., N.M. Cox "Principles of Biochemistry", CBS Publishers & Distributors.
4. Lubert Stryer "Biochemistry", W.H. Freemen & Co. , New York.
5. Weil J.H. "General Biochemistry", New Age International (Pvt. Ltd.).
6. Murray R.K. and others (Eds). Harper's Biochemistry, 25th Edn. Appleton and Lange Stanford.

Immunology

Course Outline

Immunology	IMM	BTL-402
Course Title	Short Title	Course Code

Course Objective:

This course is introduced for learning the basic fundamentals of the defense mechanism of human body. The prospectus includes a prior knowledge about the immunity, mechanisms and the therapy or treatment for curing the diseases.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**40**	**03**
Tutorial	**01**	**15**	**12**	**01**

Prerequisite Course(s): 10th & 12th Std Zoology.

Objective of the Subject:

To build a necessary platform for analyzing the chemical basis of immune system, including the introduction to immune organs and their role in biological systems, antibodies, and other immune molecules, fundamentals of techniques used in immunology.

Learning outcomes:

- The course is designed to give an understanding of the basic principles of modern immunology and an introduction to methods used in immunological research.
- Students will be able to describe the cells, molecules and pathways involved in the induction and regulation of innate and adaptive immune responses and how regulatory responses can be exploited therapeutically.
- Demonstrate an understanding of how vaccines work and of the requirements for developing new safe and effective injectable and mucosal vaccines.
- Integrate information on the role of the immune system in asthma and chronic obstructive pulmonary disease and the use of this information to develop new therapies for these conditions.

Course Content

SE Biotechnology **Immunology -** **Semester - IV**

Teaching Scheme	**Examination Scheme**	
Lectures :3 Hrs/week	End Semester Exams (ESE)	: 80 Marks.
Practical : 2 Hrs/Week	Duration of Paper (ESE)	: 3 Hours.
Tutorial : 1Hr/Week	Internal Sessional Exam (ISE)	: 20 Marks.
	Internal Continuous Assessment (ICA)	: 25 Marks
	End Semester Exam (ESE) (PR)	: 25 Marks

UNIT – I **No of Lecture: 8 Hours, Marks: 16**

Introduction to Immunology

Properties of immune response, Innate and acquired Immunity, active and passive immunity.

Cells & Tissues of Immune System: Lymphocytes, Classes of lymphocytes, antigen presenting cells, NK Cells, Mast Cells, Dendritic Cell, LPT cells, Organs of the Immune System, Bone marrow, Thymus, Lymph node, Spleen, MALT.

UNIT – II **No. of Lecture: 8 Hours , marks :16**

Molecular Immunology

Molecular structure of antibody, Classification, Isotypes, Synthesis assembly and expression of immunoglobulin molecules, Nature of antigens, function and diversity, Generation of anti-body diversity, Antigens: Different characteristics of antigens, mitogens, Hapten, Adjuvants.

UNIT – III **No. of Lecture: 8 Hours, marks :16**

MHC Molecule & Immune Mechanism

Discovery of MHC complex, Role of MHC, Structure of MHC molecule, Binding of peptides to MHC molecules, MHC restriction.

Mechanism of Immune Response: Cytokines, T- cell receptors, B cell activation cell complement system, antigen processing and presentation, regulation of immune response.

UNIT – IV **No. of Lecture: 8 Hours, marks :16**

Immunological Techniques

Antigen- antibody reactions, Immuno diffusion, immuno - electrophoresis, ELISA, RIA, Rocket immuno - electrophoresis, Agglutination reaction, Precipitation reaction, Flow cytometry.

UNIT –V **No. of Lecture: 8 Hours , marks :16**

Applied Immunology

Immune system in health and disease, autoimmunity, hypersensitivity, Immunology of graft rejection methods and precautions, GVHD, Hybridoma technology: - Fusion of myeloma cells with lymphocytes, production of monoclonal antibodies and their application.

References:

1. C.V. Rao " A Textbook of Immunology" Narosa Publishing House.
2. Kuby " A Textbook of Immunology" Freeman Publication.
3. Roitt I.M. (1998) Essentials of Immunology. ELBS, Blackwell Scientific Publishers, London.
4. Ivan Riot- Essentials of Immunology (6th Edition), Blakswell Scientific Publications, Oxford, 1988.

Biostatistics

Course Outline

Biostatistics	**BST**	**BTL-403**
Course Title	**Short Title**	**Course Code**

Course Description

This course is a combination of both elementary probability and basic statistics with a strong emphasis on engineering and science applications. The course coverage explores the treatment of data; probability; probability distributions; probability densities; curve fitting; correlation and regression; sampling distributions; inferences concerning means; inferences concerning variances; inferences concerning proportions; analysis of variance; factorial experimentation. This course will create interest to the students for probability and statistics.

Lectures	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	03	15	45	03
Tutorial	01	15	12	01

Objective of the subject:

1. Students will understand the Probability distribution. Namely, Binomial, Poisson and Normal distribution are discussed which will allow them to apply to engineering problems.
2. Students will understand what is meaning of bi-variate data and correlation between them.
3. Students will learn how to fit a curve to a given data.
4. Students will also understand the meaning of sampling.
5. Students will learn to test a hypothesis based on a sample.
6. Students will also learn various tests, for large sample and small sample.
7. Students will learn Experimental design.
8. Students will learn 2^2, 2^3 designs

Learning Outcomes:

1.Will be able to use Probability distributions effectively. Also will be able to know a given set of data will follow which distribution.

2.Will be able to calculate the mean and variance of a probability distribution.

3.Can correlate bivariate data and set relationship among data.

4.Can use sampling for performing any real experiment which is otherwise very expensive.

5.Will be able to use t-test, F-test and chi-square test etc. for Goodness of fit to test hypotheses.

6.Able to apply Randomization to avoid confounding the variable under investigation with other uncontrollable variables.

Course Content

SE Biotechnology **Biostatistics** **Semester - IV**

Teaching Scheme	**Examination Scheme**	
Lectures :3 Hrs/week	End Semester Exams (ESE)	: 80 Marks.
Tutorial : 1Hr/Week	Duration of Paper (ESE)	: 03 Hours.
	Internal Sessional Exam (ISE)	: 20 Marks.

UNIT – I **No of Lecture: 8 Hours, Marks: 16**

Probability Distributions

Random variables, The mean and variance of a Probability distribution, The Binomial and Poisson distributions, The Poisson's approximation to the Binomial Distribution. Continuous random variable, and Normal Distribution, Normal approximation to the Binomial Distribution.

UNIT – II **No of Lecture: 8 Hours, Marks: 16**

Curve Fitting

The method of Least Square, Curvilinear regression (quadratic, exponential), Correlation coefficient and its properties, Inferences about the correlation coefficient-(Normal Population)

UNIT – III **No of Lecture: 8 Hours, Marks: 16**

Sampling

Definitions of (population, sample, statistic, parameter, hypothesis, null hypothesis, alternative hypothesis, critical region, level of significance), Interval estimation, Confidence interval, confidence limit, Sampling, types of sampling, type-I error, type-II error. Test of sampling for single mean, two means.

UNIT – IV **No of Lecture: 8 Hours, Marks: 16**

Tests of Significance

Hypotheses concerning one proportion, Hypotheses concerning two proportions. Small sample test (1. Student t-test for an assumed mean and equality of means of two populations when sample observations are independent, 2. F-test for comparison of variances of two populations,) Chi-square test for independence of attributes, Goodness of fit and homogeneity of samples.

UNIT – V **No of Lecture: 8 Hours, Marks: 16**

Experimental Designs

Principles of experimental designs, Completely randomized, Randomized block and Latin square designs, Simple factorial experiments of 2^2, 2^3, 2^4, Confounding in factorial experiments (mathematical derivations not required); Analysis of variance (ANOVA) and its use in the analysis of RBD.

Reference Books:

1. Miller & Freund's Probability and Statistics for Engineers (Sixth Edition), by Richard A. Johnson.
2. A Text Book of Engineering Mathematics, by N. P. Bali and Manish Goyal.
3. Probability and Statistics for Engineers (India Edition), by Jay L. Devore
4. Gupta S.C. Fundamentals of Statistics. Himalaya Publishing House, New Delhi
5. Statistical methods in biology by Norman T.J. Bailey (3rd Edition), Cambridge University Press (1995).
6. Khan. Biostatistics. Tata Mc Graw Hill Publishers.
7. Daniel W.W.(9TH Edn., 2009). Biostatistics: A Foundation for Analysis in the Health Sciences. John Wiley and Sons Inc. New York.
8. Sharma N.K.(1996). Statistical Techniques. Mangal Deep Publications, Jaipur, India.

Unit Operation –II

Course outline

Unit Operation –II	**UO-II**	**BTL-404**
Course title	Short title	Course code

Course Description: The goals of the course are to understand the basic principles of mechanical operation and their applications in different areas of engineering and technology.The subject also includes solids handling and process characteristics for solids to process in industrial operations.

	Hours / Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Lecture	03	15	40	03

Prerequisite Course(s): Engineering Mechanics and Mathematics

Objective of the subject:

1. To make the student familiar with properties of solid.
2. To understand separation technique
3. To understand laws of crushing and grinding.
4. To study the industrial importance of mechanical operations.
5. To make student familiar with Fluidization and types of conveyors.

Learning Outcomes:

After successful completion of this course the student will be able to:

1. Understand the handling of solid and size reduction of solid.
2. Identify the separation technique.
3. Classify the solid according to size .
4. Understand the separation technique of fluid and solid.

5. Understanding basic principles of particles preparation and their characterization.

Course Content

SE Biotechnology **Unit Operation –II** **Semester -IV**

Teaching Scheme	**Examination Scheme**	
Lectures :3 Hrs/week	End Semester Exams (ESE)	: 80 Marks.
Practical : 2 Hrs/Week	Duration of Paper (ESE)	: 03 Hours.
	Internal Sessional Exam (ISE)	: 20 Marks.
	Internal Continuous Assessment (ICA)	: 50 Marks

UNIT-I **No. of Lecture: 8 Hours, marks :16**

Size Reduction

Properties of solids, Particle size, Specific surface area of the Mixture, Average particle size. Mechanism of size reduction , Energy utilization , crushing Efficiency , Energy for size reduction , Laws of crushing ,Types of equipment on the various stages of reduction such as Jaw crushers, Gyratory crusher, Hammer mill , Ball mill , Ultra fine grinders etc., Power requirement , Numerical based on above.

UNIT –II **No. of Lecture: 8 Hours, marks: 16**

Screening & Handling of Solids

Separation of solids by screening , Different types of screens , Capacity and efficiency of screen , Actual & ideal screens ,Screen analysis , Screening equipments such as Grizzly, Gyratory screens , Trommels , Shaking screens , Oscillating Screens. Material Balance over screen , Calculation of screen Effectiveness . Numerical based on above.

Handling of solids: Nature & characteristics of bulk solid, conveyor, Types of conveyor such as belt conveyor, Chain and flight conveyors, Screw conveyors and pneumatic conveyors.

UNIT III **No. of Lecture: 8 Hours, marks: 16**

Classification of solids & Sedimentation

Equipments for classification such as Gravity settling tank, Spitzkasten , Drag classifier , Elutriator , Cone classifier , Double cone classifier, Rake classifier, Cyclone separator, Magnetic separators, Electrostatic separator, Floatation Equipment , jigging , tabling etc.

Sedimentation: Laboratory batch sedimentation, Thickeners, Calculation of area & depth for continuous thickeners. Numerical based on sedimentation.

UNIT IV **No. of Lecture: 8 Hours, marks: 16**

Filtration & Centrifugation

Filtration: Equipments for filtration, constant pressure & constant rate filtration, filter calculations, Optimum time cycle, Handling of compressible cakes and use of filter aids , Washing of Cake .Numerical based on above .

Centrifugation: Centrifugation calculations, Filtration in a centrifuge, Equipments of centrifugal filtration .Problems on centrifugal Filtration. Comparison of sedimentation & centrifugation.

UNIT V **No. of Lecture: 8 Hours, marks: 16**

Fluid Solid Systems

Fluidization: Characteristics of fluidized systems, Effect of fluid velocity on pressure Gradient, Minimum fluidization velocity, types of fluidization , Application of fluidization such as fluidized bed catalytic cracking, in chemical and process industries, Fluidized bed combustion.

Numerical based on above.

References:

1. R. S. Hiremath and A.P. Kulkarni , Unit operations of Chemical Engg. (Mechanical operations Vol.-I: Everest publication.

2. Pauline M. Doran, Bioprocess Engineering Principles, Academic Press an Imprint of Elsevier.

3. W.L. McCabe and J.C. Smith, Unit Operations of Chemical Engg. : Tata McGraw Hill

4. J. M. Coulson and R.F. Richardson, Chemical Engg. Vol. I & II : Butter worth & Heinemann.

5. I. P. Chattopadhaya, Unit Operations of Chemical Engg. Vol. I : Khanna Publications, Delhi.

Process Heat Transfer
Course Outline

Process Heat Transfer	**PHT**	**BTL-405**
Course title	Short title	Course code

Course Description:

This course introduces students to key concepts and principles required to analyze problems involving heat exchange and energy conversion. Objective of the course is to study modes of heat transfer and development of relations to calculate hear transfer rate.

Lecture	**Hours / Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	15	40	03

Prerequisite Course(s): 10^{th} and 12^{th} Std Physics, Chemistry, Mathematics.

Objective of the subject:

1. To make the student familiar with conduction, convection and radiation phenomenon.
2. To understand condensation and boiling operations with regards to the processing of bio chemicals.
3. To develop the relations for rate of heat transfer to achieve optimized operations.
4. To study the types of heat exchanger and their uses in different industrial operations.
5. To study the types of evaporator and their uses for various industrial processes and applications.

Learning Outcomes:

After successful completion of this course the student will be able to :

1. Demonstrate general applications of heat transfer modes as conduction, convection and radiation in biochemical process industry.
2. Control the different parameters which are required for various biochemical processes.
3. Know the working and principle of all types of evaporators which are used in industries.
4. Know working and principles of all types of Heat Exchanger equipments which are widely used in biochemical, fermentation and pharmaceutical industries.
5. Apply their knowledge to condensate and boiling the various types of biochemicals and other fluids used in industries.
6. Design of heat exchange equipments.

Course Content

SE Biotechnology **Process Heat Transfer** **Semester -IV**

Teaching Scheme	**Examination Scheme**	
Lectures :3 Hrs/week	End Semester Exams (ESE)	: 80 Marks.
Practical : 2 Hrs/Week	Duration of Paper (ESE)	: 3 Hours.
	Internal Sessional Exam (ISE)	: 20 Marks.
	Internal Continuous Assessment (ICA)	: 25 Marks
	End Semester Exam (ESE) (OR)	: 25 Marks

UNIT-I **No. of Lecture: 8 Hours, marks :16**

Conduction in solids

Fourier's law of heat conduction, steady state heat conduction through walls (single and multilayer), heat flow through cylinder, sphere, unsteady state heat conduction, Lumped capacity. Thermal insulation, Optimum thickness of Insulation, Critical radius of insulation.

Numericals based on above.

UNIT-II **No. of Lecture: 8 Hours, marks :16**

Convection

Classification of convection(natural convection and force convection), individual and over all Heat transfer coefficients, Fouling factor ,Flow arrangement in heat exchanger, Log mean temperature difference(LMTD), Wilson Plot .

Numericals based on above.

UNIT-III **No. of Lecture: 8 Hours, marks :16**

Radiation heat transfer

Fundamental of radiation, black body radiation, Kirchhoff's law, radiant heat exchange between nonblack surfaces, Combined heat transfer by conduction, convection and radiation.

Heat transfer to boiling liquids**:** Pool boiling of saturated liquid .Boiling point curve.

Numericals based on above.

UNIT-IV **No. of Lecture: 8 Hours, marks :16**

Condensation & Evaporation

Heat transfer to fluids with phase change: Condensation, Drop wise and film wise Condensation, Condensation on vertical plate .

Evaporation: Types of evaporator (Jacketed pan evaporator, Calendria type evaporator, single effect evaporator. forced circulation evaporator, Multiple effect evaporator.

Numericals based on single effect evaporator.

UNIT-V **No. of Lecture: 8 Hours, marks :16**

Heat exchange equipments

Heat exchangers (Double pipe ,Shell and tube ,Kettle type ,plate type Heat Exchangers).

Effectiveness factor, capacity and NTU.

Numericals based on above.

Reference Books:

1. W.L.McCabe and J.C.Smith , Unit operations in chemical engineering. McGraw Hill/Kogakusha Ltd.
2. Dawande S.D. Principals of Heat Transfer and Mass Transfer. Central Techno Publications, Nagpur.
3. Coulson & Richardson , Chemical engineering. – Volume. I, Pergamon Press
4. Kern D.Q. Process Heat Transfer, McGraw Hill Book 1NC New York, 1950
5. D.S. Kumar, Process Heat Transfer, S.K. Kataria and Sons Publisher, New Delhi
6. Pauline M. Doran, Bioprocess Engineering Principles, Academic Press an Imprint of Elsevier.

Course Outline

Lab Computer Applications	**Lab CA**	**BTP-406**
Course Title	Short Title	Course Code

Course Description: This laboratory course is dealing with applications of computers for designing the various formulas required for Bioprocess engineering programme with a comprehensive study of the C++ programming language.

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Lecture	**01**	**15**	**10**	**01**
Laboratory	**02**	**15**	**16**	**01**

Prerequisite Course(S): Computer Programming, Engineering Mathematics I and II.

General Objectives:

1. Students will learn to solve matrix equations using Matrix Inversion method.
2. Students will learn to solve Differential equation of first order by various methods like Taylor's series method, Modified Euler's method, Runge Kutta's 4^{th} order method.
3. Students will also learn to solve Numerical Integrations by various methods like, by Picards method, Trapezoidal Rule, by Simpson's $1/3^{rd}$ Rule, Simpson's $3/8^{th}$ rule.

Learning Outcomes:

Students completing this course will able to apply knowledge of Basic Science using knowledge of C and C++ language in Bioprocess Engineering Problems. Students will demonstrate their ability to solve Bioprocess Engineering Problems using computer interface. Students will be able to provide a definite solution to various designing problems in Bioprocess Engineering field.

Course Content

SE Biotechnology **Lab Computer Applications** **Semester – IV**

Teaching Scheme
Theory : 1 hours/ week
Practical : 2 hours/ week

Examination Scheme
Internal Continuous Assessment (ICA): 50 Marks

Theory:

Introduction to object oriented programming

(a) Structure of C++ programming.

(b) Tokens, keywords, constant in C++.

(c) Derived data types, operators, expression in C++.

(d) Function in C++.

(e) Classes and objects in C++.

Introduction to Polymath and Bioprocess Engineering problems based softwares.

Fundamental concepts of Matrices, Numerical Differentiation & Numerical Integration.

Lab Work: (Any Eight from the following)

1. To solve Matrices using Matrix Inversion Method.
2. To solve Matrices using Gauss Elimination method.
3. To solve Differential equation of first order by Taylor's series method
4. To solve Differential equation of first order by Modified Euler's method
5. To solve Differential equation of first order by Picards method
6. To solve Differential equation of first order by Runge Kutta's 4^{th} order method
7. To solve Numerical Integration by Weddle's rule.
8. To solve Numerical Integration by Trapezoidal Rule
9. To solve Numerical Integration by Simpson's $1/3^{rd}$ Rule
10. To solve Numerical Integration by Simpson's $3/8^{th}$ rule

Reference Books:

1. E Balagurusamy “Object Oriented Programming with C++”, Tata McGraw Hill, 4/E,2008.
2. Yashavant Kanetkar, “Let Us C” , BPB Publications ,10/E, 2010.
3. Steven C. Chapra, Raymond P. Canale, Numerical Methods for Engineers, 6^{th} Edition, Tata McGraw Hill.
4. David M. Himmelblau, Basic Principles & Calculations in Chemical Engineering, 6^{th} Edn., Pearson Education Pvt.Ltd., New Delhi.
5. S.S.Sastry, Introductory methods of Numerical Analysis, Prentice Hall

LAB Biochemistry

Lab Course Outline

LAB Biochemistry	LAB BCH	BTP-407
Course Title	Short Title	Course Code

Practical	Hours/ Week	No. of Weeks	Total Hours	Semester Credits
	02	15	26	1

Course Description:

In this laboratory, course emphasis is on the understanding of basics of qualitative and quantitative identification and estimation of biomolecules from the enormous diversity of source in environment. The learner here can use this knowledge and apply in allied branches of Biotechnology as required.

Prerequisite Course(s): Course of Chemistry & Biology at HSC level and FE.

General Objective:

The objective of the laboratory is to impart the fundamental knowledge of chemical basis of biology at the research level to the students and develop their ability to apply the specific procedures to analyze the experimental results.

In this lab, students will be familiar with the use and application of biomolecules in laboratory and various equipments which they can apply in research and Development in the field of Biotechnology

Learning Outcomes:

After successful completion of this lab student will be able to:

- Estimate the amount of different biomolecules like carbohydrates, proteins, nucleic acids from various sources.
- Understand the basic principle of isoelectric precipitation.
- To apply the basic properties of biomolecules for their separation from mixture.
- To extract the lipids from various biological sources.
- To understand the basic principles of thin layer chromatography and gel electrophoresis.

Lab Course Content

Practical -2 Hrs/ weeks

(Note: Minimum Eight Experiments from the following)

1 Estimation of carbohydrates.

a. Estimation of reducing sugars by Dinitrosalicylic acid method.

2. Estimation of proteins.

a. Estimation of proteins by Lowry method.

3. Estimation of nucleic acids:

4. Isoelectric precipitation.

5. Separation of amino acids by paper chromatography.

6. Separation of sugars by paper chromatography.

7. Extraction of Lipids.

8. Thin layer Chromatography.

9. Gel Electrophoresis.

10-11. Assay of enzyme activity and enzyme kinetics.

12. Identification and estimation of an intermediate of EMP pathway.

13. Cell fractionation.

14. Vitamin Assay.

LAB Immunology

Lab Course Outline

LAB Immunology **LAB IMM** **BTP-408**

Course Title Short Title Course Code

Laboratory	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	2	15	16	01

Course Description:

Course emphasis is on the understanding of basic concepts in immunology. The learner here can use this knowledge and apply in allied branches of Biotechnology as required. The course is also helps for the study of antigen antibody interaction.

Course Objectives:

1) To study the antigen antibody interaction.
2) To study the analytical techniques such as ELISA, Ouchterlony diffusion.
3) To study the advanced techniques of the antigen antibody interactions such as Precipitin reaction, Antibody titer test, Agglutination reaction.

Course Outcomes:

By completion of this course students will able to:

1) To apply the basic fundamentals in antigen antibody reaction for designing the experiment.
2) To perform the analytical techniques in immunology is the industry.

Lab Course Content

Practical -2 Hrs/ weeks

(Note: Minimum Eight Experiments from the following)

Practical Work Shall be based on any 08 experiments mentioned below.

1. Immunoelectrophoresis.
2. Radial immunodiffusion.
3. Antigen –Antibody interaction: The Ouchterlony procedure
4. Introduction to ELISA reactions
5. Western Blot Analysis – demo.
6. Immunology of pregnancy test – demo.
7. Latex agglutination test
8. Precipitin reaction
9. Antibody titer test
10. Agglutination reaction.

LAB Unit Operation -II

Lab Course Outline

LAB Unit Operation-II	**LAB UO-II**	**BTP-409**
Course Title	Short Title	Course Code

Laboratory	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	02	15	16	01

Course Description: This course is intended to provide engineering students with a background in important concepts and principles of Unit operation –II.

Prerequisite Course(s): Engineering Mechanics and Mathematics.

General Objective: The objective of the laboratory Course is to impart the fundamental knowledge of unit operations to the students and develop their ability to apply the specific procedures to analyze the experimental results.

Learning Outcomes:

After successful completion of this lab course the student will be able to:

1. Separate of solids by sedimentation techniques .
2. Ascertain the fineness number and to study the differential & cumulative screen analysis of the sand.
3. Determine power requirement for crushing.
4. Determine the rate of filtration ,specific cake resistance and filter medium resistance
5. Find out the rate of filtration
6. Calculate minimum fluidization velocity
7. Determine the effectiveness of the Vibrating screen.
8. Mini Pulveriser : To study the Mini Pulveriser
9. Cyclone Separator : To study the operating behavior of cyclone separator and to find out its efficiency.

Lab Course Content

Practical -2 Hrs/ weeks

TW / Practicals:

Term Work Shall be based on any 08 experiments mentioned below. List of the Experiments.

1. To study the separation of solid by sedimentation
2. Sieve Shaker: To ascertain the fineness number and to study the differential & cumulative screen analysis of the sand
3. Ball Mill :To verify the laws of crushing & grinding
4. Jaw Crusher : To verify the laws of crushing & grinding
5. Plate & Frame Filter Press: To determine the rate of filtration ,specific cake resistance and filter medium resistance
6. Rotary Vacuum Filter: To find out the rate of filtration
7. Fluidization : To observe and study the behavior of the bed during fluidization and to calculate minimum fluidization velocity
8. Sigma Kneader Mixer : To study the sigma Kneader Mixer
9. Vibrating Shifter : To find out the effectiveness of the Vibrating Shifter
10. Mini Pulveriser : To study the Mini Pulveriser
11. Cyclone Separator : To study the operating behavior of cyclone separator and to find out its efficiency
12. Ribbon Blender : To study the Ribbon Blender & to find out the mixing index

LAB Process Heat Transfer

Lab Course Outline

LAB Process Heat Transfer	**LAB PHT**	**BTP-410**
Course Title	Short Title	Course Code

Laboratory	Hours/ Week	No. of Weeks	Total Hours	Semester Credits
	02	15	16	01

Course Description:

In this laboratory course emphasis is on the understanding of basics of Process heat transfer

Prerequisite Course(s): Engineering Physics and Chemistry I and II, Mathematics.

General Objective: The objective of the laboratory is to impart the fundamental knowledge of Process heat transfer to the students and develop their ability to apply the specific procedures to analyze the experimental results.

Learning Outcomes:

After successful completion of this Lab course the student will be able to:

1. Demonstrate general applications and use of heat exchange equipments in industries.
2. Control the different parameters which are required for various processes industries .
3. Apply their knowledge to condensate and boiling the various types of fluids used in industries.
4. Determination of emissivity of test plate.
5. Determination thermal conductivity of metals and insulators.

Lab Course Content

Practical -2 Hrs/per Week

(Note: Minimum EIGHT Experiments from the following)

1) Conductivity of metals and / or insulator.
2) Experiment on Pin fins.
3) Experiment on forced convection apparatus.
4) Experiment on natural convection apparatus.
5) Determination of emissivity of test plate.
6) Stefan Boltzmann apparatus .
7) Parallel / counter flow heat exchanger.
8) Study of pool boiling phenomenon and critical heat flux.
9) Study of heat transfer in evaporator .
10) Temperature profile in a rod .
11) Study of evaporators .
12) Drop wise and film wise condensation .

Proposed Syllabus

(With effect from 2014-15)

T.E. Biotechnology

Third Year Biotechnology

Faculty of Engineering and Technology
North Maharashtra University, Jalgaon

T.E. Biotechnology

Semester-V

Third Year Biotechnology

Faculty of Engineering and Technology
North Maharashtra University, Jalgaon

NORTH MAHARASHTRA UNIVERSITY, JALGAON
STRUCTURE OF TEACHING & EVALUATION
T.E. (BIOTECHNOLOGY) W.E.F.2014-2015

Semester V

Course Code	Name Of The Course	Group	Teaching Scheme				Evaluation Scheme					Credits
							Theory		Practical		Total	
			Theory Hrs/Week	Tutorial Hrs/Week	Practical Hrs/Week	Total	ISE	ESE	ICA	ESE		
BTL-501	Bioprocess Instrumentation & Analysis	D	3	--	--	3	20	80	--	--	100	3
BTL-502	Molecular Biology	D	3	--	--	3	20	80	--	--	100	3
BTL-503	Chemical Reaction Engineering	D	3	--	--	3	20	80	--	--	100	3
BTL-504	Enzyme Engineering	D	3	--	--	3	20	80	--	--	100	3
BTL-505	Bioprocess Industrial Economics & Management	C	3	--	--	3	20	80	--	--	100	3
BTP-506	LAB Molecular Biology	D	--	--	4	4	--	--	50	25	75	2
BTP-507	LAB Bioprocess Instrumentation & Analysis	D	--	--	2	2	--	--	25	25	50	1
BTP-508	LAB Chemical Reaction Engineering	D	--	--	2	2	--	--	25	25	50	1
BTP-509	LAB Tissue Culture Engineering	B	1	--	2	3	--	--	50	--	50	2
BTP-510	Industrial Training/EDP/Special Study	D	--	--	--	--	--	--	25	--	25	2
TOTAL			**16**	**--**	**10**	**26**	**100**	**400**	**175**	**75**	**750**	**23**

NOTE: As Molecular Biology practical requires 4 hrs workload for performance of practical hence two laboratory hours are merged to form four hours slot.

Semester VI

Course Code	Name Of The Course	Group	Teaching Scheme				Evaluation Scheme					Credits
							Theory		Practical		Total	
			Theory Hrs/Week	Tutorial Hrs/Week	Practical Hrs/Week	Total	ISE	ESE	ICA	ESE		
BTL-601	Bioprocess Engineering	D	3	--	--	3	20	80	--	--	100	3
BTL-602	Genetic Engineering	D	3	--	--	3	20	80	--	--	100	3
BTL-603	Fermentation Technology	D	3	--	--	3	20	80	--	--	100	3
BTL-604	Mass Transfer	D	3	--	--	3	20	80	--	--	100	3
BTL-605	IPR & Entrepreneurship	C	3	--	--	3	20	80	--	--	100	3
BTP-606	LAB Bioprocess Engineering & Fermentation Technology	D	--	--	4	4	--	--	50	50	100	2
BTP-607	LAB Mass Transfer	D	--	--	2	2	--	--	25	25	50	1
BTP-608	LAB Genetic Engineering	B	--	--	2	2	--	--	25	--	25	1
BTP-609	Minor Project	D	--	--	2	2	--	--	50	--	50	2
BTP-610	Seminar - I	D	--	--	2	2	--	--	25	--	25	2
TOTAL			**15**	**--**	**12**	**27**	**100**	**400**	**175**	**75**	**750**	**23**

NOTE: As Bioprocess Engineering & Fermentation Technology practical requires 4 hrs workload for performance of practical hence two laboratory hours are merged to form four hours slot.

Bioprocess Instrumentation & Analysis

Course Outline

Bioprocess Instrumentation & Analysis	**BIA**	**BTL-501**
Course Title	Short Title	Course Code

Course Description:
This course describes basic principles of instrumentation and instrumental analysis. This course will make the students knowledgeable in various types of measuring instruments used in process industries.

Lecture	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	**15**	**45**	**03**

Objective of the Subject:

1. To make the student familiar with various types of Measurement techniques.
2. To make the student familiar with various methods of composition analysis.
3. To understand basic principles behind the working of different analytical instruments and its application in industries.

Prerequisite Course(s): 12^{th} Std. Science and SE Biotechnology Courses

Learning outcomes:
After completion of this course students will able to:
1. Familiar with various standards and calibration methods used in Instrumentation and Instrumental Analysis.
2. Will get knowledge of basic principles behind the working of different analytical instruments and its application in industries.
3. Use suitable measurement technique for process industries.
4. Have ability to control system for monitoring of various parameters in bioprocess industries and to maintain safety.

Course Content

TE Biotechnology **Bioprocess Instrumentation & Analysis** **Semester - V**

Teaching Scheme	**Examination Scheme**	
Theory : 3 hours/ week	End Semester Examination (ESE) :	80 Marks
	Paper Duration (ESE):	03.00 hr
	Internal Sessional Examination (ISE):	20 Marks

Unit: I **No. of Lecture: 8 Hours, Marks: 16**

Qualities of Measurement: The meaning of measurement, the elements of instruments, Expansion Thermometers: Introduction, Constant volume gas thermometer, Bimetallic Thermometer, Industrial pressure spring thermometer, Response of Thermometer. Thermoelectric Temperature Measurement: Introduction, Simple thermocouple circuit, Industrial thermocouples, Thermocouple lead wires, thermal wells, response of thermocouples. Resistance temperature detector

Unit: II **No. of Lecture: 8 Hours, Marks: 16**

Pressure and Vacuum Measurement: Introduction, Indicating pressure gage, Bellows pressure element, Useful ranges of absolute pressure measuring gages, Mclead vacuum gage. Measurement of Level: Float and tape liquid level gage, Float and shaft liquid level unit, Level measurement in pressure vessels, Gamma ray method, Ultrasonic method and resistive method.

Unit-III **No. of Lecture: 8 Hours, Marks: 16**

pH measurement: Introduction , Method of pH Indicator, Potentiometric Method, Application of pH Measurement. Infrared Spectroscopy: Introduction, Instrumentation, Application of Infrared spectroscopy. X-ray diffraction: Introduction, Application of X- ray diffraction.

Unit-IV **No. of Lecture: 8 Hours, Marks: 16**

Refractrometry: Introduction, Abbe refractometer, Application of refractometer.
UV Spectrophotometer: Introduction, Instrumentation, Application of UV Spectrophotometer.
Colorimetery: Introduction, Theory.

Unit-V **No. of Lecture: 8 Hours, Marks: 16**

Flame photometry: Introduction, Instrumentation, Application of Flame photometry.
Scanning Electron Microscope: Introduction, Instrumentation, Application of Scanning Electron Microscope, Transmission Electron Microscope: Introduction, Instrumentation, Application of Transmission Electron Microscope.

Text Books:

1. D.P.Eckman, Industrial Instrumentation, Willey Eastern Ltd., New Delhi.
2. Gurdeep Chatwal and Sham Anand, Instrumental methods of Chemical analysis, Himalaya publication House, Mumbai.

Reference Books:

1. Patranabis D. Industrial Instrumentation, Tata – Mcgraw Hill Publications, New Delhi.
2. P. Kudesia and S.S. Sawhaney, Instrumental methods of chemical analysis Pragati Prakashan, P.O.Box No. 62, Begum Bridge, Meerut 250001,U.P.
3. Nakra B.C. and K.K. Chaudhary, Instrumentation Measurement and Analysis, Tata – McGraw Hill, New Delhi.
4. B.K.Sharma.Goel, Instrumentation methods of chemical analysis, Publishing House,11,Shivaji Road, Meerut-250001,U.P.

Molecular Biology

Course Outline

Molecular Biology	**Mol Bio**	**BTL-502**
Course Title	Short Title	Course Code

Course Description:
This course is aimed at developing the basic knowledge and skills of molecular biology to undergraduate students. The background expected includes a prior knowledge of SE Biotechnology courses. The goals of the course are to understand the basic principles of Molecular Biology and their applications in engineering trade.

	Hours per Week	**No. of Weeks**	**Total Hours**	**Credits**
Lecture	**03**	**15**	**45**	**03**

Prerequisite Course(s): 11^{th}, 12^{th} Biology, SE Biotechnology courses

General Objective:

- To develop the basic knowledge and skills of molecular biology, including the introduction to central dogma of molecular biology and their role in biological systems,.

Learning Outcomes:
After completion of the course, students will be able to;

- To describe basic molecular and genetic concepts and principles.
- To communicate the fundamental concepts of molecular biology both in written and in oral format.
- Critically evaluate data, develop and design experiments to address a novel problem in the form of project.
- Demonstrate advanced knowledge in a specialized field of molecular biology.

COURSE CONTENT

TE Biotechnology **Molecular Biology** **Semester-V**

Teaching Scheme

Lectures -3 Hrs/week

Examination Scheme

End Semester Exams (ESE): 80 Marks.
Paper Duration: 3 Hours.
Internal Sessional Exam (ISE):20 Marks.

Unit: I: **No. of Lecture: 8 Hours, Marks: 16**

Introduction to Genetic Material

Introduction: Nucleic acids, DNA Chemical Composition, Chargoffs Equimolar Base Ratio, Molecular Structure of DNA, Watson and Crick Double Helical Model of DNA, forms of DNA (B-DNA, A-DNA, C-DNA, D-DNA, E-DNA, Z-DNA)

RNA: Occurrence, types of RNA: rRNA, tRNA, mRNA. Structure of ribosome's. Central Dogma, One Gene – One Polypeptide Hypothesis.

Unit: II **No. of Lecture: 8 Hours, Marks: 16**

DNA Replication

Replication: Overview, Basic rules and requirements of Replication, Types of DNA replication: Generalized Model for the DNA replication, Semi conservative method of replication, Meselson and Stahl experiment, bidirectional DNA replication, Molecular mechanism of DNA replication, Enzymes and proteins involved in DNA replication: Structure and functions of DNA polymerase I,II,III, primase, polynucleotide ligase, endonuclease, helicase, single stranded binding proteins, topoisomerase, Replication Models Theta replication model, Rolling circle Model, D-Loop Model.

Unit: III **No. of Lecture: 8 Hours, Marks: 16**

Transcription

Transcription and Processing of RNA: Transcription, **Mechanism of Transcription in Prokaryotes,** RNA polymerase of prokaryotes (structure, types and function),Transcription Unit, Promoter Site, Molecular Mechanism of Transcription in Prokaryotes, , Molecular **Mechanism of Transcription in Eukaryotes**, RNA polymerase of Eukaryotes (structure, types and function), Transcription Factors, Eukaryotic promoters, **RNA processing/Post transcriptional modification:** Introduction, processing of the pre rRNA, tRNA, and the mRNA transcript(eukaryotic), RNA splicing (mechanism).

Unit: IV **No. of Lecture: 8 Hours, Marks: 16**

Genetic Code and Protein Synthesis

Genetic code: Nature and characteristics of Genetic Code, Reasons for degeneracy, Biological Significance of Degeneracy of Genetic Code

Protein synthesis:- Mechanism of protein synthesis: Transcription Overview,

Translation: Activation of the amino acids, attachment of activated amino acids with tRNA, stages during translation, Translation in Prokaryotes and Eukaryotes, Translocation of proteins, Post translational processing of Proteins (Protein Folding and Biochemical Modifications)

Unit: V **No. of Lecture: 8 Hours, Marks: 16**

Regulation of gene expression & DNA damage and repair

Gene regulation in prokaryotes, Mechanisms of gene regulation at Transcription level, Induction and repression, Lac Operon System, Tryptophan Operon System, Gene regulation and Translation level, Gene regulation in eukaryotes,

DNA damage and repair: Types of damages, damaging agents, repair mechanisms - photoreactivation, dark repair, postreplicational recombination repair, SOS repair.

Reference books:

1. Fundamentals of Molecular Biology by Veer Bala Rastogi; Ane Books Pvt. Ltd
2. Cell and Molecular Biology by P.K.Gupta, Third Edition, Rastogi Publications
3. Molecular Biology of cell – Lodish et al
4. Genes and Genomes – Singer M and Berg P.

Chemical Reaction Engineering

Course Outline

Chemical Reaction Engineering	**CRE**	**BTL-503**
Course Title	Short Title	Course Code

Course Description:
The goal of the course is intended to provide a strong foundation in concepts and principles of Chemical reactions used in bioprocess industries.

Lecture	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	**15**	**45**	**03**

Objective of the Subject:

1. To make the student familiar with various types of reactions.
2. Student will be able to understand the kinetic study of various chemical & biochemical reactions.
3. Student will be able to design various types of reactors used in process industries.

Prerequisite Course(s): 12^{th} Std. Science and SE Biotechnology Courses.

Learning outcomes:
After completion of this course students will able to:

1. Determine the rate and order of reaction from experimental data.
2. Analyze and interpret the kinetics of reactions.
3. Apply the fundamentals of chemical reaction engineering to design different types of reactors.
4. Explain heterogeneous system with its applications.

Course Content

TE Biotechnology **Chemical Reaction Engineering** **Semester - V**

Teaching Scheme	**Examination Scheme**	
Theory : 3 hours/ week	End Semester Examination (ESE) :	80 Marks
	Paper Duration (ESE):	03.00 hr
	Internal Sessional Examination (ISE):	20 Marks

Unit: I **No. of Lecture: 8 Hours, Marks: 16**

Introduction to chemical reaction engineering: Classification of chemical reactions, rate of reaction, order and molecularity of reaction, rate constant, activation energy, transition state theory and temperature dependency, comparison of theories, Reaction mechanism.

Unit: II **No. of Lecture: 8 Hours, Marks: 16**

Collection and interpretation of kinetic data, ,integral and differential method of analysis of data, Half life method , Constant volume batch reactor ,Variable volume batch reactor.

Unit: III **No. of Lecture: 8 Hours, Marks: 16**

Ideal reactors, mixed flow reactor, plug flow reactor, space time and space velocity, holding time and space time , comparison in mixed and plug flow reactors, Recycle reactor, Autocatalytic reaction.

Unit: IV **No. of Lecture: 8 Hours, Marks: 16**

Residence time distribution of fluid in vessel, Conversion directly from tracer information, Models for non-ideal flow, Dispersion models, Tank in series model, Concept of micro and macro mixing.

Unit: V **No. of Lecture: 8 Hours, Marks: 16**

Introduction – Rate equations for heterogeneous systems , Contacting patterns in Two –Phase system ,Introduction to fluid particle reaction non-catalytic reactions, un reacted core model for Spherical particle of unchanging size, Rate of reaction for shrinking spherical particles , Determination of rate controlling step , Various contacting patterns in fluid solid reactors for fluid-particle non-catalytic reactions.

Text Books:

1. H. Scott Fogler, Elements of chemical reaction engineering, Prentice Hall New, Jersy.
2. Octave Levenspiel, Chemical reaction engineering, John Wiley and sons.

Reference Books:

1. J.M. Smith, Chemical engineering kinetics, McGraw Hill
2. S.D. Dawande, Principles of reaction engineering, Central Techno publication, Nagpur.
3. Lanny D. Schimdt , Chemical reaction engineering, Oxford University Press.

Enzyme Engineering

Course Outline

Enzyme Engineering	**EE**	**BTL-504**
Course Title	Short Title	Course Code

Lecture	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	**15**	**45**	**03**

Course Description: This course is introduced for learning the basic fundamentals of Enzyme Engineering to undergraduate students. The goals of the course are to understand the basic knowledge of Enzymes, their classification, production, purification and Immobilization to be use in different areas.

Prerequisite Course(s): 12th Std. Science and SE Biotechnology Courses.

Objective of the subject

1. Get knowledge of enzyme & its classification & its role in metabolic pathway of living systems.
2. Will get knowledge of enzyme kinetics and its application in production of desired products
3. Can communicate the molecular mechanism of enzyme action and modification to increase its stability.
4. Ability to design and conduct experiments to analyze and interpret enzyme kinetic data for the design of enzyme reactor for production of value added products
5. Get knowledge of various analytical techniques for characterization of enzymes
6. Get knowledge of application of enzymes in various industries used for the production of Bioproduct for the welfare of society.
7. Will have ability to apply knowledge of enzyme kinetics in designing metabolic pathway in living system to produce value added products.

Learning outcomes

After successful completion of this course the student will be able to:

1. Classify enzymes on the basis of their working mechanism.
2. Calculate the enzyme kinetics and activity by performing various assays.
3. Characterize the enzymes by using modern equipments.
4. Immobilize enzyme by various immobilization techniques for better stability and activity as well as to reduce their losses during use.
5. Will able to apply molecular mechanism of various enzymes in different metabolic pathways.

Course Content

TE Biotechnology **Enzyme Engineering** **Semester - V**

Teaching Scheme
Theory: 3 hours/ week

Examination Scheme
End Semester Examination (ESE): 80 Marks
Paper Duration (ESE): 03 Hours
Internal Sessional Examination (ISE): 20 Marks

Unit- I **No. of Lecture: 8 Hours, Marks: 16**

Enzymes

Classification, nomenclature, International units and types of enzymes, General characters of enzymes: characters such as specificity, catalysis and regulation and localization of enzymes in the cell, Structure of enzymes: Primary, secondary and tertiary structure of enzyme, Models of enzyme activity: Lock and key model, Induced fit, Substrate Strain model. Isoenzyme, with example and its application.

Unit- 2 **No. of Lecture: 8 Hours, Marks: 16**

Enzyme Kinetics

Introduction to kinetics: activation energy, transition state theory and energy, consideration, Enzyme kinetics, rate equation, Rate of reaction, First order and second order reaction, Michaelis – menten equation (Steady state kinetics) and Haldane relationship, Significance of Km, Lineweaver – Burk or Double – reciprocal plot, Eadie-Hofstee plot, Hanes plot, Turnover number, Specificity constant, Bisubstrate reaction.

Unit- 3 **No. of Lecture: 8 Hours, Marks: 16**

Enzyme inhibition, its kinetics and Catalysis

Types of inhibition- Reversible and irreversible inhibition, Kinetics of inhibition. Catalytic efficiency- proximity and orientation effects, distortion or strain, Different mechanisms of enzyme catalysis, acid base and covalent catalysis and metal-ion catalysis, Molecular mechanism of action of chymotrypsin, Lysozyme, Chemical modification of enzymes, Bisubstrate or Multisubstrate reaction: Ping – Pong mechanism, sequential mechanism,

Unit-4 **No. of Lecture: 8 Hours, Marks: 16**

Allosteric and regulatory enzyme, enzyme production and purification

Binding of ligands to Protein, Co-operativity models- MWC and KNF model, Regulations by allosteric enzymes, other mechanisms of enzyme regulation-enzyme induction and repression and covalent modification.

Sources of enzymes-animal plant and microbial sources, large scale production of enzymes- basic methodology of production, extraction and purification of enzymes, Enzyme production and recombinant DNA technology.

Unit-5 **No. of Lecture: 8 Hours, Marks: 16**

Enzyme immobilization and Enzyme applications

Methods of immobilization - ionic bonding, adsorption, covalent bonding (based on R groups of amino acids), and microencapsulation and gel entrapment, Properties of immobilized enzymes, Applications of immobilized enzymes.

Applications of enzymes in food, sugar, leather, detergent industries etc., Uses of enzymes in drug, medicine, industries, Uses of enzymes to make amino acids and peptides, Legislative and safety aspects.

Reference Books:

1. Lehninger, Nelson and cox. Principles of Biochemistry –Macmillan publishers.
2. Voet and Voet, Biochemistry, Wiley publisher.
3. Biotol series, Principles of Cell energetics , Butterworth- Heinemann Ltd,Jordan Hill, Oxford.
4. Biotol Series, Principles of enzymology and its application, Butterworth- Heinemann Ltd,Jordan Hill, Oxford.
5. Nicholascprice and Tewis stereous, Fundamentals of Enzymology, Oxford University press.
6. Palmer, Enzymes, Oxford University press.
7. Michael L. Shuler, Fikret Kargi, Bioprocess Engineering, Basic concepts, Prentice Hall India Pvt. Ltd., New Delhi.. .
8. J. F. Richardson and D. G. Peacock, Coulson and Richardson’s Chemical Engineering (Vol: 3) Asian Books Pvt. Ltd., New Delhi
9. Murray moo-young, Comprehensive Biotechnology Pergemon Press(Vol 2)
10. Pauline M. Doran, Bioprocess Engineering Principles, Academic Press an Imprint of Elsevier.
11. James E. Bailey, David F. Ollis, Biochemical Engineering Fundamentals, Mc Graw-Hill Book Company.
12. Textbook of Biotechnology by B.D.Singh, Kalyani Publication.

Bioprocess Industrial Economics and Management

Course Outline

Bioprocess Industrial Economics and Management	**BIEM**	**BTL-505**
Course Title	Short Title	Course Code

Lecture	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	**15**	**45**	**03**

Course Description: This course is introduced for learning the basic fundamentals of Bioprocess Industrial Economics and Management to undergraduate students. The goals of the course are to understand the basic knowledge of economics, various factors to be considered during industrial set up, marketability of product etc.

Prerequisite Course(s): 12th Std. Science and SE Biotechnology Courses.

Course Objectives:

The objective of the course is to provide the basic knowledge of Bioprocess Industrial Economics and Management, economics, profitability, various factors to be considered during industrial set up, marketability of product etc.

Learning outcomes

After completion of this course students will able:

1. To apply the basic knowledge of economics in order to design the bioprocesses at low cost
2. To apply knowledge of marketability to communicate effectively about various bioprocesses of products.
3. To apply the knowledge to set up a bioprocess Industry in all respect
4. To estimate the cost of final product
5. To calculate the profitability and losses during the product formation.

Course Content

TE Biotechnology Bioprocess Industrial Economics and Management Semester - V

Teaching Scheme
Theory: 3 hours/ week

Examination Scheme
End Semester Examination (ESE): 80 Marks
Paper Duration (ESE): 03 Hours
Internal Sessional Examination (ISE): 20 Marks

Unit I

Bio process Design Considerations: No. of Lecture: 8 Hours, Marks: 16

Technical feasibility survey, process development, flow diagram, equipment design and specifications, marketability of product, availability of technology, raw materials, equipments, human resources, land and utilities, site characteristics, waste disposal, government regulations and other legal restrictions, community factors and other factors affecting investment and production cost, Indian Bioprocess Industry - Current Status and Trends.

Unit II

Cost Estimation: No. of Lecture: 8 Hours, Marks: 16

Factors affecting investment and production cost, capital investment, fixed investment and working capital, estimating equipment cost by 6/10 factor rule, method of estimating capital investment. Different costs involved in total product cost, computer automization in costing.

Unit III

Investment Cost and Profitability: No. of Lecture: 8 Hours, Marks: 16

Interest and investment cost, type of interest, types of taxes and tax returns, types of insurance and legal responsibility, depreciation, types of depreciation, and methods of determining depreciation. Profitability, mathematical methods of profitability evaluation, cash flow diagram, break even analysis, balance sheet, pricing issue method and income statement.

Unit IV

Fermentation Economics: No. of Lecture: 8 Hours, Marks: 16

Introduction, isolation of microorganisms of potential industrial interest, strain improvement, market potential, effects of legislation on production of antibiotics and recombinant proteins, plant and equipment, media, air sterilization, heating and cooling, aeration and agitation, batch process cycle times, continuous culture, recovery costs, water usage and recycling, effluent treatment.

Unit V

Bioproduct Economics: **No. of Lecture: 8 Hours, Marks: 16**

Bioproduct regulation, Fermentation process economics: A complete example, Economic consideration of commercial Bioproduct: Enzymes, Proteins via rDNA, Antibiotics, Vitamins, Alkaloids, Nucleosides, Steroids, Monoclonal antibodies, Brewing and wine making, Fuel Alcohol Production, Organic and Amino acid manufacture, Single cell protein, Anaerobic methane production.

Reference Books:

1. Peter M.S. Timmerhaus K.D. Plant Design and Economics for Chemical Engineers. McGraw Hill.
2. Vilbrandt F.C. and C.E. Dryden, Chemical Plant Design. McGraw Hill
3. T.R. Banga and S.C.Sharma, Industrial Organization and Engineering Economics, Khanna Publications, New Delhi.
4. O.P.Khanna Industrial Engineering and Management, Dhanpat Rai Publications Pvt. Ltd. New Delhi.
5. Dewett and Varma, Elementary Economic Theory, S Chand and Company Ltd New Delhi
6. James E. Bailey, David F. Ollis, Biochemical Engineering Fundamentals, Mc Graw-Hill Book Company.
7. P. F. Stanbury, A. Whitaker and S. J. Hall, Principles of Fermentation Technology, Aditya Book Private Limited.

Molecular Biology Lab

LAB COURSE OUTLINE

(Molecular Biology Lab)

Molecular Biology	**Mol Bio**	**BTL-506**
Course Title	Short Title	Course Code

Practical	**Hours/ Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	04	**15**	**60**	**02**

Molecular Biology Lab

Course Description:

In this laboratory, course emphasis is on the understanding of basics of Molecular Biology techniques. The learner can use this knowledge and apply in allied branches of Biotechnology as required.

Prerequisite Course(s): 11th, 12th Biology, SE Biotechnology courses

General Objective:

The objective of the laboratory is to impart the fundamental knowledge of molecular biology at the research level to the students and to develop their ability to apply the specific procedures to analyze the experimental results.In this lab, students will be familiar with the molecular Biology lab techniques which they can apply in research and development in the field of Biotechnology.

Learning Outcomes:

After successful completion of this lab student will be able to:

- Isolate the genetic material e.g. DNA & RNA from different cells.
- Isolate the total plasmid DNA from bacteria.
- To calculate molecular weight by using DNA marker with agrose gel electrophoresis
- To spool of chromosomal DNA from onion cells
- To determine the melting temperature (Tm) and base composition of DNA from thermal denaturation characteristics.
- Well versed with the principles and practice of agarose gel electrophoresis.
- To quantify Nucleic acids.

Molecular Biology Lab

Semester-V

Teaching Scheme
Practicals -4 Hrs/week

Examination Scheme
External Sessional Exams (ESE)/Oral (OR):25 Marks.
Internal Continuous Assessment: 50 Marks.

Minimum eight experiments from the following:

1. Isolation of genomic DNA from bacteria.
2. Isolation of RNA from yeast.
3. Isolation of total plasmid DNA from bacteria.
4. Calculation of molecular weight by using DNA marker with agarose gel electrophoresis.
5. DNA extraction from blood.
6. Spooling of chromosomal DNA from onion cells.
7. Determination of melting temperature (Tm) and base composition of DNA from thermal denaturation characteristics.
8. Principles and practice of agarose gel electrophoresis.
9. Quantitation of Nucleic acids.

Reference books:

1. Introduction to Practical Biochemistry, Third Edition, by David Plummer.
2. Biochemical Methods, Second Edition by S. Sadasivam, A. Manickam, New Age International Ltd, Publishers.

Lab Bioprocess Instrumentation & Analysis

LAB COURSE OUTLINE

Bioprocess Instrumentation & Analysis Lab **BIA LAB** **BTP-507**

Course Title Short Title Course Code

Laboratory	**Hours/ Week**	**No. of Weeks**	**Total Hours**	**Semester Credit**
	02	**15**	**30**	**01**

Bioprocess Instrumentation & Analysis Lab

Course Description:

The goal of the lab course is intended to provide a strong foundation in concepts and principles of Bioprocess Instrumentation & Analysis of different materials.

Prerequisite Course(s): 12th Std. Science and SE Biotechnology Courses.

General Objective: The objective of the laboratory is to impart the fundamental knowledge of Bioprocess Instrumentation & Analysis to the students and develop their ability to apply the specific procedures to analyze the experimental results.

Learning Outcomes:

After successful completion of this lab course the student will be able to:

1. Familiarized with various measurement techniques used in bioprocess industries.
2. Determine purity of product in process industries.
3. Will get knowledge of basic principles behind the working of different analytical instruments and its application in bioprocess industries.

Lab Bioprocess Instrumentation & Analysis

Semester-V

Teaching Scheme
Practicals -4 Hrs/week

Examination Scheme
External Sessional Exams (ESE)/Oral (OR):25 Marks.
Internal Continuous Assessment (ICA): 25 Marks.

Minimum 08 experiments shall be performed from the following:

1. To study the response of bimetallic thermometer.
2. To study Calibration of thermocouple.
3. To measure the pH of given solution.
4. To determine concentration of given solution by colorimeter
5. To study Flame photometry
6. To study Abbey's refractometer
7. To study infra red spectrophotometer
8. To study UV spectrophotometer.

References:

1. Patranabis D. Industrial Instrumentation, Tata – Mcgraw Hill Publications, New Delhi.
2. P. Kudesia and S.S. Sawhaney, Instrumental methods of chemical analysis Pragati Prakashan, P.O.Box No. 62, Begum Bridge,Meerut250001,U.P.
3. Nakra B.C. and K.K. Chaudhary, Instrumentation Measurement and Analysis, Tata – McGraw Hill, New Delhi.
4. B.K.Sharma.Goel, Instrumentation methods of chemical analysis, Publishing House,11,Shivaji Road, Meerut-250001,U.P.

Lab Chemical reaction Engineering

LAB COURSE OUTLINE

Chemical reaction Engineering Lab **CRE LAB** **BTP-508**

Course Title Short Title Course Code

	Hours/ Week	No. of Weeks	Total Hours	Semester Credit
Laboratory	**02**	**12**	**24**	**01**

Chemical reaction Engineering Lab

Course Description:

The goal of the Lab course is intended to provide a strong foundation in concepts and principles of Chemical reactions used in bioprocess industries.

Prerequisite Course(s): 12th Std. Science and SE Biotechnology Courses.

General Objective: The objective of the laboratory is to impart the fundamental knowledge of Chemical reaction engineering to the students and develop their ability to apply the specific procedures in industries and to analyze the experimental results.

Learning Outcomes:

After successful completion of this lab course the student will be able to:

1. Understand the kinetic study of various chemical and biochemical reactions used in process industries
2. To design various types of Reactors.
3. Demonstrate an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Lab Chemical Reaction Engineering

Semester-V

Teaching Scheme
Practicals -2 Hrs/week

Examination Scheme
External Sessional Exams (ESE)/Oral (OR):25 Marks.
Internal Continuous Assessment (ICA): 25 Marks.

Minimum 08 experiments shall be performed from the following:

1. To determine the reaction rate constant {k} for given reaction.(CSTR / BATCH / SEMIBATCH / PFR)
2. To determine the effect of temperature on reaction rate constant. .(CSTR / BATCH / SEMIBATCH / PFR)
3. To determine the activation energy {E} for the given reaction. .(CSTR /BATCH / SEMIBATCH / PFR)
4. To draw C [t], E [t] and F [t] curve and to calculate the mean residence time {tm} variance { σ2} and skewness { S3} for plug flow reactor.
5. To draw C [t], E [t] and F [t] curve and to calculate the mean residence time {tm} variance $\{\sigma^2\}$ and skewness $\{S^3\}$ for annular reactor.
6. To draw C [t], E [t] and F [t] curve and to calculate the mean residence time {tm} variance {σ2} and skewness {S3} for packed Bed reactor.
7. To study the cascade CSTR.
8. To study the kinetic in tubular flow reactor [coiled tube] for the given reaction.

Reference Books:

1. H. Scott Fogler, Elements of chemical reaction engineering, Prentice Hall New, Jersy.
2. Octave Levenspiel, Chemical reaction engineering, John Wiley and sons.

Lab Tissue Culture Engineering

Course Outline

Lab Tissue Culture Engineering	TCE	BTP-509
Course Title	**Short Title**	**Course Code**

LAB	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Theory	**01**	**15**	**15**	**02**
Practical	**02**	**15**	**30**	

Course Description:
This course is aimed at introducing the fundamentals of plant tissue culture to TE students. The basics of animal tissue culture techniques are also incorporated in the course. The course also includes the lab designing, sterilization techniques, media involved and various laboratory techniques.

Prerequisite Course(s): 12th Std. Science and SE Biotechnology Courses.

Course Objectives

The objective of the course is to provide the basic knowledge of plant tissue culture and animal tissue culture techniques. Also to get the students acquainted with various laboratory techniques.

Learning outcomes:

After successful completion of this course the students will be able to:

1. Understand the basics of the lab design

2. Understand various sterilization techniques

2. Apply the knowledge of various PTC techniques

3. Understand the fundamentals of ATC

4. Understand the genetic engineering approaches related to the course

Course Content

TE Biotechnology **Tissue Culture Engineering** **Semester – V**

Teaching Scheme
Theory: 1 hours/ week
Practical: 2 hours/week

Examination Scheme
Internal Continuous Assessment (ICA):50 Marks

Theory:

(a) Introduction to PTC

(b) Applications of PTC

(c) Genetic Engineering in plant

(d) Introduction to ATC

(e) Fundamentals of ATC

Lab Work: (Any Eight Experiments from the following)

1. Laboratory Setup & Introduction to PTC techniques

2. General Sterilization techniques

3. Preparation of culture medium sterilization of explants

4. Initiation of callus culture

5. Micropropogation/ Multiple shoot induction

7. Embryo culture

8. In-vitro seed germination

9. Meristem culture

10. RAPD (DEMO)

11. Lab design, sterilization procedures, media preparation for ATC and cryopreservation

12. Hardening and acclimatization of in vitro raised rooted shoots

13. Encapsulate the shoot buds/ seeds to demonstrate the production of synthetic seeds

14. Primary culture from chick embryo.

Reference Books:

1.R.A.Dixon and Gonzales, Plant cell culture : A Practical Approach, IRL Press.

2. S.S.Purohit, Biotechnology Fundamentals and Applications, Agrobios (India), 4th Edition, 2005.

3. S.S.Bhojwani and M.K.Razdan, Plant Tissue Culture : Theory and Practical, (1996) Elsevier, Amsterdam.

4. S.B Primrose and R.M.Twyman, Principles of Gene Manipulation and Genomics, Blackwell publishing, 7th edition, 2006.

5. Plant Biotechnology: The genetic manipulation of plants; A. Slater, N. Scott, M. Fowler; Published by Oxford University press, New York (2003)

6. Methods in Plant Tissue Culture; U Kumar; AgroBios India, (2003)

7. Bernard R. Glick, Molecular Biotechnology 3rd edition, CBS Publishers Distributors.

8. J.Hammond,P.McGarvey and V.Yusibov (Eds.), Plant Biotechnology New Products and Applications, Springer.

Industrial Training / EDP/ Special Study

Course Outline

Industrial Training/EDP/Special Study	**IT/EDP/SS**	**BTP-510**
Course Title	Short Title	Course Code

Examination Scheme
Internal Continuous Assessment: 25 marks

Industrial Training:

• Every student has to undergo industrial/practical training for a minimum period of two weeks during summer vacation after S.E (after fourth semester).

• The industry in which practical training is taken should be a medium or large scale industry.

• The paper bound report on training must be submitted by every student in the beginning of T.E. First term along with a certificate from the company where the student underwent training.

• The report on training should be detailed one.

• Maximum number of students allowed to take training in company should be five. Every student should write the report separately.

OR

Special Study:

• In case if a student is not able to undergo practical training , then the students should be asked to prepare a review paper on a recent topic in Biotechnology and allied fields.

OR

EDP/EAC of 3-5 days:

Student should undergo Entrepreneurship Awareness/Development Camp (EAC/EDP) of minimum 3 days and should submit the certificate of the programme.

Every student shall be required to present a seminar on Industrial Training / EDP/EAC/ Special Study in the presence of two teachers.

These teachers (fixed by the head of department in consultation with the Principal) shall award marks based on the following:

(a) Report 10 marks

(b) Seminar presentation 10 marks

(c) Viva-voce at the time of Seminar presentation 05 marks.

T.E. Biotechnology

Semester-VI

Third Year Biotechnology

Faculty of Engineering and Technology

North Maharashtra University, Jalgaon

Bioprocess Engineering

Course Outline

Bioprocess Engineering	**BPE**	**BTL-601**
Course Title	Short Title	Course Code

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Lecture	**03**	**15**	**40**	**03**

Course Description:
This course is aimed at introducing the fundamentals of bioprocess engineering. The basics of bioreactor designing have also been incorporated in the course. The course also includes study of various types of bioreactors.

Prerequisite Course(s): 12th Std. Science and SE Biotechnology Courses.

Course Objectives
The objective of the course is to provide the basic knowledge of fermentation processes and media preparations along with the sterilization procedures. The course also deals with various parameters involved in bioreactors designing. The course also aims at providing the knowledge of various types of industrially used bioreactors.

Learning outcomes:

After successful completion of this course the students will be able to:

1. Apply knowledge of chemical and mechanical engineering for design of biological system in biotech industries.
2. Design and conduct experiments on different bioreactors and to analyze and interpret data for optimization of process.
3. Design various bioprocess equipment to meet desired needs of mankind within realistic constrain like social, ethical, health and safety
4. To get the knowledge of properties of materials and its view in designing bioprocess equipment within the standards prescribed by regulating authority in India and world.
5. Integrate knowledge of bioscience, biochemical engineering, , in commercial context to solve a substantial range of bio- processing and biological engineering problems and issues for production of value added products for societal development.

Course Content

TE Biotechnology Bioprocess Engineering Semester – VI

Teaching Scheme
Theory: 3 hours/ week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Examination (ISE): 20 Marks

UNIT I: **No. of Lecture: 8 Hours, Marks: 16**

Introduction to Fermentation process & Media for Industrial Fermentation Process

Upstream Process, Downstream Process, Range of fermentation process, Component parts of fermentation process , Medium Sterilization. Batch Sterilization: Continuous sterilization, Fermentor Sterilization, Feed Sterilization, Filter sterilization.

Unit II: **No. of Lecture: 8 Hours, Marks: 16**

Design of Bioreactors:

Introduction, Basic objective in design of a reactor, aseptic operation and containment, body construction, aeration and agitation, stirrer glands and bearings, baffles design, sparger system, achievement and maintenance of aseptic conditions, valves and steam traps, types of valves and pressure control valves. Scale up of fermenters, design condition for scale up, scale-up methods.

Unit III: **No. of Lecture: 8 Hours, Marks: 16**

Types of Bioreactors:

Batch bioreactors, Continuous bioreactors, Semi continuous bioreactors, Stirred tank bioreactors, Airlift bioreactor systems, Trickle bed bioreactor, Airlift external loop bioreactors, waldhof-type fermenter, Tower fermenter, Cylindro- conical vessel, Deep jet fermenter, Cyclone column, Rotating disc fermenter, Reactor dynamics: Dynamic models and stability

Unit IV: **No. of Lecture: 8 Hours, Marks: 16**

Solid state & Submerged Fermentation, Process monitoring & Control:

Introductions, types of solid state fermenter, Submerged Fermentation , Brief introduction to pipe joints, Physical and chemical sensors for medium and gases, Online/ Offline sensors.

Unit V: **No. of Lecture: 8 Hours, Marks: 16**

Bioreactor Design Considerations:

Design consideration: Design codes, maximum working pressure, design pressure, design temperature, design stress, factor of safety, and selection of factors of safety, design of wall thickness, corrosion ratio, Poisson ratio, criteria of failure. Materials of construction: mechanical properties, materials, corrosion, protective coating, choice of materials, corrosion prevention.

Reference Books:

1. Biochemical Engineering Fundamentals (1986) (2/e) Bailey JE and Ollis DF, McGraw-Hill International Editions CES, Singapore.

2. Biochemical Engineering (1997) Blanch HW and Clark DS, Marcel Dekker Inc., USA.

3. Bioprocess Engineering Principles (1995) Doran PM, Academic Press Ltd, USA.

4. Bioprocess Engineering: Basic Concepts (2002) Shuler ML and Kargi F, Pearson Education Pvt. Ltd., Singapore.

5. Principles of Fermentation Technology (1995) (2/e) Stanbury PF, Whitaker A and Hall SJ, Butterworth-Hienemann Ltd., UK.

6. Comprehensive Biotechnology Vol. 2 (1985) Moo-Young M, Pergamon Press Ltd., UK.

Genetic Engineering

Course Outline

Genetic Engineering	**GE**	**BTL-602**
Course Title	Short Title	Course Code

Lecture	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	**15**	**45**	**3**

Course Description: This course is introduced for learning the basic fundamentals of Genetic Engineering to undergraduate students. The goals of the course are to understand the basic knowledge of Genetics, different enzymes used to engineer the genes, rDNA technology, and applications of rDNA technology.

Course Objectives:
The objective of the course is to provide the basic knowledge of Genetics, different enzymes used to engineer the genes, rDNA technology, and applications of rDNA technology.

Prerequisite Course(s): 12th Std. Science and SE Biotechnology Courses.

Learning outcomes:
After completion of this course students will able:

1. To apply the knowledge of rDNA technology for the construction of novel gene for the better use with wide functionality.
2. To use various vector systems to study functionality of insert gene.
3. To use various instrument to increase the efficiency of the DNA.
4. Apply the knowledge of genetics for human welfare in disease diagnosis, in criminal cases as well as pharmaceuticals for drug designing and development.
5. To express the knowledge of genetic engineering both in written and oral format.

Course Content

TE Biotechnology Genetic Engineering Semester - V

Teaching Scheme
Theory: 3 hours/ week

Examination Scheme
End Semester Examination (ESE): 80 Marks
Paper Duration (ESE): 03 Hours
Internal Sessional Examination (ISE): 20 Marks

Unit I

Recombinant DNA technology **No. of Lecture: 8 Hours, Marks: 16**

The recombinant DNA concept, Important Discoveries, Principles of cloning, Biohazards and Bioethics of Genetic Engineering.

Unit II

The Tools: Enzymes **No. of Lecture: 8 Hours, Marks: 16**

Nucleases, The Restriction Endonucleases Type I, II, III, star activity, isoschizomers Phosphodiesterase,Polynucleotidekinase,DNAligase,DNApolymeraseI,Reversetranscriptase, Terminal deoxynucleotidyl transferase,Poly A polymerase.

Unit III

The Tools: Vector Systems **No. of Lecture: 8 Hours, Marks: 16**

E coli systems **–** the host cells , *E. coli* – Plasmid Vectors , *E .coli* – Bacteriophage vectors , *E. coli* systems – Plasmid-Phage combination vectors , Other Prokaryotic Host-Vector systems , Eukaryotic Host-Vector Systems: Yeast, Eukaryotic Host-Vector Systems: Animals, Eukaryotic Host-Vector Systems: Plants.

Unit IV **No. of Lecture: 8 Hours, Marks: 16**

Molecular research procedures

DNA sequencing techniques PCR, Blotting Techniques, Gene silencing techniques, RNAi, Knockout Technology, SAGE.

Unit V **No. of Lecture: 8 Hours, Marks: 16**

Significance of rDNA technology and Human Welfare

Gene therapy, Restriction fragment length polymorphism (RFLPs), Random amplified polymorphic DNA (RAPD), SNPs, AFLP, microarray, DNA fingerprinting.

Reference Books:

1. Genes VIII – Benjamin Lewin, Benjamin Cummings; United States edition.
2. Genes and Genomes – Singer M and Berg P
3. Textbook of Biotechnology by R.C.Dubey, S. Chand & Co. P Ltd, New Delhi.
4. Textbook of Biotechnology by B.D.Singh, Kalyani Publication.
5. Textbook of Biotechnology by U.Satyanarayana, Books and Allied Pvt.Ltd.

Fermentation Technology

Course Outline

Fermentation Technology	**FT**	**BTL- 603**
Course Title	Short Title	Course Code

Lectures	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	**15**	**45**	**03**

Course Description:
This course is introduced for learning the basic fundamentals of Fermentation Process to undergraduate students. The prospectus includes a prior applications involved in Industrial Biotechnology. The goals of the course are to understand the basic principles, Mechanism and working of fermenters and processes and its applications in different areas.

Prerequisite Course(s): 12th Std. Science and SE Biotechnology Courses.

Course Objectives
The objective of the course is to provide the basic knowledge of fermentation technology, preparation of inoculums, sterilization and various fermentation processes.

Learning outcomes:

By completion of this course students will able:

1. Describe the fermentation process and evaluate factors that contribute in enhancement of cell and product formation during fermentation process.
2. Interpret the suitable media to obtain high yield of the product and to develop inoculum for different fermentation processes.
3. Analyze lab scale information and apply it for scaling up process.
4. To design the experiment and fermenter for beverages production.
5. To design the experiment and fermenter for food production.
6. To increase the productivity and yield of fermentation process.

Course Content

TE Biotechnology Fermentation Technology Semester – VI

Teaching Scheme
Theory: 3 hours/ week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Examination (ISE): 20 Marks

UNIT – I **No. of Lecture: 8 Hours, Marks: 16**

Introduction to Fermentation Process & Media Formulation:

An introduction to fermentation process, Isolation methods for Industrial microorganisms, Culture preservation and stability, the improvement of industrial microorganisms. Media for Industrial fermentation, Introduction ,typical media, Medium fermentation: Water, Energy sources, Carbon sources, Nitrogen sources, Minerals, Growth factors, Nutrient recycle, Buffers, Precursors, Metabolic regulators, Oxygen requirement and antifoams, pH.

UNIT – II **No. of Lecture: 8 Hours, Marks: 16**

Types of Sterilization Processes

Sterilization: Introduction, Medium sterilization, Design of Batch sterilization process:
Calculation of Del factor during heating and cooling, Calculation of holding time at constant temperature, Richard's rapid method for the design of sterilization cycles, the scale up of batch sterilization processes, Filter sterilization: Filter sterilization of fermentation media, air and fermenter exhaust air, the theory and design of depth filters.

UNIT –III **No. of Lecture: 8 Hours, Marks: 16**

Inoculum Development Processes

The development of Inocula for industrial fermentation: Introduction, Criteria for the transfer of inoculums, The development of inocula for yeast processes, The development of inocula for bacterial processes, The development of inocula for mycelial processes, The aseptic inoculation of plant fementers, Solid state fermentation.

UNIT –IV **No. of Lecture: 8 Hours, Marks: 16**

Fermentative production of Beverages, Industrial Chemicals and Biomolecules.

Beer, Wine, Rum, Gin, Whisky, Brandy, Champaign. Fermentative production of citric acid, acetic acid, lactic acid, ethanol, acetone and butanol, gluconic acid, steroid biotransformation, Enzyme production- Amylases, Proteolytic enzymes, Invertase enzyme, Pectinases, Lipases; Vitamins: Vitamine B12, Riboflavin, Vitamin A, Amino acid production: LGlutamic acid, L-Lysine, L-Threonine.

UNIT –V **No. of Lecture: 8 Hours, Marks: 16**

Fermentation of food products and Antibiotics.

Fermentative production of food products: cheese and types of cheese, fermented soyabean foods, biomass production (single cell protein, baker's yeast), fermented dairy products like yogurt, cultured buttermilk, Production of penicillin, B-Lactum antibiotics, Streptomycin, Cephalosporin, Tetracycline.

Reference books:

1. P. F. Stanbury, A. Whitaker and S. J. Hall, Principle of Fermentation Technology, Aditya Books (P) Ltd, New Delhi.
2. L. E. Casida, Industrial Microbiology, New Age Industrial Publishers.
3. Pauline M. Doran, Bioprocess Engineering Principles, Academic Press an Imprint of Elsevier.
4. B.D.Singh, Biotechnology, Kalyani Publication.
5. Prescot and Dun, Industrial Microbiology, McGraw-Hill Book Company, Inc. New York.
6. Text Book of Biotechnology by R.C.Dubey ,S. Chand & Co. P Ltd, New Delhi
7. Text Book of Biotechnology by U. Satyanarayana, Books and Allied Pvt.Ltd.
8. Murray moo-young, Comprehensive Biotechnology Pergemon Press (Vol. 2)

Mass Transfer

Course Outline

Mass Transfer	**MT**	**BTL-604**
Course Title	Short Title	Course Code

Course Description:
The goal of the course is intended to provide a strong foundation in concepts and principles of mass transfer operations used in industries.

Lecture	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	**15**	**45**	**03**

Objective of the Subject:

1. Student will be able to understand the basic principles of separation techniques.
2. Student will be able to design various mass transfer equipments.

Prerequisite Course(s): 12^{th} Std. Science and SE Biotechnology Courses.

Learning outcomes:
After completion of this course; students will be able to:

1. Demonstrate the knowledge of various mass transfer operations and its application in process industries.
2. Explain & apply knowledge of different separation techniques in downstream processing.
3. Apply appropriate criteria for selection among alternative separation technologies.
4. Increase yield and purity of various products in process industries by applying knowledge.
5. Ability to analyze and design mass transfer equipments.

Course Content

TE Biotechnology **Mass Transfer** **Semester -VI**

Teaching Scheme
Theory : 3 hours/ week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE): 03.00 hr
Internal Sessional Examination (ISE): 20 Marks

Unit: I **No. of Lecture: 8 Hours, Marks: 16**

Mass Transfer

Introduction to mass transfer, Equilibrium for mass transfer process: Local two phase mass transfer. Local overall mass transfer coefficient, Use of local overall coefficient. Material balances for steady state co current, countercurrent, cross flow cascade, counter flow cascade. Application of mass transfer processes.

Unit: II **No. of Lecture: 8 Hours, Marks: 16**

Distillation

Introduction to distillation process, Vapor liquid equilibrium, The methods of distillation (Binary mixture), The fractionating column, McCabe Thiele & Lewis Sorel method, Batch distillation, Azeotropic, extractive and steam distillation, Introduction to distillation equipments.

Unit: III **No. of Lecture: 8 Hours, Marks: 16**

Extraction & Leaching

Introduction to extraction process, Liquid equilibria, Material balances for stage wise contact methods, Stage contact and continuous contact type extractors.

Leaching: General principles of leaching, working principle of moving-bed leaching equipments: Bollman extractor, Hildebrandt extractor

Unit: IV **No. of Lecture: 8 Hours, Marks: 16**

Adsorption

Introduction to adsorption operation, Type of adsorption operation, Nature of adsorbents, Adsorption equilibria, Adsorption of liquids, Material balances for stage wise for operation, Continues contact process for adsorption, Principle of ion exchange operation, Equilibria for ion exchange operation, Rate of ion exchange operation, Application of ion exchange operation.

Unit: V **No. of Lecture: 8 Hours , Marks :16**

Crystallization

Introduction to crystallization, Growth and properties of crystals, Effect of impurities in crystallization, Effect of temperature on solubility, Fractional crystallization, Caking and yield of crystals, Different type of crystallizers.

Text Books:

1. R. E. Treybal , Mass transfer operation ,McGraw Hill Publication
2. Coulson and Richardson Chemical Engineering (Vol. I and II), Pergamon Press

Reference Books:

1. Christie J. Geankoplis ,Transport Processes and Unit Operations ,Prentice Hal inc
2. P. Chattopadhayay , Unit operation in Chemical Engg. (Vol. I and II), Khanna Publications Delhi.

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IPR and Entrepreneurship

Course Outline

IPR and Entrepreneurship	**IPRE**	**BTL-605**
Course Title	Short Title	Course Code

Lecture	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	**15**	**45**	**03**

Course Description: This course is introduced for learning the basic fundamentals of Intellectual property rights and Entrepreneurship to undergraduate students.The goals of the course are to understand the basic knowledge of Intellectual property rights, trademarks, biosafety & bioethics and entrepreneurship.

Prerequisite Course(s): 12th Std. Science and SE Biotechnology Courses.

Objectives of the subjects

The objective of the course is to provide the basic knowledge of IPR and Entrepreneurship, Intellectual property, trademarks, biosafety & bioethics and entrepreneurship.

Learning outcomes

After successful completion of this course the student will be able to:

1. Choose which type of IPR they should apply for.
2. Adopt environment friendly approach industrially.
3. Understand various ethical issues regarding the field.
4. Understand entrepreneurial aspects.
5. Understand the basics of marketing management.

Course Content

TE Biotechnology **IPR and Entrepreneurship** **Semester - VI**

Teaching Scheme
Theory: 3 hours/ week

Examination Scheme
End Semester Examination (ESE): 80 Marks
Paper Duration (ESE): 03 Hours
Internal Sessional Examination (ISE): 20 Marks

UNIT 1: IPR, Patents and copyright **No. of Lecture: 8 Hours, Marks: 16**

General Overview of Intellectual Property Rights, WIPO, WTO, Trade Related Intellectual Property Rights. Patent- Basic requirements of Patentability, Patentable Subject Matter, Procedure for Obtaining Patent, Provisional and Complete Specification. Copyright-Objectives of copyright, Rights conferred by registration of copyright, Infringement of copyright.

UNIT 2: Trademarks, GI and other types of IPR **No. of Lecture: 8 Hours, Marks: 16**

Trademarks-Basic Principles of Trademark, Rights conferred by Registration of Trademark, Infringement of Trademark. Geographical Indications-Objectives of Geographical Indications, Rights conferred, Infringement of Geographical Indications, International Position, Indian Position, Bioprospecting and Biopiracy. GATT Farmers rights, plant breeders right.

UNIT 3: Biosafety and Bioethics **No. of Lecture: 8 Hours, Marks: 16**

Biosafety and Bioethics Management-Key to environmentally responsible use of biotechnology. Cartagena Protocol on Biosafety, Ethical implications of Biotechnological products and techniques. Contempory ethics of healthcare. Ethical aspects of hazardous worte and toxic substance. Ethical aspects of scientific publishing.

UNIT 4: Entrepreneurship **No. of Lecture: 8 Hours, Marks: 16**

Need, scope and characteristics of entrepreneurship management of self and understanding human behavior, business ethics, performance appraisal, and (SWOT) analysis. Market survey techniques - Criteria for the principles of product selection and development.

UNIT 5: Marketing **No. of Lecture: 8 Hours, Marks: 16**

Elements of Marketing and Sales Management - Nature of product and market strategy, Packaging and advertising, After Sales Service, Pricing techniques. Financial institutions, financial incentives. Technical feasibility of the project, plant layout & process planning for the product, Quality Control, Critical Path Method (CPM) and Project Evaluation Review Techniques (PERT) as planning tools for establishing SSI.

Reference Books:

1. Entrepreneurship: New Venture Creation, David H. Holt.
2. Patterns of Entrepreneurship: Jack M. Kaplan.
3. Entrepreneurship and Small Business Management: C.B. Gupta, S.S. Khanka,Sultan Chand.

Bioprocess Engineering & Fermentation Technology

LAB COURSE OUTLINE

(Bioprocess Engineering & Fermentation Technology Lab)

Genetic Engineering	**BEFT**	**BTP-608**
Course Title	Short Title	Course Code

Practical	**Hours/ Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	04	**15**	**60**	**02**

Course Description:

In this laboratory course, emphasize has given on the understanding of basics of bioreactor design, various sterilization procedures involved, kinetics of the processes and fermentation procedure of various products.

General Objective:

The objective of the laboratory is to impart the basic knowledge of bioprocess engineering. This practical course also focuses on various sterilization techniques involved in the field of bioprocess engineering. This course also deals with the study of kinetics and other aspects of microbial cultures.

Prerequisite Course(s): 12th Std. Science and SE Biotechnology Courses.

Learning Outcomes:

After successful completion of this lab student will be able to:

1. Understand the basic design of the fermenter.
2. Apply the knowledge to study kinetics of the process.
3. Apply the knowledge of sensors and various sterilization techniques involved in the process.

LAB Course Content

TE Biotechnology Bioprocess Engineering & Fermentation Technology Semester – VI

Teaching Scheme	**Examination Scheme**	
Theory: 3 hours/ week	Internal Continuous Assessment (ICA)	: 50 Marks
	External Sessional Examination (ESE)/ Oral (OR)	: 50 Marks

Minimum eight experiments from the following:

1. Introduction to the fermenter.
2. Feed Sterilization
3. Fermenter Sterilization
4. Growth kinetics of microorganisms using shake flask method.
5. Determination of specific thermal death rate constant (Ka).
6. Determination of Volumetric oxygen transfer coefficient (KLa), effect of aeration and agitation speed.
7. Preparation of Immobilized enzymes and cells and evaluation of kinetic parameters.
8. Kinetics study of Product formation.
9. Effect of substrate and product concentration on biomass yield for baker's yeast production.
10. Studies on settling characteristics of various microbial cultures
11. Study of Physical and chemical sensors for medium and gases.
12. Fermentative production of Sauerkraut.

Reference books:

1. R.A.Dixon and Gonzales, Plant Cell Culture : A Practical Approach, IRL Press.
2. S.S.Purohit, Biotechnology: Fundamentals and Applications, Agrobios (India), 4th Edition, 2005.
3. P.F.Stanbury, A.Whitkar and S.J.Hall, Principles of Fermentation Technology, Aditya Book House, New Delhi.
4. B.D.Singh, Biotechnology: Expanding Horizons, Kalyani Publishers, New Delhi, Second Revised Edition, 2008.
5. Biochemical Methods, Second Edition by S. Sadasivam, A. Manickam, New Age International Ltd, Publishers.

Lab Mass Transfer

LAB COURSE OUTLINE

Mass transfer Lab	**MT LAB**	**BTP-607**
Course Title	Short Title	Course Code

Laboratory	**Hours/Week**	**No. of Weeks**	**Total Hours**	**Semester Credit**
	02	**12**	**24**	**01**

Mass Transfer Lab

Course Description:
The goal of the course is intended to provide a strong foundation in concepts and principles of mass transfer operations used in industries.

Prerequisite Course(s): 12th Std. Science and SE Biotechnology Courses.

General Objective: The objective of the laboratory is to impart the practical knowledge of Mass transfer operations to the students.

Learning Outcomes:
After successful completion of this lab course; the student will be able to:

1. Explain and apply various separation techniques in industries.
2. Determine purity of product in process industries.
3. Increase purity of various products in process industries.

Mass Transfer

Semester-V

Teaching Scheme
Practicals -2 Hrs/week

Examination Scheme
External Sessional Exams (ESE)/Oral (OR):25 Marks.
Internal Continuous Assessment (ICA): 25 Marks.

Minimum 08 experiments shall be performed from the following:

1. To determine mass transfer coefficient for dissolution of benzoic acid without chemical reaction.
2. Simple Distillation: To verify Rayleigh's equation for simple distillation
3. To study Bubble Cap Distillation.
4. Liquid – Liquid Extraction: To study and determine the efficiency of cross Current liquid- liquid extraction.
5. To construct ternary diagram for acetic acid –water –benzene
6. To plot Tie line diagram for acetic acid –water –benzene
7. To determine the percentage leaching of NaOH from a mixture of NaOH and $CaCo_3$.
8. Adsorption: To study adsorption of acetic acid on activated charcoal
9. To calculate percentage yield of crystals obtained with and without seeding in saturated solution of solute.

Reference Books:

1. R. E. Treybal , Mass transfer operation ,McGraw Hill Publication
2. Coulson and Richardson Chemical Engineering (Vol. I and II), Pergamon Press

Genetic Engineering

LAB COURSE OUTLINE

(Genetic Engineering Lab)

Genetic Engineering	**GE**	**BTP-608**
Course Title	Short Title	Course Code

Practical	**Hours/ Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	02	**15**	**30**	**02**

Course Description:
In this laboratory, course emphasis is on the understanding of basics of Genetic Engineering techniques. The learner can use this knowledge and apply in allied branches of Biotechnology as required.

Prerequisite Course(s): 11th, 12th Biology, SE Biotechnology courses

General Objective:
The objective of the laboratory is to impart the fundamental knowledge of Genetic Engineering at the research level to the students and develop their ability to apply the specific procedures to analyze the experimental results. In this lab, students will be familiar with the Genetic Engineering lab techniques which they can apply in research and Development in the field of Biotechnology.

Learning Outcomes:
After successful completion of this lab student will be able to:

1. Use restriction digestion enzyme for various applications of DNA study
2. Use ligation enzyme to join different DNA to form new product
3. Prepare plasmid for various applications
4. Use DNA fingerprinting method by RFLP for various applications.
5. To map the genomic DNA
6. To transform DNA by using various vectors
7. Will be able to apply the knowledge of Southern, Northern and western blotting for the detection of target DNA, RNA and proteins.

LAB COURSE CONTENT

TE Biotechnology **Genetic Engineering** **Semester – V**

Teaching Scheme
Practical: 2 hours/ week

Examination Scheme
Internal Continuous Assessment: 25 Marks

Minimum eight experiments from the following:

1. Restriction digestion of genomic DNA of bacteria
2. Ligation of bacterial DNA.
3. Plasmid preparation.
4. DNA fingerprinting (by RFLP)
5. DNA mapping using restriction enzymes
6. Transformation of *E.coli* with plasmid pBR 322
7. Transduction
8. Southern Blotting
9. Northern Blotting

Reference books:

1. Introduction to Practical Biochemistry, Third Edition, by David Plummer.
2. Biochemical Methods, Second Edition by S. Sadasivam, A. Manickam, New Age International Ltd, Publishers.

Minor Project

Course Outline

Minor Project	**Minor Project**	**BTP-609**
Course Title	Short Title	Course Code

Examination Scheme:
Internal Continuous Assessment: 50 Marks
Practical Hrs/week: 2 hrs

A minor project related to Biotechnology and allied fields.
Project report should consist of details of work carried out by the student.
Every student shall be required to present a seminar in the presence of two teachers. These teachers (fixed by the head of department in consultation with the Principal) shall award the marks based on the following:
(a) Report 20 marks
(b) Seminar presentation 20 marks
(c) Viva-voce at the time of Seminar presentation 10 marks

SEMINAR-I

Course Outline

Seminar-I	**Seminar-I**	**BTP-610**
Course Title	Short Title	Course Code

Examination Scheme:
Internal Continuous Assessment: 25 Marks
Practical hrs / week: 2 hrs.

During sixth term, every student individually will study a topic assigned to him and submit a report in a typed form and shall deliver a short lecture / seminar on the topic at the time of seminar oral examination .The topic assigned will be related to the field of Biotechnology, Biochemical Engineering and allied fields.
The students shall deliver the seminar (10 to 15 minutes) and submit the seminar report to the staff member on different technical subjects during the semester. The assessment of the term work shall be based on the: -

1. Attendance to the seminar-5 Mark
2. Performance of the seminar delivery-10 Mark
3. Seminar report -5Mark
4. Viva voce during the seminar- 5 Mark

The staff member/members shall guide the students in:

1. Selecting the seminar topic.
2. Information retrieval (literature survey)

a) Source of Information i.e. names of the journals, reports, books etc.
b) Searching for the information i.e. referring to chemical abstracts etc.

3. Preparing the seminar report
4. Delivering the seminar

The oral examination shall be conducted by a committee of teachers internally which shall include the concerned guide also and shall award the oral marks (at the end of sixth term).

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

SYLLABUS OF

FINAL YEAR ENGINEERING (B.E.)

BIOTECHNOLOGY

TERM – I and II

W.E.F. 2009-2010

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NORTH MAHARASHTRA UNIVERSITY, JALGAON

STRUCTURE OF TEACHING and EVALUATION

B.E. (BIOTECHNOLOGY) **W.E.F.2009-2010**

First Term

Sr. No.	Subject	Teaching Scheme Hours/Week		Examination Scheme				
		Lectures	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Bioprocess Engineering - I	04	--	03	100	25	--	--
2	Bioprocess Modeling and Simulation	04	04	03	100	25	25	--
3	Bioseparation Processes	04	--	03	100	25	--	--
4	Elective –I	04	--	03	100	--	--	--
5	Fermentation Biotechnology-II	04	04	03	100	25	--	50
6	Project –I	--	02	--	--	25	--	25
7	Seminar	--	02	--	--	25	--	--
		20	12		500	150	25	75
	Grand Total	32			750			

Second Term

Sr. No.	Subject	Teaching Scheme Hours/Week		Examination Scheme				
		Lectures	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Bioprocess Engineering -II	04	04	03	100	25	--	25
2	Bioprocess Engineering and Economics	04	02	03	100	25	--	25
3	Bioinformatics	04	04	03	100	25	25	--
4	Elective –II	04	--	03	100	25	--	--
5	Project –II	--	04	--	--	100	--	50
6	Industrial Visit / Case Study	--	--	--	--	25	--	--
		16	14		400	225	25	100
	Grand Total	30			750			

Elective – I

1. Advanced Biomaterials.
2. Plant Tissue Culture and Plant Biotechnology.
3. Protein Engineering.
4. Food Biotechnology.

Elective – II

1. Metabolic Engineering.
2. Biosafety and Bioethics.
3. Biomedical Fluid Dynamics.
4. Applied Genetic Engineering

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B.E.BIOTECH. TERM-I

1. BIOPROCESS ENGINEERING-I

Teaching Scheme:
Lectures: 4 Hrs. / Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Term Work: 25 Marks

Unit: I

Design of bioreactors and scale up:

Introduction, Basic objective in design of a reactor, aseptic operation and containment, body construction, aeration and agitation, stirrer glands and bearings, baffles design, sparger system, achievement and maintenance of aseptic conditions, valves and steam traps, types of valves and pressure control valves.

Scale up of fermenters, design condition for scale up, scale-up methods.

(10 Hrs, 20 Marks)

Unit II

Bioreactors

Types of bioreactors: Batch bioreactors, Continuous bioreactors, Semicontinuous bioreactors, Stirred tank bioreactors, Airlift bioreactor systems, Trickle bed bioreactor, Airlift external loop bioreactors, waldhof-type fermenter, Tower fermenter, Cylindro-conical vessel, Deep jet fermenters, Cyclone column, Rotating disc fermenters, Reactor dynamics: Dynamic models and stability.

Solid state fermenter: Introductions, types of solid state fermenter, few examples of bioproducts produced from solid state fermenter.

(10 Hrs, 20 Marks)

Unit III

Bioreactors configuration:

Enzyme reactors, batch growth of microorganisms, continuous culture of microorganisms, stirred tank reactor with recycle of biomass, continuous stirred tank fermenters in series, Fed batch fermenters, plug flow fermenters, problems on above, estimation of kinetic parameters (batch and continuous culture experiments).

(10 Hrs, 20 Marks)

Unit IV

Bioreactor Design Considerations:

Design consideration: Design codes, maximum working pressure, design pressure, design temperature, design stress, factor of safety, and selection of factors of safety, design of wall thickness, corrosion ratio, Poisson ratio, criteria of failure.

Materials of construction: mechanical properties, materials, corrosion, protective coating, choice of materials, corrosion prevention.

Brief introduction to pipe joints. (10 Hrs, 20 Marks)

Unit-V

Process design of bioreaction vessel: Introduction, materials of construction, agitation, classification of bioreaction vessels, heating systems, design of bioreaction vessels.

Agitators: Introduction, types of agitators, baffling, power requirements, design of turbine agitator.

(10 Hrs, 20 Marks)

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REFERENCES:

1. Cooney and Humphery, Comprehensive Biotechnology, Volume-2, Elsevier Publication.
2. Syed Tanveer Ahmad Inamdar, Biochemical Engineering Principles and Concepts, , PHI Publication.
3. James E. Bailey, David F. Ollis, Biochemical Engineering Fundamentals, Mcgraw –Hill, International Edition.
4. Paulin.M.Doran, Bioprocess Engineering Principles, Elsevier Publication.
5. Michael L. Shuler, Fikret Kargi, Bioprocess Engineering - Basic Concepts, PHI Publishers.
6. P. F. Stanbury, A. Whitaker and S. J. Hall, Principles of Fermentation Technology, Aditya books, Private Limited New Delhi.
7. B.D Singh, Biotechnology- Expanding Horizons, Kalyani Publications.
8. Operational Mode of Bioreactors- Biotol series ,Elsevier Publications.
9. B.C.Bhattacharya, Introduction to Chemical Equipment Design (Mechanical Aspects), CBS publisher and Distributors, New Delhi.
10. M.V.Joshi, V.V.Mahajan, Process Equipment Design, Macmilan India Ltd.
11. S.D.Dawande, Process Design of Equipments (vol 1and2) Central Techno Publications, Nagpur.
12. J.H.Perry, Chemical Engineer's Hand Book, Mcgraw Hill, New Delhi
13. H.C.Vogel, Woyes Coulson and Richardson,Principles, Process Design of Equipment, (vol 6).

Term Work shall be based on the following assignments:

1. Design of Bioreactors and Scale up.
2. Types of Bioreactors by taking example of product produced.
3. Solid state fermenter with example of bioproduct produced.
4. Bioreactor Design consideration.
5. Pipe joints and types of pipe joints.
6. Process design of bioreaction vessel.
7. Design of Agitators.
8. Types of Agitators.

2. BIOPROCESS MODELING AND SIMULATIONS

Teaching Scheme:
Lectures: 4 Hrs. / Week
Practical: 4 Hrs. / Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Practical: 25 Marks
Term Work: 25 Marks

Unit I

Introduction to modeling:

Introduction: Role of process dynamics and control, historical background, Laws and Languages of process control, Mathematical Modeling of Bioprocess Engineering System: Fundamentals uses of mathematical model, scope of coverage, principles of formulation; Fundamental Laws of Modeling: continuity equation, energy equation,

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equation of motion, transport equation, equation of state, phase and chemical equilibrium, chemical kinetics;
Lumped parameter and distributor parameters.

(10 Hrs, 20 Marks)

Unit II

Study of mathematical models of Biochemical Engineering Systems:
Introduction, modeling of CSTRs (isothermal, constant hold up, variable hold up), Batch reactors, non isothermal CSTR, Plug flow reactor, Fluidized bed reactor, Reactors used in effluent treatments, Trickle bed reactor, Fermenter.

(10 Hrs, 20 Marks)

Unit III

Computer aided design of heat and mass transfer equipment:
Batch distillation with hold up, Ideal binary distillation column, Multicomponent nonideal distillation column, Reactor with mass transfer, Design of shell and tube heat exchangers, Double pipe heat exchangers, Design of gas dryer.

(10 Hrs, 20 Marks)

Unit IV

Biological Models:
Modeling of gene regulation, Modeling of signal transduction in prokaryotes and eukaryotes, Models for inheritance, Genetic inbreeding model, Simple logistic models, Simple prey predator models, Volterra's model of an interacting species, Microbial population models (growth model, product formation), Pharmaceutical models, Blood glucose in diabetic patients.

(10 Hrs, 20 Marks)

Unit V

Simulation:
Introduction, Computer programming, Computational methods, Runga-Kutta Method, Newton Raphson Method; Simulation of reactors, Simulation of Double pipe and Shell tube heat exchangers, Simulation for catalyst surface temperature, Simulation of rotary dryer.

(10 Hrs, 20 Marks)

REFERENCES:

1. Luyben W.L. "Process Modeling Simulation and Control for Chemical Engineers", McGraw Hill, 1988.
2. Chapra S.C., R.P. Canale, "Numerical Methods for Engineers", Tata-McGraw Hill Publications.
3. Franks R.E.G., "Modeling and Simulation in Chemical Engineering", Wiely Instscience, NY
4. John Ingam, Irving J. Dunn., "Chemical Engineering Dynamic Modeling with PC simulation", VCH Publishers.
5. J.R. Leigh, Modeling and Control of Fermentation Processes, Peter Peregrinus, London, 1987.
6. J.N.Kapur, Mathematical Models in Biology and Medicine.
7. Cooney and Humphery, Comprehensive Biotechnology,Volume-2,Elsevier Publication.

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8. James E. Bailey, David F. Ollis, Biochemical Engineering fundamental, Mcgraw –Hill, International edition.
9. Pevzner, Computational Molecular Biology- An Algorithmic Approach, PHI, New Delhi.
10. Setubal, Introduction to Computational Molecular Biology, Cengage Learning PVT.
11. Vose, Simple Genetic Algorithms, The- Foundations and Theory, PHI, New Delhi.

Practical and Term work: Practical and term work shall consist of minimum eight experiments from list given below.

1) CAD of shell and tube exchanger.
2) CAD of adsorption column.
3) CAD of single effect evaporator.
4) Computer controlled heat exchanger.
5) CAD for rotary dryer.
6) Simulation of temperature on surface catalyst.
7) Simulation of reactor design.
8) Simulation of ammonia production system.
9) Modeling and simulation of protein.
10) Drug designing.

3. BIOSEPARATION PROCESSES

Teaching Scheme:
Lectures: 4 Hrs. / Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Term Work: 25 Marks

Unit I

Introduction and separation of particles:

Role and importance of downstream processing in biotechnology, characteristics of biological mixtures (broth), criteria of recovery process, process design criteria.

Separation of particles:

Introduction, filtration, filter media, theory of filtration, types of filters (vacuum filter, plate and frame filter, leaf filter),centrifugation, theory of centrifugation, types of centrifuge (tubular bowl centrifuge, basket centrifuge, ultra centrifuge), sedimentation, precipitation and flocculation.

(10 Hrs, 20 Marks)

Unit II

Cell disruption methods:

Introduction, types of intracellular products and importance, methods of cell disruption, physico-mechanical cell disruption: liquid shear (high pressure homogenizer), solid shear agitation and abrasives (bead mill, kinetics of bead mill), freezing - thawing, ultrasonication (ultrasonic vibrators), thermal shock, osmotic shock, chemical treatment: alkali treatment, detergent solubilization, lipid solubilization, enzymatic method.

(10 Hrs, 20 Marks)

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Unit III

Extraction and Concentration:

Extraction, modes of extraction, liquid-liquid extraction, two phase aqueous extraction, super critical extraction, solvent recovery, extraction application.

Concentration of products:

Evaporation, types of evaporation, membrane process, design and configuration of membrane separator equipment, ultrafiltration, reverse osmosis, dialysis, nanofiltration, sorption, sorption mechanism, materials of sorption, modes of operation in sorption process, adsorption.

(10 Hrs, 20 Marks)

Unit IV

Purification of product:

Fractional precipitation, Chromatography: Types of chromatography: Adsorption, Ion exchange, Gel permeation, Affinity, Molecular Exclusion, High Performance Liquid Chromatography (HPLC), Gas Liquid Chromatography (GLC); Crystallization, Drying, types of drying (spray drying, vacuum drying, freeze drying), Electrophoresis: Theory of electrophoresis, gel electrophoresis, SDS-page electrophoresis, isoelectric focusing, immunoelectrophoresis.

(10 Hrs, 20 Marks)

Unit V

Formulation and Case studies:

Introduction, importance of formulation, formulation of baker's yeast, enzymes (glucose isomerase, detergent enzymes), formulation of pharmaceutical products, application research, Granulation: wet granulation, dry granulation or slugging, Tabletting: compressed tablets, tablet formulation, coating, pills, capsules, Case studies of recovery process of penicillin, cephatomycin, nuclease, citric acid, proteins, etc.

(10 Hrs, 20 Marks)

REFERENCES:

1. Biotal series, Product Recovery in Bioprocess Technology, Elsevier Publisher
2. Murray Moo-Young, Comprehensive Biotechnology (Vol: 1), Pergamon Press, An Imprint of Elsevier.
3. Michael R Ladisch, Bioseparation Engineering Principles, Practice and Economics, Wiley-Inter science
4. Syed Tanveer Ahmad Inamdar, Biochemical Engineering Principles and Concepts, , PHI Publication
5. Gary Walsh, Biopharmaceuticals: Biochemistry and Biotechnology.
6. P. F. Stanbury, A. Whitaker and S. J. Hall, Principles of Fermentation Technology, Aditya Books (P) Ltd, New Delhi
7. Belter P.A. and Cussier E, Bioseparations, Wiley, 1985.

Term Work shall be based on the following assignments:

1. Role and importance of downstream processing in biotechnology.
2. Separation of particles.
3. Cell disruption methods.
4. Extraction methods.
5. Concentration of products.
6. Chromatography and its types.

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7. Electrophoresis and its types.
8. Case studies of recovery process of some bioproducts.

ELECTIVE – I
1. ADVANCED BIOMATERIALS

Teaching Scheme
Theory: 4 Hours/Week

Examination Scheme
Paper: 100 Marks (3Hrs)

Unit-I

Applications of biomaterial, tissue engineering for artificial organs, Types of biomaterials and their applications for the human body, issues of biocompatibility and its evaluation, Surface characterization of biomaterials, biomaterials-blood (bio-fluid) interface, Surface modification for improved compatibility.

(10 Hrs,20 Marks)

Unit-II

Biomaterials in cardiovascular System: Collagen hyaluronic acid and other biopolymer applications, Cardiovascular implant biomaterials: artificial heart valves, Mechanicals and bioprosthetic valves; Vessel grafts, Endothelial cell seeding as a surface modification of biomaterials.

Orthopedic implant materials: Materials for reconstruction of cartilage, ligaments and tendons, Bone replacement and bone cement, Artificial joint replacement.

(10 Hrs, 20 Marks)

Unit-III

Artificial red blood cells, artificial lung surfactants, artificial saliva, artificial synovial fluid, dialysis membranes, artificial liver, artificial pancreas, biodegradable block copolymers and their applications for drug delivery materials used for neuronal reconstruction and regeneration.

(10 Hrs,20 Marks)

Unit- IV

Polhydroxyallalkaloids and polylactides, Biodegradable plastic: characteristics, production and application.

Cyclodextrins: Properties, production and applications.

Biomaterials for development of biosensors enzymes, pigments etc.

(10 Hrs,20 Marks)

Unit - V

Bionanomaterials: Silver and Gold nanoparticles, other nanoparticles, its biological properties, its production, agents for its dispersion and application.

Ophthalmology: Artificial cornea, intraocular lenses, artificial tears, Tissue engineering and artificial organs, Wound dressings, artificial skin, facial implants, Dental restorative materials, implanted dental interfaced.

(10 Hrs,20 Marks)

REFERENCES:

1. D.L. Wise et al. (Eds.): "Encyclopedic Handbook of Biomaterials and Bioengineering (4Vols.)", Marcel Dekker, New York, 1995.
2. S. Fredrick: "Biomaterials, Medical Devices and Tissue Engineering": An Integrated Approach. Chapman and Hall, 1994.
3. L.L. Hench, E.C. Ethridge: "Biomaterials", An interfacial Approach. Academic

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Press, New York, 1982.
4. S. Frederick, H. Chrstiansen, L. Devid: "Biomaterial Science and Biocompatibility".

ELECTIVE – I
2. PLANT TISSUE CULTURE AND PLANT BIOTECHNOLOGY

Teaching Scheme:
Lectures: 4 Hrs. / Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)

Unit I

Introduction to plant tissue culture:

Introduction, history of tissue culture, general techniques (about aseptic conditions), requirements (equipments), media, media constituents, media selection, types of media, totipotency of cells, explant, criteria for selection of explant, surface sterilization of explant, classification of tissue culture, callus culture, cell suspension culture, application of callus culture and cell suspension culture, regeneration of plantlet by callus culture.

(10 Hrs, 20 Marks)

Unit II

Tissue culture methods:

Meristem culture, anther culture, ovary culture, embryo culture, somatic hybridization, protoplast culture (isolation of protoplast, purification of protoplast and culture media of protoplast), protoplast fusion methods, Micro propagation, Somatic embryogenesis, somaclonal variation, haploid plants, cybrids, Gynogenesis, synthetic seeds and preservatives, cryopreservation.

(10 Hrs, 20 Marks)

Unit III

Plant Biotechnology:

Plant viruses, classification of plant viruses, virus as a tool to deliver foreign DNA, gene construction of plants, vectors for production of transgenic plant, transformation techniques: Agro bacterium mediated gene transfer, Agro infection, direct gene transfer method; integration of the transgenes, analysis of transgene integration, Nitrogen fixation, nif gene.

(10 Hrs, 20 Marks)

Unit IV

Transgenic plants I:

Introduction, characteristics of transgenic plants, herbicide resistance, insect resistance, virus resistance, drought resistance, microbial disease resistance, stress tolerance, genetic manipulation of flowers pigmentation, fruit ripening and flower wilting.

(10 Hrs, 20 Marks)

Unit V

Transgenic plants II:

Modification of starch, plant nutritional content, food plant taste and appearance, oil and seed protein quality, male sterility, biochemical production, pharmaceutical products, plant derived vaccines, biofertilizers.

(10 Hrs, 20 Marks)

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REFERENCES:

1. R.A.Dixon and Gonzales, Plant cell culture : A Practical Approach, IRL Press.
2. S.S.Purohit, Biotechnology Fundamentals and Applications, Agrobios (India), 4th Edition, 2005.
3. B.D.Singh, Biotechnology-Expanding Horizons, Kalyani Publishers, New Delhi, Second Revised Edition, 2008.
4. S.S.Bhojwani and M.K.Razdan, Plant Tissue Culture : Theory and Practical, (1996) Elsevier, Amsterdam.
5. J.Hammond,P.McGarvey and V.Yusibov (Eds.), Plant Biotechnology New Products and Applications, Springer.
6. S.B Primrose and R.M.Twyman, Principles of Gene Manipulation and Genomics, Blackwell publishing, 7th edition, 2006.
7. Bernard R. Glick, Molecular Biotechnology 3rd edition, CBS Publishers Distributors.

ELECTIVE – I
3. PROTEIN ENGINEERING

Teaching Scheme: Examination Scheme:
Lectures: 4 Hrs. / Week Paper: 100 Marks (3 Hrs)

Unit I
Introduction to Proteins:
Introduction, biosynthesis of protein, post translation modification, primary, secondary, tertiary and quaternary structure of proteins, conformational analysis and forces that determine protein structure, energy status of a protein , effect of amino acids on structure of proteins with example, structure and functional relationship.

(10 Hrs, 20 Marks)

Unit II
Structure Determination:
Methods of protein isolation, purification and quantification, physical methods to determine protein structure: X-ray crystallography, NMR spectroscopy; amino acid sequencing methods.

(10 Hrs, 20 Marks)

Unit III
Protein Engineering:
Mutagenesis, types of mutagenesis, site directed mutagenesis, protein engineering, modifications to 3D structure of proteins, design and synthesis of peptides, PCR, PCR in site directed mutagenesis.

(10 Hrs, 20 Marks)

Unit IV
Application of Protein Engineering:
Specific examples of engineered enzymes, Tryesyl tRNA synthetase, Dihydrosolate reductase, Subtilisin, Pepsin class of enzymes, Lysozyme, charging tRNA, Peptide vaccines, Engineered Proteins in medical application, Chemical modifications: phosphorylation, glycosylation, methylation, formylation, Application of engineered proteins.

(10 Hrs, 20 Marks)

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Unit V

Protein Modeling and Drug Design:

Protein database, structure database, alignment methods to determine protein function and similarity, structure prediction, molecular modeling, structural similarities and super-imposition techniques, Molecular interactions: docking, calculation of molecular properties, energy calculation in docking, introduction to software used in protein modeling and drug design.

(10 Hrs, 20 Marks)

REFERENCES:

1. Klaus Demobowsky, "Novel Therapeutic Proteins": Wiley Publications.
2. Messer- Schmidt, "Handbook of Metaloproteins" – Wiley Publications.
3. Ronald Kellner et al., "Microcharacterisation of proteins", 2nd ed. Wiley, Publications
4. Susane Brakmann, "Directed Molecular Evolution of Proteins"- Wiley Publications
5. Walsh, " Protein: Biotechnology and Biochemistry", 2nd ed., Wiley Publications
6. Westermeier – "Proteomics in Practice"- Wiley Publications.
7. Buchanan B.B. Grussem. W. and Jones. R.L. 2000. 'Biochemistry and Molecular Biology of Plants". American Society of Plant Physiologists, Maryland, USA.

ELECTIVE – I
4. FOOD BIOTECHNOLOGY

Teaching Scheme: Examination Scheme:

Lectures: 4 Hrs. / Week Paper: 100 Marks (3 Hrs)

Unit I:

Introduction, world food requirement, aims of food biotechnology, interdisciplinary approach, constituents of food, functional properties of dietary carbohydrates and their sources, fatty acids in food, functions of dietary proteins and their sources, dietary requirement of vitamins, Food quality: evaluation (sensory) of food quality, quality factors for the consumers safety, food safety standards.

(10 Hrs, 20 Marks)

Unit II:

Microorganisms in food:

Types of microorganisms in food, role and significance of micro organisms in foods, factors influencing microbial activity.

Microbial examination of foods, food borne diseases: food infection, viral infections, food borne parasites, food intoxication.

(10 Hrs, 20 Marks)

Unit III:

Food spoilage and Preservation:

Food fit for consumption, deterioration of food quality, causes of food spoilage, spoilage of various foods and food products; food preservation using high temperature, evaporation ,drying, low temperature and irradiation.

(10 Hrs, 20 Marks)

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Unit IV:
Food Biotechnology:
Food fermentation, microbial culture in food industry, fermented dairy products (milk, yogurt and cheese), fermented meat products and vegetable products, fermentation for flavor production, idali, vinegar, colors, vitamins, beverage, single cell proteins, sauerkraut, deoxygenation and desugaring by glucose oxidase.

(10 Hrs, 20 Marks)

Unit V:
Unit operations:
Food engineering operations, size reduction, screening, mixing, emulsification, filtration, membrane separation, centrifugation, extraction, expression, crystallization, heat processing.

(10 Hrs, 20 Marks)

REFERENCE:

1. B. Sivashankar, Food Processing and Preservation, Prentice Hall ,India.
2. Powar and Daginawala, General Microbiology (vol 2), Himalaya Publishing House.
3. Murray Moo-Young, Comprehensive Biotechnology (Vol: 3), Pergamon Press, An imprint of Elsevier.
4. S.S. Purohit, Microbiology: Fundamentals and Application, Agrobios India.
5. Fraizer, Food Microbiology ,TMH publication
6. Hiller, Genetic Engineering of Food: Detection of Genetic Modifications, Willy Publication.

5. FERMENTATION BIOTECHNOLOGY-II

Teaching Scheme:
Lectures: 4 Hrs. / Week
Practical: 4 Hrs. / Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Oral: 50 Marks
Term Work: 25 Marks

Unit I
Beverage products:
Fermentative production Alcoholic beverages: Beer, Wine, Rum, Gin, Whisky, Brandy, Champaign.
Industrial Chemicals:
Fermentative production of citric acid, acetic acid, lactic acid, ethanol, acetone and butanol, gluconic and itaconic acid, fumaric acid, steroid biotransformation.

(10 Hrs, 20 Marks)

Unit II
Fermentation of food products:
Fermentative production of food products: cheese and types of cheese, fermented soyabean foods, biomass production (single cell protein, baker's yeast), fermented dairy products like yogurt, cultured buttermilk;
Microbial flavors and fragrances (methyl ketones, lactones, butyric acid, terpenes and terpene transformation).
Biofertilizers: Production of Rhizobium, Bacillus thuringienesis, Trichoderma viride.

(10 Hrs, 20 Marks)

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Unit III

Biomolecules:

Enzyme production- Amylases, Proteolytic enzymes, Invertase enzyme, Pectinases, Lipases; Vitamins: Vitamine B12, Riboflavin, Vitamin A, Amino acid production: L-Glutamic acid, L-Lysine, L-Threonine; Microbial pigments, Microbial polysaccharides.

(10 Hrs, 20 Marks)

Unit IV

Biopharmaceuticals and Biotransformation:

Production of penicillin, B-Lactum antibiotics, Streptomycin, Cephalosporins, Aminoglycoside, Tetracyclines, Steroid Biotransformation.

(10 Hrs, 20 Marks)

Unit 5

Important products through r-DNA technology:

Hepatitis B, vaccine, interferons, Insulin, somatotrophic hormone, therapeutic proteins Vaccines.

Production of biodiesel and biogas, Biological production of hydrogen and biofuel cells Biological waste treatment (utilization of mixed culture).

(10 Hrs, 20 Marks)

REFERENCES:

1. L.E.Casida,JR ,Industrial Microbiology, New Age International (P) Ltd Publication.
2. Jayanta Achrekar, Fermentation Biotechnology, Dominant Publishers and Distributors
3. D.Lanch,Drew,Wang, Comprehensive Biotechnology-Volume 3,Elsevier Publication.
4. B.D.Singh, Biotechnology, Kalyani Publication.
5. Michael L. Shuler, Fikret Kargi, Bioprocess Engineering: Basic Concepts, Prentice Hall India Pvt. Ltd., New Delhi.
6. Prescot and Dun, Industrial Microbiology, McGraw-Hill Book Company, Inc. New York.

Practical and Term work: Practical and term work shall consist of minimum eight experiments from list given below.

1. Study of growth curve of microorganisms.
2. Production of ethyl alcohol using yeast.
3. Citric acid production using Aspergillus niger.
4. Penicillin production using Penicillium crysogenum.
5. Production of enzyme by solid state fermentation.
6. Isolation of bacterial pigments.
7. Production of enzyme by submerged fermenter.
8. Production of bakers yeast (biomass production).
9. Vinegar production by fermentation.
10. Analysis of molasses.
11. Analysis of finished product (rectified spirit, beer, etc.).

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6. PROJECT-I

Teaching Scheme: Examination Scheme:
Practical: 2 Hrs./ Week Oral : 25 Marks
Term Work: 25 Marks

The project topic shall consists of either some investigation work or design problem or experimental set up of some development work or prototype equipment or dissertation related to field of Biotechnology, Biochemical Engineering and allied fields.
Project shall be taken in the beginning of the seventh term in consultation with concerned guide and must be completed in eighth term. The project proposal must be submitted in the beginning of the seventh term by every student or a group of students (not more than five students in a group).
The students shall submit the report to the corresponding guide, present their work in due time based on following points,

- Introduction.
- Literature survey.
- Physical / chemical properties etc.
- Experimental setup and procedure.
- Extent of project completed.

Presentation can be performed with OHP slides / LCD.
The progress of the project shall be evaluated by a committee of internal teachers which shall include concerned guide also and shall award the term work marks.
The oral examination of the project shall be conducted by concerned guide and external examiner jointly.

7. SEMINAR

Teaching Scheme: Examination Scheme:
Practical: 2 Hrs./ Week Term Work: 25 Marks

During seventh term, every student individually will study a topic assigned to him and submit a report in a typed form and shall deliver a short lecture / seminar on the topic at the time of seminar oral examination .The topic assigned will be related to the field of Biotechnology, Biochemical Engineering and allied fields.

The students shall deliver the seminar (10 to 15 minutes) and submit the seminar report to the staff member on different technical subjects during the semester. The assessment of the term work shall be based on the: -

1. Attendance to the seminar
2. Performance of the seminar delivery
3. Seminar reports and
4. Viva voce during the seminar.

The staff member/members shall guide the students in:

1. Selecting the seminar topic.
2. Information retrieval (literature survey)
    a) Source of Information i.e. names of the journals, reports, books etc.
    b) Searching for the information i.e. referring to chemical abstracts etc.

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3. Preparing the seminar report
4. Delivering the seminar

The oral examination shall be conducted by a committee of teachers internally which shall include the concerned guide also and shall award the oral marks (in the seventh term / at the end of seventh term).

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B.E. BIOTECH. TERM II.

1. BIOPROCESS ENGINEERING – II

Teaching Scheme:
Lectures: 4 Hrs. / Week
Practical: 4 Hrs. / Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Oral: 25 Marks
Term Work: 25 Marks

Unit-I

Plant Tissue Engineering-I:
Introduction to tissue engineering, media components (micro and macro nutrients) and preparation, media selection, cellular totipotency,practical application of cellular totipotency, criteria for selection of explant, classification of tissue culture, callus culture, cell suspension culture, application of callus culture and cell suspension culture, single cell culture, meristem culture.

(10 Hrs, 20 Marks)

Unit-II

Plant Tissue Engineering-II:
Bioprocess consideration in using plant cell cultures, bioreactors for suspension cultures, bioreactors for organized tissue, production of secondary metabolites, anther culture, ovary culture, embryo culture, protoplast culture, synthetic seeds and preservations.

(10 Hrs, 20 Marks)

Unit-III

Animal Tissue Engineering-I:
Introduction, Culture environment: substrate, gas phase, media, constituents of media, types of media; isolation of tissue, primary culture, culturing and maintenance of different cell lines, cloning and selection of specific cell types, stem cell isolation and culture, instability, variation and preserving of cell lines, short term lymphocyte culture, fibroblast cultures from chick embryo, epithelial cells culture.

(10 Hrs, 20 Marks)

Unit-IV

Animal Tissue Engineering-II:
Bioreactors considerations for animal cell cultures, Bioreactors for animal cell lines: Monolayer culture (Air lift fermenter, Roux flask, Roller bottle, Hollow fiber cartridge), Suspension cultures (stirred tank bioreactors, packed glass bead reactors), Immobilized cell reactors; Products of animal cell cultures, culture of tumor tissue. Three dimensional culture systems: organ culture, Histotypic culture; a brief about transgenic animals.

(10 Hrs, 20 Marks)

Unit V

Instrumentation and control:
Introduction, methods of measuring process variables, In-line measurements: parameters like temperature, pressure, agitator speed and power consumption, foam detection, liquid and gas flow rates, volume, chemical environment like pH, dissolved oxygen ,dissolved CO_2, redox probe, ion probe, microbial biomass; On line measurement: Ion specific

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sensors, enzyme and microbial electrodes, infrared spectroscopy, mass spectrometers; off line analytical methods, computer applications in fermentation technology, Biosensors.

(10 Hrs, 20 Marks)

REFERENCES:

1. R.A.Dixon and Gonzales, Plant Cell Culture : A Practical Approach, IRL Press.
2. S.S.Purohit, Biotechnology: Fundamentals and Applications, Agrobios (India), 4th Edition, 2005.
3. B.D.Singh, Biotechnology: Expanding Horizons, Kalyani Publishers, New Delhi, Second Revised Edition, 2008.
4. S.S.Bhojwani and M.K.Razdan, Plant Tissue Culture : Theory and Practical, (1996) Elsevier, Amsterdam
5. J.Hammond,P.McGarvey and V.Yusibov (Eds.), Plant Biotechnology New Products and Applications, Springer.
6. S.B Primrose and R.M.Twyman, Principles of Gene Manipulation and Genomics Blackwell Publication, 7th Edition, 2006.
7. Bernard R. Glick, Molecular Biotechnology 3rd edition, CBS Publishers and Distributors.
7. P.F.Stanbury, A.Whitkar and S.J.Hall, Principles of Fermentation Technology, Aditya Book House, New Delhi.
9. R. Ian Freshney,Culture of Animal Cells: A Manual of Basic Technique, A John Wiley and Sons Publications

Practical and Term work: Practical and term work shall consist of minimum eight experiments from list given below.

1. Growth kinetics of microorganisms using shake flask method.
2. Determination of specific thermal death rate constant (Ka).
3. Determination of Volumetric oxygen transfer coefficient (K_La), effect of aeration and agitation speed.
4. Preparation of Immobilized enzymes and cells and evaluation of kinetic parameters.
5. Kinetics study of Product formation.
6. Effect of substrate and product concentration on biomass yield for bakers yeast production.
7. Studies on settling characteristics of various microbial cultures.
8. Explant preparation and their inoculation on suitable plant growth media.
9. Callus induction technique and regeneration of plant from callus culture.
10. Artificial seed production.
11. Shake flask studies of plant cell culture.

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2. BIOPOCESS ENGINEERING AND ECONOMICS

Teaching Scheme:
Lectures: 4 Hrs. / Week
Practical: 2 Hrs. / Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Oral: 25 Marks
Term Work: 25 Marks

Unit I

Bio process Design Considerations**:**

Technical feasibility survey, process development, flow diagram, equipment design and specifications, marketability of product, availability of technology, raw material equipment, human resources, land and utilities, site characteristics, waste disposal, government regulations and other legal restrictions, community factors and other factors affecting investment and production cost, Indian Bioprocess Industry - Current Status and Trends.

(10 Hrs, 20 Marks)

Unit II

Cost Estimation:

Factors affecting investment and production cost, capital investment, fixed investment and working capital, estimating equipment cost by 6/10 factor rule, method of estimating capital investment. Different costs involved in total product cost, computer automization in costing.

(10 Hrs, 20 Marks)

Unit III

Investment Cost and Profitability:

Interest and investment cost, type of interest, types of taxes and tax returns, types of insurance and legal responsibility, depreciation, types of depreciation, methods of determining depreciation.

Profitability, mathematical methods of profitability evaluation, cash flow diagram, break even analysis, balance sheet, pricing issue method and income statement.

(10 Hrs, 20 Marks)

Unit IV

Fermentation Economics:

Introduction, isolation of microorganisms of potential industrial interest, strain improvement, market potential, effects of legislation on production of antibiotics and recombinant proteins, plant and equipment, media, air sterilization, heating and cooling, aeration and agitation, batch process cycle times, continuous culture, recovery costs, water usage and recycling, effluent treatment.

(10 Hrs, 20 Marks)

Unit V

Bioproduct Economics:

Bioproduct regulation, Fermentation process economics: A complete example, Economic consideration of commercial Bioproduct: Enzymes, Proteins via rDNA, Antibiotics, Vitamins, Alkaloids, Nucleosides, Steroids, Monoclonal antibodies, Brewing and wine making, Fuel Alcohol Production, Organic and Amino acid manufacture, Single cell protein, Anaerobic methane production.

(10 Hrs, 20 Marks)

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REFERENCES:

1. Peter M.S. Timmerhaus K.D. Plant Design and Economics for Chemical Engineers. McGraw Hill.
2. Vilbrandt F.C. and C.E. Dryden , Chemical Plant Design. McGraw Hill
3. T.R. Banga and S.C.Sharma, Industrial Organization and Engineering Economics, Khanna Publications, New Delhi.
4. O.P.Khanna Industrial Engineering and Management, Dhanpat Rai Publications Pvt. Ltd. New Delhi.
5. Dewett and Varma, Elementary Economic Theory, S Chand and Company Ltd New Delhi
6. James E. Bailey, David F. Ollis, Biochemical Engineering Fundamentals, Mc Graw-Hill Book Company.
7. P. F. Stanbury, A. Whitaker and S. J. Hall, Principles of Fermentation Technology, Aditya Book Private Limited.

TERM WORK: Term work shall be based on any eight of the following:

1. Indian Bioprocess (biotech) industry.
2. Location of bioprocess plant.
3. Cost estimation.
4. Interest and investment cost.
5. Taxes and insurance.
6. Profitability.
7. Break even analysis.
8. Fermentation economics.
9. Bioproduct economics.

3. BIOINFORMATICS

Teaching Scheme:
Lectures: 4 Hrs. / Week
Practical: 4 Hrs. / Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Practical: 25 Marks
Term Work: 25 Marks

Unit -I

Introduction:

Entropy and information, Shannon's formula, Ergodic process-Redundancy concepts, Introduction to bioinformatics, bioinformatics and internet, DNA sequencing methods.

Databases:

Introduction, primary and secondary databases, format v/s contents, the database, the Gen bank flat files and its format, database at NCBI, Databases : DDBJ, EMBL, Genbank, submitting DNA sequence to database; Structure database: PDB, Molecular modeling database at NCBI, structure file format, Database structure viewers.

(10 Hrs, 20 Marks)

Unit-II

Sequence alignment:

Introduction, types of sequence alignment, evolutionary basis of sequence alignment, Algorithms for sequence alignment: Needlemen-Wunsch and Smith-Waterman

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algorithm, methods of pair wise sequence alignment, Database similarity searching: FASTA, BLAST, Substitution Score and Gap penalties, PAM matrix, multiple sequence alignment, Hidden markov models and threading methods.

(10 Hrs, 20 Marks)

Unit-III

Phylogenetic analysis:

Introduction, elements of phylogenetic models, phylogenic data analysis, relation between Phylogenetic analysis and multiple sequence alignment, evolutionary trees, methods for Phylogenetic prediction: Maximum Parsimony method, Distance methods, Maximum likelihood approach, Phylogenetic software.

(10 Hrs, 20 Marks)

Unit-IV

Gene prediction:

Introduction, open reading frame based gene prediction, procedure for gene prediction, gene prediction in microbial genomes, gene prediction in eukaryotes, neural networks and pattern, Discrimination methods, Promoter prediction in E.Coli, Promoter prediction in eukaryotes, gene finding methods: GRAIL, GENSCAN, PROCRUSTES, Gene parser.

(10 Hrs, 20 Marks)

Unit-V

Structure prediction:

Prediction of RNA structure:-

Introduction, features of RNA secondary and tertiary structure, sequence and base pairing patterns for structure prediction, methods predicting RNA structure: Energy minimization and identification of base covariation.

Prediction of protein structure :-

Introduction, protein structure description, classes of protein structure, protein structure classification in databases, structural alignment methods, protein structure prediction by amino acid sequence: use of sequence patterns, prediction of secondary structure, prediction of 3D structure.

(10 Hrs, 20 Marks)

REFERENCES:

1. Andreas D. Boxevanis, Bioinformatics, Wiley International.
2. David W. Mount, Bioinformatics: Sequence and Genome analysis, Cold Spring Harbour.
3. T.K.Attwood and Parry – Smith D.J, Introduction to Bio Informatics, Pearson Education Ltd, South Asia.
4. Vittal.R.Srinivas, Bioinformatics: A Modern Approach, PHI.
5. S.C.Rastogi, N.Mendiratta, P.Rastogi, Bioinformatics: Methods and Applications, PHI.

Practical and Term work: Practical and term work shall consist of minimum eight experiments from list given below.

1. Databases search: protein and nucleic acid database.
2. Restriction mapping.

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3. Sequence (FASTA and BLAST) searches.
4. Pair wise comparison of sequences.
5. Multiple alignments of sequences.
6. Phylogenetic analysis.
7. Gene structure prediction.
8. Protein database retrieval and visualization.
9. RNA structure prediction.
10. Protein structure prediction.

ELECTIVE II
1. METABOLIC ENGINEERING

Teaching Scheme:
Lectures: 4 Hrs. / Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Term Work: 25 Marks

Unit-I

Basic concepts of metabolic engineering, overview of cellular metabolism, introduction to various metabolic pathways, primary and secondary metabolites, medical and agriculture, importance of secondary metabolites.

(10 Hrs, 20 Marks)

Unit-II
Metabolic Regulation:
Metabolic regulation of genome level, Jacob and Monad model, coordinate regulation of prokaryotic gene expression, lactose operon, tryptophan operon, feed back regulation, cumulative feed back regulation, regulation of gene expression.

(10 Hrs, 20 Marks)

Unit-III
Computational Methods for Pathways:
Introduction, Analysis of pathways: metabolic pathways, genetic pathways, signaling pathways, pathway resources, metabolic control analysis, simulation of cellular activities, biological markup languages.

(10 Hrs, 20 Marks)

Unit-IV
Metabolic Flux:
Metabolic pathway synthesis algorithms, metabolic flux analysis and its application, mathematical calculation for the flow of carbon and nitrogen fluxes, methods for experimental determination of metabolic fluxes by isotope labeling, stereochemistry of regulatory molecules, concepts of regulatory analogs.

(10 Hrs, 20 Marks)

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Unit-V

Different models for cellular reactions, genetic regulation of metabolic fluxes, examples of metabolic pathway manipulations and engineering, analysis of metabolic control and structure metabolic networks, thermodynamics of cellular processes.

(10 Hrs, 20 Marks)

REFERENCE:

1. James Bower and Itamid Bodour, Computational modeling of Genetic and Biochemical Networks,
2. Valino, Metabolic Flux Analysis.
3. Vittal.R.Srinivas, Bioinformatics: A Modern Approach, PHI.
4. S.C.Rastogi, N.Mendiratta, P.Rastogi, Bioinformatics: Methods and Applications, PHI.
5. D. Voet and J.G. Voet 1990, Biochemistry, John Willey and Sons.
6. Szallasi, Stelling, Periwal, System Modeling in Cellular Biology: From Concepts to Nuts and Bolts, PHI, New Delhi.

TERM WORK: Term work shall be based on any eight of the following:

1. Overview of cellular metabolism and metabolic pathway.
2. Primary and Secondary metabolites.
3. Metabolic regulation.
4. Regulation of gene expression.
5. Computational analysis of metabolic pathway.
6. Metabolic flux analysis.
7. Metabolic pathway synthesis algorithms.
8. Examples of metabolic pathway engineering.

ELECTIVE II
2. BIOSAFETY AND BIOETHICS

Teaching Scheme:
Lectures: 4 Hrs. / Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Term Work: 25 Marks

Unit I

Biosafety:

Introduction, objectives of biosafety guidelines, risk assessment, risk regulation, containment, planned introduction of genetically modified organism, biosafety during industrial production, Biosafety levels: experiment with microorganism, research involving plants, research involving animals, Good manufacturing and Good Laboratory practices.

(10 Hrs, 20 Marks)

Unit II

Biosafety regulation and guidelines:

Biosafety guidelines and regulation, biosafety guidelines in India, National and International guidelines with regard to rDNA technology, transgenic science, GM crops,

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hazardous material from bioprocess, pharmaceutical product; GM food debate, Biosafety assessment procedures for Biotech food and related products, ecological safety assessment of recombinant organism and transgenic crops, Bioterrorism and convention on biological weapons.

(10 Hrs, 20 Marks)

Unit III

Introduction:

Bioethics: Legality, morality and ethics, principle of bioethics: autonomy, human rights, beneficence, privacy, justice, equity etc; Biotechnology and society: Introduction to science, technology and society, public acceptance issues in biotechnology

Ethical conflicts in biotechnology: Fear of unknown, black face of biotechnology? When transgenes wander, should we worry? BT cotton creating resistance to biotechnology? Conflicts of BT cotton, some case studies, unequal distribution of risk and benefit of biotechnology.

(10 Hrs, 20 Marks)

Unit IV

Bioethics in animal genetic engineering: Introduction, Issues concern to use of animals, case studies, Animal as a tennis ball? Gene therapy and transgenic animal. Should animal be patentable?

Bioethics in plant genetic Engineering, bioethics and moral concern, Gene flow in crops, BT-cotton case studies, transgenic plants are not absolutely safe, Public education of biotechnology.

Bioethics in Microbial Technology.

(10 Hrs, 20 Marks)

Unit V

Intellectual property rights:

Introduction, IPR in India , intellectual property , protection of IPR : Trade secret, Patent, Copyright, Plant variety protection , International Harmonization of patent laws: Trips, India and Trips ,WTO-GATT; methods of application of patent, protection of biological inventions, plant breeders right ,examples of patents in biotechnology, choice of IPR protection, management of IPR, benefits and problems from IPR, Indian response to the IPR upheaval.

(10 Hrs, 20 Marks)

REFERENCES:

1. Thomas J A Fucnh – Biotechnology and Safety Assessment, Academic Press.
2. Fleming D A, Hunt D L, Biological Safety Principles and Practices, Assm Press Washington.
3. Singh K ,Intellectual Property Rights on Biotechnology, BCIL New Delhi.
4. Moo-Young ,Compressive Biotechnology Vol.4, Elsevier Publisher.
5. B D Singh , Biotechnology, Kalyani Publishers.
6. S S Purohit, Biotechnology, Agro Bios.

TERM WORK: Term work shall be based on any eight of the following:

1. Biosafety, risk assessment and regulation.
2. Good manufacturing and Good Laboratory practices.
3. Biosafety guidelines and regulation.
4. National and International biosafety guidelines.

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5. Bioethics and public acceptance issues in biotechnology.
6. Bioethics in animal and plant genetic engineering with Case studies.
7. Intellectual property rights.
8. Examples of patent in biotechnology.

ELECTIVE II
3. BIOMEDICAL FLUID DYNAMICS

Teaching Scheme:
Lectures: 4 Hrs. / Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Term Work: 25 Marks

Unit-I
Introduction to fluid mechanics: Fluid properties, basic laws governing conservation of mass momentum and energy; Laminar flow, Couette flow and Hagen-Poiseulille equation, turbulent flow.

(10 Hrs,20 Marks)

Unit-II
Flow dynamics study of circulatory system, heart and blood vessels, anatomy and physiological considerations

(10 Hrs,20 Marks)

Unit-III
Components and functions of arterial and venous systems; Lymphatic system; Body fluids and their motions; Flows of Newtonian and non-Newtonian fluids in rigid tubes, flexible tubes and collapsible tubes.

(10 Hrs,20 Marks)

Unit-IV
Blood flow through arteries and veins; Holt and Conrad's experimental investigations. Kinetic energy, flow, pressure-flow, pressure-flow relations in vascular beds.

(10 Hrs,20 Marks)

Unit-V
Cardiac cycle; Cardiac value dysfunctions; Blood pressure,regulation and controlling factors; Coronary Circulation, heart failure.

(10 Hrs,20 Marks)

REFERENCES:

1. J.F. Green, "Fundamental Cardiovascular and Pulmonary Physiology", Lea and Febiger, Philadelphia, 1982.
2. C.A. Keele, E. Neil and N. Joels: Samson Wright's Applied Physiology 13th Ed., Oxford University Press, Delhi 1982.
3. A. Noordergraft: 1978., "Circulatory System Dynamics" Academic Press, New York,
4. R.R. Puniyani: , , 1996. , "Clinical Haemorheology" New Age Int. Publishers. New Delhi.

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TERM WORK: Term work shall be based on any eight of the following:

1. Introduction to fluid mechanics.
2. Anatomy and physiological of circulatory system.
3. Flow dynamics study of circulatory system.
4. Components and functions of arterial, venous and lymphatic system.
5. Body fluids and their motion.
6. Pressure – flow relations in body fluids flow.
7. Cardiac value dysfunction.
8. Blood pressure regulation and controlling factors.

ELECTIVE II
4. APPLIED GENETIC ENGINEERING.

Teaching Scheme:
Lectures: 4 Hrs. / Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Term Work: 25 Marks

Unit I

Genetic Engineering Techniques:

Blotting methods: Western, Northern and Southern blotting; DNA sequencing methods, synthesis of DNA (gene), PCR, Types of PCR: Inverse, RT-PCR, site directed mutagenesis using PCR, overlap extension PCR, asymmetric PCR, nested PCR, PCR application, Antisense technology, microarrays.

(10 Hrs, 20 Marks)

Unit II

Genomics:

Human genome project, mode of human inheritance, genetic linkage and gene mapping, molecular markers in genome analysis: RFLP, AFLP, RAPD, SCAR, micro satellites, protein based markers; detection of mutations in human genes: single-strand conformation analysis, denaturing gradient gel electrophoresis, heteroduplex analysis, chemical mismatch cleavage, direct DNA sequencing; applications of molecular markers.

(10 Hrs, 20 Marks)

Unit III

Transgenic Animals:

Animal vectors, artificial chromosome (MAC) vectors, transaction methods, embryonic stem cell transfer, detection of transgenic and transgene function, transgenic animals: mice, rabbits, cattle, goat, sheep, pigs and fish; Invitro fertilization and embryo transfer.

(10 Hrs, 20 Marks)

Unit IV

Gene Therapy:

Introduction, types of gene therapy: Somatic and Germline therapy; methods of gene therapy, gene therapy in immuno deficiency disease and cancer, targeting and destroying artificial clotting (thrombosis) by using plasminogen, curing Severe Combined Immunodeficiency (SCID) by Adenosine Deaminase (ADA) gene, breast cancer

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treatment (genetically modified antibody), prevention of tissue and organ graft rejection, gene augmentation therapy, gene medicine, transgenic animals as models of human disease.

(10 Hrs, 20 Marks)

Unit V

Genetic Engineering for Human Welfare:

Production of human peptide hormone, insulin, somatotropin, somatostatin, human interferon genes, human growth hormone, tumor necrosis factor alpha, vaccines for hepatitis B virus, vector vaccines, vaccines for rabies, polio virus, foot and mouth disease, malaria vaccines, monoclonal antibodies as therapeutic agents, nucleic acid as therapeutic agents, animal bioreactors and molecular farming, DNA profiling (DNA fingerprinting):methods and applications.

(10 Hrs, 20 Marks)

REFERENCES:

1. S.B.Primrose and R.M.Twyman, Principles of Gene Manipulation and Genomics, 7th Edition, Blackwell Publishing.
2. Bernard R.Glick and Pasternak , Molecular Biotechnology, CBS publishers Distributors , New Delhi
3. B.D Singh, Biotechnology – Expanding Horizons, Kalyani Publishers.
4. R.C.Dubey, A Textbook of Biotechnology, S.Chand Publishers, New Delhi
5. S.S.Purohit , Biotechnology, Agrobios India.

TERM WORK: Term work shall be based any eight of the following:

1. Genetic Engineering Techniques.
2. PCR and its types, Antisense technology, Microarrays.
3. Molecular markers in genome analysis.
4. Transgenic Animals.
5. Invitro fertilization and embryo transfer.
6. Gene Therapy.
7. Genetic Engineering for Human Welfare.
8. DNA profiling (DNA fingerprinting): methods and applications.

5. PROJECT- II

Teaching Scheme	Examination Scheme
Practical: 4 hrs / week	Oral: 50 Marks
	Term Work: 100 Marks

The students are required to carry out one of the following projects.

1. Processes based Project: Manufacture of Bioproduct.
2. Equipment based Project: Detailed design and fabrication of the equipment for a given capacity.
3. Experimental based Project: Experimental investigation of basic or applied research problem in the field of Microbiology, Immunology, Molecular biology, Bioprocess, Biochemistry, Genetic Engineering, Bioinformatics, Enzyme technology and Environmental Biotechnology.

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4. Industrial Problems: Any problem or project directly related to existing plants for modification of process or equipment or regarding pollution control and energy conservation under the guidance of a staff member and /or staff members and submit a typed report in duplicate.

The Project Work consists of collection of literature, study of various processes, selection of the process, computation of material and energy balances, process design of important equipments, detailed design of one of the main equipment, plant location and layout, cost estimation, economic analysis, details of experimental set up, analysis of data, pollution control, safety, marketing, conclusions and recommendations, bibliography, etc., as applicable to the individual problem.

The object of the project is to make use of the knowledge gained by the student at various stages of the degree course. This helps to judge the level of proficiency, originality and capacity for application of the knowledge attained by the student at the end of the course.

Each group should consist of maximum 5 students. For term-work (Internal) of 100 marks, the assessment should be by conducting frequent written tests, seminars during the year and an oral examination at the end of the year conducted by all the staff members of the department. The Head of the Department should see that the assessment procedure should be the same for all the students of the class. For external 50 marks, the project work shall be assessed by an oral examination by at least two examiners, one internal and one must by external at the end of the year.

The object of the VIVA VOCE examination (Internal and External Orals) is to determine whether the objectives of the project work have been met by the student as well as to assess the originality and initiative of the student as demonstrated in the project work.

6. INDUSTRIAL VISIT / CASE STUDY

Examination Scheme:
Term Work: 25 Marks

During seventh term, every student shall visit minimum two to three industries or organization pertaining to the Biotechnology arranged by College and accompanied by departmental teachers as per AICTE and University norms. The report of technical visit shall be submitted by every student at the end of eighth term which shall be evaluated by the concerned teachers through internal Viva Voce.

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NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Second Year Engineering

(CIVIL ENGINEERING)

Faculty of Engineering and Technology

COURSE OUTLINE

SEMESTER – III

W.E.F 2013 – 2014

SE (Civil) : Semester - III

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory			Practical	Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Engineering Mathematics - III	* A/D	3	1	---	4	20	80	---	---	100	4
Strength of Materials	B	3	1	---	4	20	80	---	---	100	4
Concrete Technology	D	3		---	3	20	80	---	---	100	3
Building Construction Techniques and Materials	D	3	---	---	3	20	80	---	---	100	3
Surveying I	D	3	---	---	3	20	80	---	---	100	3
Soft Skills – III	C	1	---	2	3	---	---	50	---	50	2
Strength of Materials lab	B	---	---	2	2	---	---	50	---	50	1
Concrete Technology lab	D	---	---	2	2	---	---	25	25	50	1
Building Construction Techniques and Materials lab	D	---	---	2	2	---	---	25	25	50	1
Surveying I lab	D	---	---	2	2	---	---	25	25(**PR**)	50	1
Total		**16**	**2**	**10**	**28**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination**
ICA: Internal Continuous Assessment

Note 1: For branches like Chemical Engineering and Biotech Engg, two laboratory hours can be merged to form a four hour slot. Note 2: Out of 3 practical ESE heads, at least 1 head should be practical.

*** E & TC, Mechanical, Automobile & Production Engineering branches shall have group D course and rest of the branches shall have group A course (e.g. Engineering Mathematics-III).**

ENGINEERING MATHEMATICS –III

COURSE OUTLINE

Course Title	Short Title	Course Code
Engineering Mathematics –III	**M-III**	

Course description:

The course deals with solution of n^{th} order LDE by different methods. Applications of PDE to solve Laplace's equation, heat equation etc. It also introduces students about real life problems of statistics and sampling theory. It includes vector differentiation with its applications.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	13	39	04
Tutorial	01	13	13	

Prerequisite Course(s): Engineering Math's – I & II

COURSE CONTENT

Engineering Mathematics –III **Semester-III**

Lecture: 3 hours / week
Tutorial: 01/week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

UNIT-I: Linear Differential Equations: (08 Hours, 16 marks)

- Solution of LDE of order n with constant coefficients.
- Method of variation of parameters (Only second order).
- Cauchy's linear equation.
- Legendre's linear equation.

UNIT-II: Applications of Linear Differential Equations and Partial Differential Equations

(08 Hours, 16 marks)

- Applications of linear differential equations to Strut, bending of beams, columns.
- Applications of Partial Differential equations to

i) One dimensional heat flow equation $\frac{\partial u}{\partial t} = C^2 \frac{\partial^2 u}{\partial x^2}$

ii) Two dimensional heat flow equation $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = 0$

UNIT-III: Statistics and Probability distributions (08 Hours, 16 marks)

- Introduction to Mean, Mode, Median, standard deviation, Variance, Coefficient of variation.
- Moments, Skewness and Kurtosis.
- Correlation and Regression.
- Binominal distribution.
- Poisson distribution.
- Normal distribution.

UNIT-IV: Testing of Hypothesis and Significance (08 Hours, 16 marks)

- Introduction to population parameters and statistics.
- Testing of hypothesis, Null hypothesis and Alternative hypothesis.
- Level of significance.
- Test of significance of large sample.
- Chi-Square test.
- T-test.

UNIT-IV: Vector Differentiation (07 Hours, 16 marks)

- Gradient of scalar point function.
- Directional derivatives of scalar point function.
- Divergence and Curl vector field.
- Solenoidal and Irrotational vecor fields.
- Applications to Bernoulli's equation.

REFERENCE BOOKS:

1. H.K. Dass - Advanced Engineering Mathematics (S. Chand Publication) New Delhi.
2. Erwin Kreyszig - Advanced Engineering Mathematics (Wiley Eastern Ltd.)
3. B.S. Grewal - Higher Engineering Mathematics, Khanna Publication, Delhi
4. Wylie C.R. & Barrett - Advanced Engineering Mathematics - Mc Graw Hill
5. B.V. Raman - Engineering Mathematics - Tata Mc- Graw – Hill.
6. A Text Book of Engineering Mathematics, By N. P. Bali, Laxmi Publication.

STRENGTH OF MATERIALS
COURSE OUTLINE

Course Title	Short Title	Course Code
Strength of Materials	**SOM**	

Course Description:

The course deals with response of solid bodies under the action of loads. It is an application of principles of mechanics to study behavior of deformable bodies. The main objective of subject is to determine internal forces, stresses, strains and deformation of structure due to external loads.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	13	39	04
Tutorial	01	13	13	

Prerequisite Course(s): Engineering Mechanics

COURSE CONTENT

Strength of Materials **Semester-III**

Lecture: 3 hours / week
Tutorial: 01/week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

UNIT-I: **No of Lect. – 9, Marks: 16**

Normal stress and strain, tensile, compressive and shear stresses Hooke's law, deformation in prismatic, stepped, & composite members due to concentrated load & self-weight, stress & strain in determinate and indeterminate members, temperature stresses.

UNIT-II: **No of Lect. – 7, Marks:16**

[A] Shear stress & strain, modulus of rigidity, Poisson's ratio, bulk modulus, relation between E, G & K, generalized Hooke's law, stress strain diagram, working stress, factor of safety.
[B] Strain energy, stresses due to various types of axial load using strain energy method.

UNIT-III: **No of Lect. – 8, Marks: 16**

[A] Concept of shear force and bending moment, shear force & bending moment diagrams for cantilevers, simple and compound beams due to concentrated, uniformly distributed, uniformly varying loads and couples, construction of loading diagrams and bending moment diagram from shear force diagram.

[B] Bending stresses in beams: Introduction to moment of inertia, parallel and perpendicular axis theorem, theory of simple and pure bending, section modulus, moment of resistance, bending stress distribution diagram.

UNIT-IV: **No of Lect. – 8, Marks: 16**

[A] Shear stresses in beams, shear stress derivation, and shear stress distribution in different cross sections of beams.

[B] Theory of pure torsion, torsional moment of resistance, power transmitted by shafts, torsional rigidity, shear stresses in shafts due to torsion, stress & strain in determinate shafts of hollow or solid cross-sections.

[C] Axially loaded columns: Euler's theory of long columns, assumptions made in Euler's theory, limitations of Euler's formula. Various end conditions & concept of equivalent length, Rankine's formula,

UNIT-V: **No of Lect. – 7, Marks: 16**

[A] Direct & bending stresses in short columns & other structural components due to eccentric or lateral loads, the middle third rule, core of section.

[B] Principal stresses & strain: Concept of principal stresses and planes, normal and tangential stress on any oblique plane, determination of principal stresses and principal planes, Mohr's circle method.

REFERENCE BOOKS:-

1. Strength of material by M. Passi, Tech-max Publications, Pune.
2. Strength of material by S. Rammurthum, Dhanpat Rai & Sons.
3. Strength of materials by S.S.Ratan, Tata McGraw Hill
4. Strength of material by D. S. Prakash Rao, University Press
5. Strength of Materials & Machine Elements by V.L. Shah and R.A. Ogale,Structures Publications, Pune.
6. Mechanics of Solids by E.P.Popov
7. Strength of Materials by Timoshenko.
8. Strength of Material by A.S. Basu, Dhanpat Rai & Sons.

CONCRETE TECHNOLOGY
COURSE OUTLINE

Course Title	Short Title	Course Code
Concrete Technology	**CT**	

Course description:-

This course introduces the students about properties of materials such as water cement, sand and aggregates and concrete. It describes various tests on fresh and hardened concrete. The course includes various admixtures and their effects, types of concrete and special concreting techniques. Various methods of concrete mix design are also discussed.

	Hours per weeks	Nos. Of weeks	Total Hours	Semester Credit
Lecture	3	13	39	03

COURSE CONTENT

Concrete technology **Semester-III**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

UNIT-I **No. of Lect. – 8, Marks: 16**

1. Cement: - Manufacture of cement, chemical composition, setting and hydration of cement. Types of cement, properties and testing of cement.
2. Aggregates – Classification, properties, grading, impurities in aggregates and testing of aggregates, its effect on strength of concrete. Quantity of water for concrete.

UNIT- II **No. of Lect. – 8, Marks: 16**

1. Fresh Concrete: - Definition and its ingredients, grades of concrete, concreting process, significance of water cement ratio. Properties of fresh concrete.
2. Hardened Concrete:
   Various properties of hardened concrete, factors affecting various properties, micro cracking, and stress - strain relation, testing of hardened concrete, creep.
3. Shrinkage of concrete, quality control during concreting.

UNIT-III **No of Lect. – 8, Marks: 16**

1. Admixtures, classification and their effects on various properties of concrete.

2. Types of Concrete: - Light weight concrete, polymer concrete, fiber reinforced concrete, ready mixed concrete, self compacting and high performance concrete, ferro cement concrete.

3. Special concrete- Transparent concrete, cellular light wt. concrete, pre-stressed concrete,
4. Under water concreting, concreting in extreme weather conditions.

UNIT-IV **No of Lect. – 8, Marks: 16**

Concrete mix design

1. Introduction, object of mix design, factors to be considered, statistical quality control, introduction to different methods of mix design. Scaffolding, shoring, under pinning and strutting, types, purposes and precautions.

2. Concrete mix design by I.S.(10262-456) method and IRC method

UNIT-V **No of Lect. – 7, Marks: 16**

1. Introduction to non-destructive testing of concrete, rebound hammer, ultrasonic pulse velocity, pull out test, impact echo test.

2. Deterioration of concrete, permeability, durability, chemical attack, carbonation of concrete, corrosion of reinforcement.

Text books:-

1. Concrete Technology by M.S.Shetty, S Chand Publication.
2. Concrete Technology by M. L. Gambhir, TMH Publication.
3. Concrete Technology by S.V.Deodhar, Central Techno Publication
4. Concrete Technology by N.V. Nayak & A.K. Jain, Narosa Publishing House Pvt. Ltd.
5. Concrete Technology by Kulkarni P.D. Ghosh, R.K. Phull Y.R., New Age International.

Reference books:-

1. Concrete Technology by A.N. Neville, J.J. Brooks, Addition Wesley

2. Concrete Technology by R.S. Varshney, Oxford & I B H.

3. Concrete Technology by P Kumar Mehta, Gujrat Ambuja

BUILDING CONSTRUCTION TECHNIQUES AND MATERIALS

COURSE OUTLINE

Course Title	Short Title	Course Code
Building Construction Techniques and Materials	**BCT&M**	

Course Description:-

This course deals with concepts in Building Construction Listed as below

- Types of building structures & various parts of building,
- Different types of masonry, scaffolding, shoring, under pinning and strutting.
- Description of building finishes and types
- Concrete and R.C.C. construction
- Types of foundations
- Study of building materials such as stone, bricks & timber, Aluminium, glass, heat insulating and sound absorbent materials.

	Hours per weeks	Nos. Of weeks	Total Hours	Semester Credit
Lecture	3	13	39	3

COURSE CONTENT

Building construction techniques and materials **Semester-III**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week **End Semester Examination (ESE) : 80 Marks**
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

UNIT-I

Types of building and foundation **No of Lect. – 8, Marks: 16**

Types of building, load bearing, framed structure, steel structure, timber structure, composite structure. Various parts of building, sub structure and super structure. Plinth, sill, floor, and roof level, plinth height, plinth protection, cornice, coping and their function.

Foundation: Purpose and classification, advantages and disadvantages of each and circumstances under which each is used. Factor considered for selection of foundation.

UNIT-II

Masonry and form work **No of Lect. – 8, Marks: 16**

1. Masonry: Principle of masonry construction, types of masonry, types of wall (load bearing, partition, timber partition, glass partition etc.)

2. Brick and brick masonry: Various types of bond in brick masonry, reinforced brick masonry, precautions to be taken in masonry construction, composite masonry, solid and hollow blocks used for masonry, cavity wall, etc.
3. Formwork: Function of form work, form erection, oiling and stripping of form, requirements of form and form work, material used for form work.

UNIT-III

Study of lintel doors & windows, circulation **No of Lect. – 8, Marks: 16**

1. Types of lintel, detailing of R.C.C. lintel, precast lintel and stone lintel.
2. Doors and windows: Type of each and circumference under which each is used, minimum area of window opening for different climatic conditions, various material used for doors and window, fixtures and fastening used. I.S. notations for doors and windows
3. Circulation: Horizontal and vertical, stair and staircase planning and design, types of staircase as per shape and material used, type of circulation.
4. Floor and roof: Ground floor, upper floor, mezzanine floor, design and constructional requirements, various types of floor finishes used, advantage and disadvantages, special flooring.

UNIT-IV

Truss and its type, R.C.C. framed structure **No of Lect. – 8, Marks: 16**

1. Steel trusses: Types, Methods of connections, connecting materials.

2. Scaffolding, shoring, under pinning and strutting, their types, purposes and precautions.

3. R.C.C. framed structure, column, beam, footing, slab and their connections, general requirements and details.

UNIT-V

Study of various material used in construction **No of Lect. – 7, Marks: 16**

1. Stone: Natural bed of stone, stone quarrying, uses of stones and qualities of good building stone, test's on stone.

2. Bricks: Composition of good brick earth, classification of burnt brick, manufacturing of bricks, qualities of good bricks, test on bricks.

3. Timber: Properties and uses, testing, conservation and sawing, defects in timbers, artificial timber, veneers, plywood and block board.

4. Other miscellaneous materials: Aluminium, glass, heat insulating materials, sound absorbent materials.

REFERENCE BOOKS

1. Building Construction by Rangwala- Published by Charotar Publishing House ISBN-13 9789380358482, ISBN-10 9380358482.
2. Building Construction by Sushil Kumar- Published by Standard Publishers Distributors, Publication Year2010, ISBN-13 9788180141683, ISBN-10 8180141683, Edition 19.
3. Building Construction by S.P. Bindra, S.P. Arora, Published by Dhanpat Rai Publications, Publication Year 2010, ISBN-13 9788189928803, ISBN-10 8189928805.
4. Building Construction by Ashok Kr. Jain, B. C. Punmia, Arun Kr. Jain, Published by Laxmi Publications, Publication Year 2009, ISBN-13 9788131804285, ISBN-10 8131804283, Edition 10thEdition.
5. Engineering Materials by Rangwala, Publisher Charotar Publishing House, Publication Year 2011, ISBN-13 9789380358260, ISBN-10 9380358261
6. Civil Engineering Material by Dr. S.V. Deodhar.

SURVEYING - I

COURSE OUTLINE

Course Title	Short Title	Course Code
Surveying- I	**SUR-I**	

Course Description:-

- This course is set keeping in mind the requirements of undergraduate students of Engineering. This course provides the fundamental knowledge of surveying and leveling which includes:
- Basic principles of surveying and certain general topics such as bench marks, reduced levels and important aspect of leveling.
- Engineering surveys such as profile leveling and cross-sections.
- Measurements of horizontal angles, vertical angles, magnetic bearings, deflection angle by using optical theodolite with different techniques.
- Traverse computation: Consecutive and independent co-ordinates.
- Tachometric Surveying: Measurement of horizontal distances and vertical distances without using chains and tapes, tachometric contour survey.
- Study of curves.
- Plane table surveying.
- Study of minor instruments.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	13	39	03
Tutorial	-	-	-	

Prerequisite Course(s): Knowledge of Element of Surveying

COURSE CONTENT

Surveying- I **Semester-III**

Teaching Scheme	**Examination Scheme**	
Lecture: 3 hours / week	**End Semester Examination (ESE)**	**: 80 Marks**
	Paper Duration (ESE)	**: 03 Hours**
	Internal Sessional Exam (ISE)	**: 20 Marks**

Unit-I: Part [A] Introduction to surveying **No of Lect. – 8, Marks: 16**

a) Surveying- Definition, principle of surveying, various types of surveying.
b) Bench mark and its types, reduced level, rise and fall method, height of instrument method.

Part [B] Leveling

a) Instruments used in leveling, dumpy level, automatic level, types of leveling staves.
b) Principal axes of dumpy level, reciprocal leveling curvature and refraction correction, distance to the visible horizon.
c) Profile leveling: L - section and cross -sections.

Unit-II: Theodolite **No of Lect. – 8, Marks: 16**

a) Principal axes and temporary adjustments of transit theodolite.
b) Uses of theodolite: measurement of horizontal angles, vertical Angles, magnetic bearings, measuring deflection angles.
c) Theodolite Traversing: Computation of consecutive and independent co-ordinates, adjustments of closed traverse, Gales traverse by co-ordinate method,

Unit-III: Tachometry **No of Lect. – 8, Marks: 16**

a) Principle of stadia method, fixed hair method with vertical staff to determine horizontal distances and elevations of the points.
b) Use of tachometry in surveying, contour, characteristics and uses, methods of interpolation, tachometric contour survey.

Unit-IV: Curves **No of Lect. – 8, Marks: 16**

a) Horizontal and vertical curves and their purposes.
b) Simple circular curves - Elements and setting out by linear & angular methods.
c) Compound curves -Elements and setting out of compound curves.
e) Transition curves -Types and uses, Length of transition curves,
(No numerical problem to be asked).

Unit-V: Plane Table Survey **No of Lect. – 7, Marks: 16**

a) Objective and equipment required for plane table survey.
b) Methods of plane tabling - radiation, intersection, traversing and resection.
c) Advantages, disadvantages, limitations and errors of plane Table surveying.
d) Minor instruments: Study and use of abney level, box sextant, digital planimeter.

REFERENCE BOOKS

1. Surveying and leveling (vol-I&II) by T.P. Kanitkar, & S.V. Kulkarni, Pune Vidarthi Griha Prakashan, Pune,
2. Surveying Vol. I and Vol .II by B.C.Punmia, Laxmi Publication (P) New Delhi.
3. Principles of surveying by Cliver and clendening
4. Advance surveying , Vol.I & II, Handbook by P.B. Shahani
5. A handbook of accurate surveying methods by S.P.Collins

Soft Skills – III
COURSE OUTLINE

Course Title	Short Title	Course Code
Soft Skills – III	**SK-III**	

Course Description: Through this course we have tried to prepare the students for the industry. Most companies test mathematical and logical ability through an aptitude test. This subject aims at working on these skills of a student through strategies formulae and practice exercises.

Lecture	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
	1	**13**	**13**	**2**

Prerequisite Course(s): Fundamental knowledge of high school mathematics.

COURSE CONTENT

Soft Skills – III **Semester-III**

Teaching Scheme **Examination Scheme**
Lecture: 1 hour / week **Internal Continuous Assessment (ICA): 50 Marks**

Unit-I

Arithmetic-1 **No. of Lect. – 3, Marks: 10**

a. Basic Formulae

i. Divisibility rules
ii. Speed maths
iii. Remainder theorem
iv. Different types of numbers
v. Applications

b. HCF, LCM and Linear Equations

i. HCF – Successive division and prime factorization methods
ii. LCM – Successive division and prime factorization methods
iii. Applications
iv. Linear Equations – Elimination method
v. Substitution method

vi. Applications

c. Averages and Mixtures

i. Concept of average
ii. Faster ways of finding it
iii. The allegation method
iv. Applications

Unit-II: Arithmetic–II **No of Lect. – 3, Marks: 10**

a. Percentages

i. Concept of percentage
ii. Working with percentages
iii. Applications

b. Profit and Loss

i. Difference between cost and selling price
ii. Concept of profit percentage and loss percentage
iii. Applications

c. Time and Work

i. Basic time and work formula
ii. Relation between time and work
iii. Applications

Unit-III: Arithmetic–III **No of Lect. –3, Marks: 10**

a. Permutations and Combinations

i. Sum rule of disjoint counting
ii. Product rule of counting
iii. Concept of factorial
iv. Permutations
v. Linear permutations
vi. Combinations
vii. Circular permutations
viii. Applications

b. Probability

i. Definition and laws of probability
ii. Mutually exclusive events
iii. Independent events
iv. Equally likely events
v. Exhaustive events
vi. Cards

vii. Dice
viii. Applications

c. Time and Distance

i. Speed
ii. Conversion factors for speed
iii. Average Speed
iv. Moving Bodies – Passing, crossing and overtaking
v. Relative speed
vi. Boats and streams
vii. Applications

Unit-IV: Non-Verbal Reasoning **No of Lect. 2, Marks: 10**

a. Analogies

i. Examples
ii. Applications

b. Classification

i. Examples
ii. Applications

c. Sequences

i. Examples
ii. Applications

Unit-V: Analytical Reasoning **No of Lect. – 3, Marks: 10**

a. Analytical Puzzles

i. Classification puzzles
ii. Ordering puzzles
iii. Assignment puzzles
iv. Applications

b. Letter and Number Series

i. Different types of letter series
ii. Different types of number series
iii. Mixed Series

c. Coding and Decoding

i. Letter coding
ii. Number coding
iii. Mixed coding
iv. Odd man out
v. Applications

Guide lines for ICA:

ICA will be based on credit tests and assignments submitted by the student in the form of journal.

Reference Books:

1. R. S. Aggarwal, “Quantitative Aptitude”, S. Chand Publication, New Delhi, 2012.
2. R. S. Aggarwal, “A Modern Approach to Verbal Reasoning”, S. Chand Publication, New Delhi, 2012.
3. R. S. Aggarwal, “A Modern Approach to Non-Verbal Reasoning”, S. Chand Publication, New Delhi, 2012.

STRENGTH OF MATERIALS
LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Strength of material	**SOM**	

ICA (Term Work): 50 Marks
Semester-III

Course description:-

In this Laboratory course emphasis is given on determining properties of metals & solving numerical's on all the topics in lab hours.

	Hours/ Week	No. Of weeks	Total Hours	Semester Credits
Practical	2	13	26	1

Lab course content:-

Group A (Practical exercise- Any five from list given below)

1. To determine tensile test on a metal.
2. To determine hardness of metal (mild Steel or aluminium).
3. Torsion test on mild steel rod.
4. To determine impact strength of steel. (By Izod test)
5. To determine impact strength of steel.(By Charpy test)
6. To determine Young's modulus of elasticity for beam materials simply supported at ends.
7. Shear test on metals.

Group B (Solve any five assignments.)

For each assignment two practical hours are assigned

1. Assignment 1

a. To solve numerical based on Normal stress and strain, tensile, compressive and shear stresses Hooke's law.

b. To solve problems based on deformation in prismatic, stepped, & composite members due to concentrated load & self-weight, Stress & strain in determinate and indeterminate members, temperature stresses.

2. Assignment 2

a. To solve numerical based on shear stress & strain, modulus of rigidity, Poisson's ratio, bulk modulus, generalized Hooke's law, stress strain diagram.

b. To solve numerical based on strain energy, stresses due to various types of axial load using strain energy method.

3. Assignment 3

a. To solve problems based on shear force and bending moment for cantilevers, simple and compound beams due to concentrated, uniformly distributed, uniformly varying load and couples.

b. To solve problems based on construction of loading diagrams and bending moment diagram from shear force diagram.

4. Assignment 4

a. To solve numerical based on bending stresses in beams, moment of inertia, parallel and perpendicular axis theorem, section modulus, moment of resistance, bending stress distribution diagram.

b. To solve numerical based on bending stresses in beams for unsymmetrical section

5. Assignment 5

a. To solve numerical based on shear stresses in beams, shear stress derivation, and shear stress distribution in different cross sections of beams.

b. To solve problems based on theory of pure torsion, torsional moment of resistance, power transmitted by shafts, torsional rigidity, Shear stresses in shafts due to torsion, Stress & strain in determinate shafts of hollow or solid cross-sections.

6. Assignment 6

a. To solve problems based on axially loaded columns: Euler's theory of long columns, Rankine's formula.

b. To solve problems based on direct & bending stresses in short columns & other structural components due to eccentric or lateral loads, the middle third rule, core of section.

c. To solve problems based on principal stresses & strain, normal and tangential stress on any oblique plane, determination of principal stresses and principal planes, Mohr's circle method.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and assignment submitted by the student in the form of journal.

CONCRETE TECHNOLOGY
LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Concrete Technology	**CT**	

ICA (Term Work) : 25 Marks
ESE (Oral) : 25 Marks

Course description:-

In this Laboratory course emphasis is on the Knowing various tests on cement, sand, aggregates and concrete

	Hours/ Week	No. Of weeks	Total Hours	Semester Credits
Practical	2	13	26	1

LAB COURSE CONTENT:-

1. Testing of Cement

a. Fineness of cement
To calculate fineness of cement given as per IS

b. Consistency of cement
To find consistency of cement given as per IS

c. Setting time of cement
To know initial and final setting time of cement given as per IS

d. Compressive strength of cement
To calculate Compressive strength s of cement given as per IS

e. Soundness of cement
To calculate soundness of cement given as per IS.

2. Testing of aggregates

a. Sieve analysis
To calculate fineness modulus and to perform sieve analysis and calculate Fineness modulus as per IS

b. Crushing value test
To calculate crushing value of aggregates as per IS

c. Impact value test

To calculate impact value of aggregates as per IS

d. Moisture content
To calculate Moisture content of aggregates as per IS

e. Abrasion test
To calculate abrasive value of aggregates as per IS

f. Shape test
To calculate flakiness and elongation index of aggregates as per IS

g. Specific gravity test
To calculate Specific gravity of aggregates as per IS

3. Test on concrete

a. workability test
To calculate workability of concrete by slump cone and compaction factor method as per IS.

b. Compressive strength (Cubes and cylinders)
To calculate compressive strength of concrete cubes and cylinders as per IS

c. Split test
To calculate tensile test of concrete cylinders as per IS

Guide Lines for ICA:-
ICA shall be based on continuous evaluation of student performance throughout the semester and term work submitted by the students.

Guide lines for ESE:-
ESE will be based on term work submitted by the student. In ESE the student may asked to answer questions based on practical's performed /assignments. Evaluation will be based on performance in **oral** examination

Text books:-

1. Concrete Technology by M.S.Shetty, S Chand Publication.
2. Concrete Technology by M. L. Gambhir, TMH Publication.
3. Concrete Technology by S.V.Deodhar, Central Techno Publication
4. Concrete Technology by N.V. Nayak & A.K. Jain, Narosa Publishing House Pvt. Ltd.
5. Concrete Technology by Kulkarni P.D. Ghosh, R.K. Phull Y.R., New Age International.

BUILDING CONSTRUCTION TECHNIQUES AND MATERIALS

LAB COURSE OUTLINE

Course title:-Building Construction Techniques and Materials **Short title: -** BCT&M

Practical: 2Hours/Week **ICA (Term Work) : 25 Marks**
ESE (Oral) : 25 Marks

Course description:-

In this Laboratory course emphasis is on the understanding of Building Construction Techniques and Materials

	Hours/ Week	No. Of weeks	Total Hours	Semester Credits
Practical	2	13	26	1

LAB COURSE CONTENT:-

1) Orthographic, isometric, oblique and axonometric view.

- To draw the various (2D & 3D) views of building.

2) C.C.T.W. panelled door: plan, elevation, section

- To know the various types doors and draw the sketches.
- To describe the various types windows and draw the sketches.

3) Flush door: plan, elevation and section

- To know the various types doors and draw the sketches.
- To describe the various types windows and draw the sketches.

4) Lintel/ Arches in stone and bricks.

- To know various types lintel and arches and draw the sketches

5) Stone masonry: U.C.R., C.R. and Ashlars.

- To study various types of bonds in brick masonry, reinforced brick masonry, precautions to be taken in masonry construction, composite masonry, solid and hollow blocks used for masonry, cavity wall, etc. and draw the sketches

6) Bonds in brick masonry with isometric view for one bond for one brick.

- To describe and draw sketches of brick, brick bats and their various views.

7) Different types of roofs.

- To study king post and queen post roofs and draw the sketches.

8) Steel trusses

- To know steel trusses methods of connections, and their connecting materials, tubular structure used as a truss and draw the sketches.

9) Types of stairs.

- To study the Circulation: Horizontal and vertical, stair and staircase planning and design, types of staircase as per shape and material used, type of circulation and draw the sketches

10) Report regarding visit to the construction sites including drawing and photographs. (Minimum two visits are mandatory).

11) Market survey (Including rates)

- Prepare the report of market survey for different building materials.

REFERENCE BOOKS

1. Building Construction by Rangwala- Published by Charotar Publishing House ISBN-13 9789380358482, ISBN-10 9380358482.
2. Building Construction by Sushil Kumar- Published by Standard Publishers Distributors, Publication Year 2010, ISBN-13 9788180141683, ISBN-10 8180141683, Edition 19.
3. Building Construction by S.P. Bindra, S.P. Arora, Published by Dhanpat Rai Publications, Publication Year 2010, ISBN-13 9788189928803, ISBN-10 8189928805.
4. Building Construction by Ashok Kr. Jain, B. C. Punmia, Arun Kr. Jain, Published by Laxmi Publications, Publication Year 2009, ISBN-13 9788131804285, ISBN-10 8131804283, Edition 10thEdition.
5. Engineering Materials by Rangwala, Publisher Charotar Publishing House, Publication Year 2011, ISBN-13 9789380358260, ISBN-10 9380358261
6. Civil Engineering Material by Dr. S.V. Deodhar

Guide Lines for ICA:-

ICA shall be based on continuous evaluation of student performance throughout the semester and drawing sheets submitted by the students.

Guide lines for ESE:-

ESE will be based on drawing sheets submitted by the student. In ESE the student may asked to answer questions based on term work /assignments. Evaluation will be based on performance in oral examination.

SURVEYING- I

LAB COURSE OUTLINE

Semester-III

Course Title	Short Title	Course Code
Surveying- I LAB	**SUR-I LAB**	

ICA (Term Work) : 25 Marks
ESE (Oral) : 25 Marks

Course Description:

This laboratory covers experiments related to measurement of horizontal angle, vertical angle, horizontal distance, elevation, reduced levels, magnetic bearings, plane table survey and minor instruments.

Practical	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
	2	13	26	1

Total Semester Credits: 1

Prerequisite Course(s): Element of civil engineering.

LAB COURSE CONTENT

(Note: All practical exercise in each group.)

Group A (Practical exercise)

1. **Use and Study of Dumpy level for finding the levels by various methods.**

   a) Explain basic principles of dumpy level.
   b) Explain different parts of a dumpy level.
   c) Explain temporary adjustments of dumpy level.
   d) Describe methods to fill data into a field book as well as the reduction of levels by height of collimation and rise and fall methods.

2. **Measurements of horizontal and vertical angles by transit Theodolite**

   a) Describe the main parts of a theodolite and their basic functions.
   b) Explain the relationship between the fundamental lines of a theodolite.
   c) Explain the temporary adjustment of a theodolite.
   d) Explain the methods to measure horizontal angle between lines.
   e) Explain the methods to measure vertical angle.
   f) Explain the errors and precautions to be taken while working with a theodolite.

3. **Measurements of horizontal angles of a triangle by repetition method.**

   a) Explain the procedure of repetition method.

b) Describe the method to fill the data into a field book.
c) Explain the errors which are eliminated by repetition method.
d). Verification of check by repetition method.

4. Computation of horizontal distances and elevations by Tachometry for horizontal and inclined sights.

a. Study about multiplying constant and additive constant of tachometer.
b. Measurement of stadia hair readings.
c. Calculation of horizontal distance with respect to instrument station.
d. Calculation of vertical elevation with respect to line of collimation.
e. Calculation of reduced level when station is in depression and elevation.

5. Radiation and intersection method in plane Table survey.

a. Study about different assoceries of plane table survey.
b. Sketch the layout of site by radiation method
c. Measurement of two point distance by intersection method.
d. Verification of distance by taping

6. Use of box sextant, Abney level and digital plan meter.

a. Study of minor instruments in surveying
b. Describe working and construction.

Group B (Projects)

Project-1:- Theodolite Traverse survey project of a closed traverse with at least four sides.

a. Fixing location of station by chaining and offsetting.
b. Measurement of horizontal angle between station by repetition method
c. Measurement of distance between station points and buildings corner points by taping.
d. Measurement of bearing of station points by prismatic compass.
e. Balancing the traverse at four corner points by Bowditch rule.
f. Drawing the sketch of traverse by applying suitable scale.

Project-2:- Tachometric contouring project with at least two instrument stations at 60 m apart.

a. Study about multiplying constant and additive constant of tachometer.
b. Divide the readings in requisite angle.
c. Measurement of stadia hair readings.
d. Calculation of horizontal distance with respect to instrument station.
e. Calculation of vertical elevation with respect to line of collimation.

f. Calculation of reduced level when station is in depression and elevation.

Project-3:- Road project for minimum length of 200m, including fixing of alignment, profile leveling, and cross sectioning.

a. Reconnaissance survey of site for selection of alignment of road
b. Fixing the alignment on ground by chaining, taping and offsetting at suitable interval.
c. Measurement of staff readings on ground points
d. Calculation of cutting and filling from RL calculation by HI and rise and fall method
e. Drawing the profile of ground and formation line of alignment by applying suitable scale.

Project-4:- Plane table survey project of a closed traverse of minimum four sides

a. Fixing location of station by chaining and offsetting.
b. Measurement of horizontal distance between station points and buildings corner points by taping.

The **Term Work** will consist of:

(i) Field book containing record of all exercises and projects listed above.
(ii) File of full imperial size drawing sheets as mentioned below

1) Theodolite Traverse survey project. 1 sheet
2) Tachometric contouring project……..1 sheet
3) Road project showing L- section, plan of road and typical cross -section…….Min -1 sheet
4) Plane Table Traverse survey project…..1 sheet

Guidelines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and term work submitted by the student in the form of field book.

Guide lines for ESE:-

ESE will be based on laboratory field book and sheets submitted by the student. In ESE the student may asked to answer questions based on experiments/assignments. Evaluation will be based on performance in **oral/ practical** examination.

REFERENCES BOOKS

1. Surveying and leveling (vol-I&II) by T.P. Kanitkar, & S.V. Kulkarni, Pune Vidarthi Griha Prakashan, Pune,
2. Surveying Vol. I and Vol .II by B.C.Punmia, Laxmi Publication (P) New Delhi.
3. Principles of surveying by Cliver and clendening
4. Advance surveying , Vol.I & II, Handbook by P.B. Shahani
5. A handbook of accurate surveying methods by S.P.Collins

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Second Year Engineering

(CIVIL ENGINEERING)

Faculty of Engineering and Technology

COURSE OUTLINE

SEMESTER – IV

W.E.F 2013 – 2014

SE (Civil) : Semester - IV

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Engineering Geology	* A/D	3	---	---	3	20	80	---	---	100	3
Fluid Mechanics I	D	3	1	---	4	20	80	---	---	100	4
Theory of Structures I	D	3	1	---	4	20	80	---	---	100	4
Building Design & Drawing	D	3	---	---	3	20	80	---	---	100	3
Surveying II	D	3	---	---	3	20	80	---	---	100	3
Computer Graphics in Civil Engineering lab	B	1	---	2	3	---	---	50	---	50	2
Engineering Geology lab	D	---	---	2	2	---	---	50	---	50	1
Fluid Mechanics I lab	D	---	---	2	2	---	---	25	25	50	1
Building Design & Drawing lab	D	---	---	2	2	---	---	25	25	50	1
Surveying II lab	D	---	---	2	2	---	---	25	25(**PR**)	50	1
Total		**16**	**2**	**10**	**28**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination**
ICA: Internal Continuous Assessment

Note 1: For branches like Chemical Engineering and Biotech Engg, two laboratory hours can be merged to form a four hour slot. Note 2: Out of 3 practical ESE heads, at least 1 head should be practical.

*** E & TC, Mechanical, Automobile & Production Engineering branches shall have group D course and rest of the branches shall have group A course (e.g. Engineering Mathematics-III).**

ENGINEERING GEOLOGY

COURSE OUTLINE

Course Title	Short Title	Course Code
Engineering Geology	**EG**	

Course Description:

This course is designed to enable students to evaluate, to apply and to analyze the relevant geological principles. In this course, the related topics on rock types/classifications, geological structures and geological processes are covered. The principles of Structural geology are introduced mainly to highlight the relevancy of engineering properties of geological materials in designing rock engineering projects. At the end of the course, students acquainted with related knowledge and principles in geology and can be able to apply these knowledge and principles in designing safe and economic engineering structures in rock masses.

	Hours / Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Lecture	03	13	39	03

Prerequisite Course(s): Elements of Civil Engineering.

Course content

Engineering Geology **Semester-IV**

Teaching Scheme
Lecture: 3 hours / week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Mineralogy & Petrology **No of Lecture: 7 Hours, Marks: 16**

1. Introduction to the subject: - Objects, scope, rock forming minerals, primary and secondary minerals.
2. Silicate and non silicate minerals', felsic and mafic minerals, essentials and accessories minerals.
3. Origin, texture, structure, classification of igneous rocks, secondary rocks, metamorphic rocks and their engineering applications,
4. Study of common rock types prescribed in practical work.

Unit-II: Structural Geology, Plate Tectonics & Ground water

No of Lect.- 8 Hours, Marks: 16

a) Structural geology: Outcrop, dip and strike, conformeable series, unconformity and overlap.
b) Faults and their types, folds and their types, inliers and outliers.
c) Structural features resulted due to igneous intrusions, concordant and discordant igneous intrusions
d) Joints and their types and Introduction to plate tectonics.
e) Water table and depth zones, relation between surface relief and water table, perched water table
f) Natural springs and seepages, contact springs, hot springs and geysers, artesian wells.

Unit-III: Geomorphology, Historical Geology & Building stones

No of Lect. – 8, Marks: 16

a) Geomorphology: geological action of river, rejuvenation, land forms resulted due to river erosion, deposition and rejuvenation.
b) Physiographic divisions of india and their characteristics, geological history of peninsula, study of formations in peninsula and the significance of their structural characters in major civil engineering activities.
c) Requirements of good building stones, engineering properties of rocks. availability of blocks of suitable size and appearance on mineral composition, textures, structures.
d) Earthquake & its causes, classification, seismic zones of india & geological consideration for constructions of building.

Unit-IV: Preliminary Geological Studies, Remote function, Geo physical exploration.

No of Lect. – 8, Marks: 16

a) Verification of surface data by subsurface exploration, drill holes, test pits, trenches, exploratory tunnels, shafts, adits, drifts, etc.
b) Compilation and interpretation of information obtained from these. correlation of surface data with results of subsurface exploration.
c) Limitations of drilling, comparative reliability of data obtained by drilling and excavation.
d) Engineering significance of geological structures such as stratification, dips, folds, faults, joints, crush zones, fault zones, dykes etc.
e) Landslides and its causes, preventive measures and case studies.
f) Principles of geo physical exploration methods for sub surface survey.

Unit-V: Role of Engineering Geology in Dams and tunneling.

No of Lect. – 8, Marks: 16

a) Preliminary geological investigation for tunnels. important geological consideration while choosing alignment
b) Role of groundwater, geological conditions likely to be troublesome, suitability of common rock type for tunneling, unlined tunnels, case studies.
c) Geological requirements for construction of dams and geological structures influence of geological condition on the choice of type and design of dam.
d) Preliminary geological work on dam sites, favorable and unsuitable geological conditions for locating a dam, precaution to be taken to counteract unsuitable condition
e) Treatment of leaky rocks, faults, dykes, crush zones, joints, fractures, unfavorable dips, etc. and case studies.

Reference Books:

1. R.B. Gupte : A Text Book of Engineering Geology -P.V.G. Publications, Pune.
2. M. Anji Reddy : A Text Book of Remote Sensing and Geographical Information Systems by - 2nd Edition B S Publication.
3. R.Legget : Geology and Engineering - McGraw Hill Book Co., London.
4. Arthur Holmes : Physical Geology -ELBS Publication.
5. Tony Waltham : Fundamentals of Engineering Geology, SPON Press.
6. J.M. Treteth : Geology of Engineers, Princeton, Von. Nostrand.
7. K V G K Gokhale : Text Book of Engineering Geology, B S Publication
8. F G Bell : Fundamentals of Engineering Geology, B S Publication
9. B S Sthya narayanswami, “Engineering Geology”, Dhanpat Rai & Co.
10. P. K. Mukerjee : A text Book of Geology, Calcutta Word Publishers.
11. Blyth F.G.M. A Geology for Engineers, Arnold London.
12. Prabin Singh. Engg. And general Geology. Katson Publishing House.
13. D.S.Arrora: Geology for Engineers, Mohindra Capital Publishing Candigarh.

FLUID MECHANICS I

Course Outline

Course Title	Short Title	Course Code
FLUID MECHANICS I	**FM-I**	

General Objective:

The general objective of course is to teach fluid and flow properties and to analyze and solve fluid problems under static and dynamic conditions. Also it aims to explain flow measurement in pipes, open channels and tanks and to introduce dimensional analysis and similitude to students.

Course Description:

This course provides the elementary level knowledge of Fluid mechanics which includes:-

- Study of Fluid properties.
- Fluid statics – Fluid pressure, buoyancy and floatation and their civil engineering applications.
- Kinematics and dynamics of fluid flow.
- Dimensional analysis and hydraulic similitude.
- Analysis of laminar flow in pipes and measurement of viscosity of liquids.
- Flow measurement by Venturimeters, Pitot tubes, orifices, mouthpieces, weirs and notches.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	3	13	39	3
Tutorial	1	13	13	1

Prerequisite Course(s):

Mathematics (calculus and differential equations), statics and dynamics. Ability to (i) draw free body diagrams, (ii) solve dynamics problems using Newton's laws of motion.

COURSE CONTENT

Fluid Mechanics- I
Semester-IV

Teaching Scheme	**Examination Scheme**
Lecture: 3 hours / week	**End Semester Examination (ESE) : 80 Marks**
	Paper Duration (ESE) : 03 Hours
	Internal Sessional Exam (ISE) : 20 Marks

Unit I **No. of lectures: 07, Marks: 16**

A) **Introduction**: - Scope and applications of fluid mechanics, Newton's law of viscosity, classification of fluids: Newtonian and non-Newtonian fluids, ideal and real fluids.

B) **Physical properties of fluids** – Mass density, specific weight, specific volume, specific gravity, dynamic and kinematic viscosities, compressibility, surface tension, capillarity, vapour pressure.

Unit II - Fluid statics **No. of lectures: 08, Marks: 16**

A) **Fluid pressure measurement: -** Fluid pressure, pressure head, measurement of pressure: - Simple and differential manometers, introduction to mechanical gauges.

B) **Pressure on surfaces: -** Static fluid pressure forces on plane and curved surfaces and their simple civil engineering applications.

C) **Buoyancy: -** Archimedes's principle, buoyancy and flotation, metacentric height, stability of floating and submersed bodies.

Unit III **No. of lectures: 09, Marks: 16**

A) **Kinematics of fluid flow**- Types of fluid flows:–Steady and unsteady; uniform and non uniform; laminar and turbulent; one, two and three dimensional; rotational and irrational flows. Velocity & acceleration for one and three dimensional flows. Stream lines, equipotential lines and flow net, uses and limitations of flow net. Equations of continuity for one and three-dimensional flows.

B) **Dynamics of fluid flow** – Forces acting on fluids in motion. Mention of various equations of motion. Euler's equation of motion and Bernoulli's theorem for one and three dimensional flows, hydraulic gradient line and total energy line, kinetic energy correction factor. Simple applications of continuity and Bernoulli's equations such as Pitot tube and Venturimeter. Introduction to linear momentum principle.

Unit IV **No. of lectures: 07, Marks: 16**

A) **Dimensional analysis and Hydraulic similitude:**– Dimensions of physical quantities, dimensional homogeneity, Buckingham pi-theorem.
Model analysis: Geometric, kinematics and dynamic similitudes, important dimensionless parameters and their significance (Reynolds and Froude numbers only). Model laws: Reynolds and Froude model laws and their applications to simple fluid flow problems.

B) **Laminar flow**: – Laminar flow through pipes- Hagen-Poiseuilli's equation, Stoke's law. Mention of various methods of measurement of viscosity. Reynolds's experiment, transition from laminar to turbulent flow.

Unit V **No. of lectures: 08, Marks: 16**

A) **Flow through opening – Orifices:** Types, coefficients of velocity, contraction and discharge, small and large orifices, completely submerged orifices.
Mouthpieces: Types, external cylindrical mouthpiece.

B) **Flows over notches and weirs** – Rectangular, triangular and trapezoidal notches and weirs, Cipolletti weir, empirical formulae for discharge over rectangular weirs, corrections for velocity of approach and end contractions.

Reference Books:-

1. Fluid Mechanics by Dr. A. K. Jain, Khanna Publishers, Delhi.
2. Hydraulic and Fluid Mechanics by Dr. P.N.Modi , Dr. S.M. Seth, , Standard Publications, Delhi.
3. A Textbook of Fluid Mechanics & Hydraulic Machines by Dr. R.K.Bansal, Laxmi Publications (P) Limited.
4. 1000 Solved Problems in Fluid Mechanics by Dr. K. Subramanya, , Tata McGraw-Hill Publishing Company Ltd., New Delhi.
5. Fluid Mechanics by Dr.Garde and Mirajgaokar.
6. Introduction to Fluid Mechanics and Fluid Machines by Som S K and Biswas G, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
7. Fluid Mechanics by Streeter and Wylie, McGraw-Hill Book Company.

THEORY OF STRUCTURE – I

Course outline

Course Title	Short Title	Course code
Theaory of Structures-I	**TOS-I**	

Course Description:

The object of the subject to analyze statically determinate and indeterminate structures such beams, trusses and arches subjected to external loads. Course focuses on different analytical tools for understanding the behavior of primarily, statically determinate structures, and also of indeterminate structures. It includes computation of deflections, internal axial forces, shear forces, and bending moments in simple trusses, beams, frames and arches. The study of influence line diagram includes identification of positions of load for maximum shear force and bending moments at specified sections.

Lecture	Hours/Week	No. of weeks	Total Hours	Semester Credits
	03	13	39	04
Tutorial	1	13	13	

Course Content

Theory of structures-I **Semester-IV**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week **End Semester Examination (ESE) : 80 Marks**
Tutorial: 1 hour / week **Paper Duration (ESE) : 03 Hours**
Internal Sessional Exam (ISE) : 20 Marks

UNIT-I **(09 Hours, 16 marks)**

a) Deflection of Beams: -

Relation between BM, slope and defection, Introduction to double integration method, Concept of moment area method, Mohr's theorems, Use of moment area method to calculate slope and deflections of beams such as simply supported, over hanging and of uniform cross sections and different cross sections. Conjugate beam method, Application of conjugate beam method to simply supported, overhanging and compound beams.

b)Strain Energy:- Castiglinao's first theorem and its application to find slope & deflection of simple beams and frames.

UNIT-II **(07 Hours, 16 marks)**

a) Deflection of trusses: -

Deflection of statically determinate plane trusses by Castigliano’s first theorem

b) Analysis of redundant trusses by Castiglino's second theorem, lack of fit and temperature changes in members, sinking of supports (degree of indeterminacy maximum upto 2 only).

UNIT-III **(08 Hours, 16 marks)**

a) Fixed Beams:- Concept, advantages and disadvantages, Nature of B.M. Diagrams, Fixed end moment due to various types of loads such as point, uniformly distributed, Uniformly varying, couples for beams, Effect of sinking of support, plotting of B.M. & S.F. diagrams.

b) Continuous Beams: - Analysis of continuous beam by three moment (Clapyeron's theorem) up to three unknowns, Effect of sinking of supports, plotting of B.M. & S.F. diagrams.

UNIT-IV **(07 Hours, 16 marks)**

b) Three hinged arch: - Concept of three hinged arch as a haunched beam, support reactions, B.M., S.F. and axial thrust diagrams for circular and parabolic three hinged arches.

b) Two hinged arches:-

Horizontal thrust at supports. Shear, normal thrust and BM at a point, BM diagrams for parabolic arch due to concentrated load and udl.

UNIT-V **(08 Hours, 16 marks)**

a) Influence lines: - Basic concepts, influence line for reactions, B.M. & S.F. for simply supported, overhanging beams, Calculations for S.F. & B.M. in beam using influence lines.

b) Moving loads: - Introduction, conditions for maximum B.M. and maximum S.F. at a section due to moving point loads, udl longer or shorter than span and train of moving loads, Absolute maximum B.M. & S.F., Construction of Max. S. F. and B.M. diagram.

REFERENCE BOOKS:-

1. Structural analysis Vol –I, II by S.S. Bhavikatti, Vikas Publishing House Pvt. Ltd.
2. Mechanics of structures Vol – II by S. B.Junnarkar and Dr. H.J. Shah, Charotar Publishing House.
3. Analysis of structures (Volume - I & II) by V.N.Vazirani, M.M. Ratwani and Dr. S.K. Duggal, Khanna Publications.
4. Theory of structures by S. Rammamrutham, Dhanpatrai Publishing Company.
5. Basic structural analysis by C.S.Reddy
6. Indererminate structures by C.K.Wang

BUILDING DESIGN AND DRAWING

COURSE OUTLINE

Course Title	Short Title	Course Code
Building Design and Drawing	**BDD**	

Course Description:

This course introduces the student about concepts in building design and drawing such as building definition, types of building, principle of planning, building rules, regulations and byelaws, building ventilation and air-conditioning, necessity of fire protection system, different building services with its importance like electrical, communications, plumbing, solar water heater, planning and designing of residential buildings of load bearing and frame structures, planning and designing of apartments (flats), one point and two point perspective drawings, Planning and designing of various public building buildings.

	Hours / Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Lecture	03	13	39	03

Prerequisite Course(s): Engineering graphics, Building construction techniques and materials

COURSE CONTENT

Building Design and Drawing **Semester-IV**

Teaching Scheme
Lecture: 3 hours / week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 04 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I **No. of Lect. – 8, Marks: 16**

1. Introduction:-
   Building definition and types of building as per occupancy, principles of planning of residential buildings, plan sanctioning procedure, building bye laws & its necessity.
2. Ventilation and Air conditioning of buildings:-
   Ventilation: -Necessity of ventilation, functional requirements, systems of ventilation and their choice, movement of wind through building, wind effect etc.

Air conditioning: - Classification, comfort and comfort conditions, principles and system of comfort, object and necessity of air conditioning.

3. Fire protection: - Fire load, fire safety, grading of occupancy by fire load, considerations in fire protection, fire resistant construction & wall openings, fire escape elements.
4. Building services: Its importance, constructional requirements for different building services-like electrical, Tele communication service & plumbing services : Layout of water supply and drainage system, one pipe and two pipe system, storage & disposal arrangement, septic tank, garbage disposal arrangements, solar water heater.

Unit-II **No of Lect. – 7, Marks: 16**

a) Planning and designing of residential buildings (load bearing or frame Structure)
b) Working drawings: - importance and use of all types of working drawings at site.

Unit-III: **No of Lect. – 8, Marks: 16**

a) Planning and designing of apartment houses(flats) (framed Structure only)
b) Perspective drawings : one point and two point perspective drawings

Unit-IV: **No of Lect. – 8, Marks: 16**

a) Planning and designing of Educational buildings, hostel buildings, library buildings, Restaurants, Hotels/lodging-boarding buildings, and primary health centers/hospitals. (frame Structure only)

Unit-V: **No of Lect. – 8, Marks: 16**

a) Planning and designing of bus stand buildings, commercial complex buildings, bank buildings, post office buildings, Community/marriage halls, factory buildings. (frame Structure only)

Note: 1) Theory questions shall be asked on **Units I.**
2) Only drawing questions shall be asked to draw on drawing sheets from **Unit II, III, IV & V**

Reference Books:

1. Building Drawing - M.G. Shah, C.M. Kale, S.Y. Patki - Tata Mcgraw Hills pvt. Ltd.New Delhi.
2. Y.S.Sane - Planning & Designing Building.
3. Building Science and Planning by Dr . S.V. Deodhar
4. National building Code (Latest)

SURVEYING - II

COURSE OUTLINE

Course Title	Short Title	Course Code
Surveying- II	**SUR-II**	

Course Description:

This course introduces the students about concepts in Surveying such as:

- Scope of geodetic surveying and triangulation in civil Engineering society.
- Adjustment of triangulation figure by using different methods
- Terrestrial and Aerial photography for large scale survey
- Distortion and displacement in photography
- Principles of remote sensing and its methods
- Locating of sounding in hydrographic surveying
- Importance and principles of electronic distance meters

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	13	39	03
Tutorial	-	-	-	

Prerequisite Course(s): Surveying- I

Course content

Surveying- II **Semester-IV**

Teaching Scheme
Lecture: 3 hours / week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Geodetic Surveying: **No of Lect. – 8, Marks: 16**

a) Objects, methods in geodetic surveying

b) Triangulation figure, Strength of figure, Classification of triangulation system

c) Selection of stations, intervisibility of height of station towers, signal and their classification
d) Phase of signals , satellite station and Reduction to centre Eccentricity of signals
e) Base line measurement, Apparatus used, Base net; equipment used for base line measurement, Extension of a base.

Unit-II: Triangulation Adjustments. **No of Lect. – 8, Marks: 16**

a) Kinds of errors; laws of weights,
b) Determination of the most probable values of quantities; The method of least squares; Indirect observations on independent quantities; normal equation; conditioned quantities
c) The probable error and its determination ; distribution of error to the field measurements ,
d) Method of correlates, station adjustment and figure adjustment;
e) Adjustment of a geodetic triangle , figure adjustment of a triangle ; calculation of spherical triangle ;
f) Adjustment of geodetic quadrilateral, Adjustment of a quadrilateral with a central station by method of least squares.

Unit-III: Photogrammetry **No of Lect. – 8, Marks: 16**

a) Objects ; application to various fields, terrestrial photogrammetry (only general idea) and aerial photogrammetry ;
b) Aerial camera;
c) comparison of map and vertical photograph ;
d) Vertical tilted and oblique Photographs ;
e) Concept of principal point nadir point, isocentre, horizon point and principal plane,
f) Scale of vertical photograph; computation of length and height from the photograph;
g) Relief displacement on vertical photograph;
h) Flight planning; ground control ; radial line method;
i) Mirror and lens Stereoscopes.

Unit-IV: Hydrographic Surveying **No of Lect. – 8, Marks: 16**

a) Objects; establishing controls; shore line survey, river surveys;
b) Soundings, tide gauges, Equipment for taking soundings; signals.
c) Nautical sextant; measuring horizontal and vertical angles with the nautical sextant,
d) Sounding party, ranges making the soundings, methods of locating the soundings ;reduction of soundings ,
e) The three point problem and methods of solution.

Unit-V: Remote Sensing **No of Lect. – 7, Marks: 16**

a) Basic principles, importance, scope,
b) Sensors used in remote sensing, platforms,
c) Applications of remote sensing to Civil Engineering.

Use of advance electronics instruments in Surveys:-

a) Study and use of various electronics equipments like EDM and Total station.

Reference Books:

1. Surveying and leveling (vol-II) by T.P. Kanitkar, & S.V. Kulkarni, Pune Vidarthi Griha Prakashan, Pune,
2. Surveying Vol. II and Vol .III by B.C.Punmia, Laxmi Publication (P) New Delhi.
3. Advance surveying by P.Som , B.N.Ghosh, TMH Publication.
4. Surveying by Norman Thomas
5. Elements of Photogrammetry by Paul Richard Wolf, McGraw-Hill Education (India) Pvt Limited.
6. Plane and geopdesic surveying by David Clark, J. E. Jackson
7. Principal of remote sensing by A. N. Patel

COMPUTER GRAPHICS IN CIVIL ENGINEERING

Course outline

Course Title	Short Title	Course Code
Computer Graphics	**CG**	

Course Description:

AutoCAD stands for Automatically Computer Aided Drafting/Designing. It is an electronic tool that enables you to make quick and accurate drawings with the use of a computer. Unlike the traditional methods of making drawings on a drawing board, with CAD you can sit back in an easy chair and create wonderful drawings just by clicking the buttons of a keyboard. Moreover, drawings created with CAD have a number of advantages over drawings created on a drawing board. CAD drawings are neat, clean and highly presentable. Electronic drawings can be modified quite easily and can be presented in a variety of formats.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Lecture	01	13	13	-

Prerequisite Course(s): Basic Knowledge of Computer.

Course Content

Computer Graphics **Semester-IV**

Teaching Scheme

Lecture: 1 hour/ week

Unit-I

Introduction to AutoCAD (Automatically Computer Aided Drafting/Designing)
No of Lectures: 7 Hours

a) Introduction to CAD, Introduction to drafting software.

b) Explanation to precision Drawing & Drawing tools, Geometric Shapes, Basic Printing, Editing Tools. .

Unit-II

Engineering and Architectural Views **No of Lect.- 6Hours**

a) Engineering and Architectural Views, Drafting Views, Layers, Templates & Design Center, Dimensioning, Blocks

b) Office Standards, Drafting symbols, Introduction to 3D.

COMPUTER GRAPHICS IN CIVIL ENGINEERING

Lab course outline

Course Title	Short Title	Course Code
Computer Graphics	**CG LAB**	

ICA (Term Work) : 50 Marks

Course Description:

In this laboratory course emphasis is given on understanding the practical oriented knowledge related to civil engineering software AutoCAD and their applications used for drawing .

Practical	**Hours/Week**	**No. Of Weeks**	**Total Hours**	**Semester Credits**
	2	13	26	02

Total Semester Credits: 2

Prerequisite Course(s): Basic knowledge of Computer.

Lab course content

Term Work

Term Work shall consist of drawings on A4 size sheets of the following

1) Practice assignments on CAD drafting tools (Min. 2 Assignments). (06 Hours)
   a) Hands on practice on Basic AutoCAD software.
   b) One drawing showing use of Basic CAD commands.
   c) One Drawing sheet showing various objetcs such as Circle, Arc,Rectangle, Ellipse,Polygon,Chamfer,Mirror etc.
   d) Familiar with AotoCAD interface commands

2) Detailed Plan of 2 BHK house. (12 Hours)
a) Foundation plan.
b) Typical Floor Plan.
c) Elevations.
   1) Drawing of 2BHK Plan (Separate plan for individual should be drawn)
   2) A foundation plan of drawn 2BHK showing various column footings.
   3) Elevation of floor plan showing various structural elements of building.
   4) Drawing of sectional elevation passing through a staircase

3) Detailed drawing of structural elements from given data. (8 Hours)
a) Detailing of RCC isolated column footing
   To draw RCC Isolated Column Footing showing each component as per data given.

b) Detailing of RCC column and beam.
   Drawing of RCC Column & Beam showing each component description as per data given.

Guide lines for ICA

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

ENGINEERING GEOLOGY LAB

Lab course outline

Semester-IV

Course Title	Short Title	Course Code
Engineering Geology	**EG LAB**	

ICA (Term Work): 50 Marks

Course Description:
In this laboratory course emphasis is given on understanding the practical oriented knowledge related to civil engineering and their applications in the field.

Laboratory	**Hours/Week**	**No. Of Weeks**	**Total Hours**	**Semester Credits**
	2	13	26	1

Total Semester Credits: 1

Prerequisite Course(s): Elements of Civil Engineering

Lab Course Content

Following experiments are to be performed. Term works shall consist of journal giving details of the experiments performed.

1. Identification of following minerals in hand specimens.
   Quartz and its varieties, common varieties of cryptocrystalline and amorphous silica, orthoclase, plagioclase, muscovite, biotite, zeolites, calcite, gypsum, fluorite, barites, tourmaline, beryl, asbestos, talc, kyanite, garnet, galena, magnetite, haematite, limonite, iron pyrites, chromite, bauxite.
   a. To know chemical composition of mineral.
   b. To know Mohs Scale of Hardness of standard minerals.
   c. To identify colour, streak, cleavage, fracture, luster, hardness, crystal form etc.
   d. To identify special property of mineral
   e. Identify mineral name based on physical properties.
2. Identification of following different rock types in hand specimens.
   Granites, Syenites, Diorites, Gabbros, Rhyolites, Trachytes, Andesites, Basalts, Varieties of Deccan Trap rock, Volcanic breccias, Pegmatites, Dolerites, Graphic granites, Laterites, Bauxites, Conglomrates, Breccias, Sand stones, Quatzites, Grits, Arkose, Shales, Chemical and organic lime stone. Marbles, Quartzites, Varieties of Gneisses, Slates, Phyllites and varieties of Schists.
   a. To know colour, texture/structure of rock specimen
   b. To identify mineral composition of rock specimen
   c. Based on mineral composition classify rock specimen.

d. Identify rock name based on properties.

3. Construction of geological section from contoured geological maps.
   a. To draw geological section from geological contour map.
   b. To identify various structural features such faults, folds, joints, dykes etc. from the section.
   c. To identify the nature of topography below the ground level.
4. Interpreting geological features without drawing section
   a. To identify geological features without drawing section
   b. Identifying faults, folds, joints, divisional planes etc.
5. Solution of engineering geological problems such as alignment of dam, tunnels, roads, canals, bridges, etc. based on geological maps.
   a. To draw the geological section from contour geological map
   b. To find out the solution of geological problems based on geological maps.
   c. To find the alternative solution or exact solution related to geological problems.
6. Logging of drill core and interpretation of drilling data with graphical representation of core log.
   a. To represent the Core-Box data in the form of Core-log & representing the same in the form of Graph by using Litholog OR
   b. To solve Numerical based on core data with graphical representation of core-log.
7. One site visit is desirable to study geology and its engineering applications, submission of field report.
   1. To get acquainted with various geological structural phenomenons, one site visit is important.
   2. Can get knowledge of faults, folds, dykes, joints etc. in the context of geology & its applications on engineering point of view.
   3. Beneficial for determining amount of dip, apparent dip in the field.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

FLUID MECHANICS I LAB

Lab course content

(Note: All practical exercise in each group.)

Course Title	Short Title	Course Code
Fluid Mechanics I Lab	**FM I lab**	

ICA (Term Work) : 25 Marks

ESE (Oral) : 25 Marks

Semester-IV

Course Description:

This laboratory covers experiments related to measurement of fluid and flow properties and basic principles of statics, kinematics and dynamics of fluid flow. These include:-

- Measurement of viscosity of liquids.
- Measurement of fluid pressure by manometers.
- Buoyancy and floatation.
- Study of Bernoulli's theorem.
- Measurement of discharge using Venturimeter, orifice and notch.
- Study of flow net by electrical analogy method.
- Study of laminar flow in Reynolds apparatus / Heleshaw's apparatus.
- Study of momentum principle.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	2	13	26	1

General Objective:

In this laboratory students will be introduced to the applications of basic principles of fluid mechanics to measure fluid and flow properties such as viscosity, pressure, discharge in pipes, open channels and tanks. Also students are introduced to verification and simple applications of equations of continuity, energy and momentum.

Objective to develop following Intellectual skills:

1. To understand basic laws of fluid statics and equations of energy and momentum and to apply the same to solve problems.
2. To learn use of Venturimeter, orifice, notch for discharge measurement.
3. To identify principles and working of different apparatus in laboratories.

Objective to develop following Motor skills:

1. Ability to draw diagrams of equipments and graphs.

2. Ability to perform the experiments and record the observations of pressure, weight, temperature, volume, time, discharge, voltage and current etc.
3. Ability to apply various discharges and measure the corresponding effects.
4. Ability to apply the basic principles in various field conditions.

Outline of Content: These experiments contain

1. Measurement and study of variation of viscosity of oil with temperature.

a. To calculate kinematic viscosity of oil at different temperatures by measuring time to collect 50 ml of oil from the cylinder of viscometer.
b. To plot graph of viscosity versus temperature and hence to find the viscosity of the oil at room temperature.

2 Study of simple and differential manometers.

a. To measure fluid pressure at any point by simple U – tube mercury manometer.
b. To measure difference of pressure by differential U – tube mercury manometer.

3 Buoyancy: metacentric height of ship model.

a. To calculate metacentric height of cargo and war ship by knowing total weight of ship, movable weight and measuring its distance from centre and angle of tilt of ship.
b. To compare and analyze metacentric heights of cargo and war ships.

4 Study of Bernoulli's theorem.

a. To measure pressure by piezometers at various points along the conduit.
b. To calculate discharge through the conduit by measuring volume of water and the required time.
c. To calculate velocities at the points by knowing the discharge and the cross sectional areas of the conduit at these points.
d. To compute total energy of flow at these points and thus to verify Bernoulli's theorem and calculate losses of energy.
e. To plot graphs of total energy head and piezometric head and length of the conduit.

5 Calibration of Venturimeter.

a. To calculate discharge experimentally through the venturimeter by measuring volume of water and the required time.

b. To compute the discharge analytically by knowing the diameters of inlet and throat and measuring the pressure difference between the inlet and throat by differential mercury manometer.
c. To calculate the coefficient of discharge of the venturimeter.
d. To plot the graph of discharge and the pressure head difference and hence to evaluate the calibration equation for the venturimeter.

6 Electrical analogy method.

a. To identify equipotential lines by observing equal voltage at different points and

hence to draw the same.

b. To draw, in the same way, the streamlines and hence the flow net.

c. To analyze the flow net at different cross sectional areas of the flow passage.

7 Study of laminar flow in Reynolds apparatus.

a. To calculate discharges through the conduit by measuring volume of water and the required time.

b. To calculate velocity and hence the Reynolds number of flow.

c. To observe and analyze the dye filament and hence the type of flow as laminar / turbulent.

8 Determination of coefficients of Orifice / Mouthpiece

a. To calculate discharge experimentally through the orifice by measuring volume of water and the required time.

b. To compute the discharge analytically by knowing the diameter of orifice and measuring the head over the orifice

c. To measure coordinates of any point on the jet.

d. To calculate the coefficients of discharge, velocity and contraction.

e. To plot the graph of discharge and the head and hence to evaluate the calibration equation for the orifice.

9 Calibration of notch.

a. To calculate discharge experimentally through the notch by measuring volume of water and the required time.

b. To compute the discharge analytically by knowing the dimensions of the notch and measuring the head over the notch.

c. To calculate the coefficient of discharge.

10 Study of Impact of jet.

a. To calculate discharge through the nozzle by measuring volume of water and the required time.

b. To find the velocity of the jet striking the plate by knowing the diameter of nozzle.

c. To compute analytically the force exerted by the jet on the plate by using the momentum principle.

d. To calculate experimentally the force exerted by the jet on the plate by measuring the weights and the liver arm.

e. To compute the coefficient of impact of the plate and thus to discuss the momentum principle and its applications.

11 Visit to WALMI, Aurangabad or any other such relevant place.

a. To study measurement of discharge on field (in open channels) by using triangular and other notches.

Note: The Term Work will consist of a laboratory journal consisting of eight experiments/assignments. At least eight out of 11 experiments/assignments should be performed.

Guidelines for ICA :

ICA shall be based on continuous evaluation of students' performance throughout the semester and practical assignments submitted by the students in the form of journal.

Guide lines for ESE:-

ESE will be based on laboratory journal submitted by the student. In ESE the student may asked to answer questions based on experiments/assignments. Evaluation will be based on performance in **oral** examination.

Reference Books:-

1. Fluid Mechanics by Dr. A. K. Jain, Khanna Publishers, Delhi.
2. Hydraulic and Fluid Mechanics by Dr. P.N.Modi , Dr. S.M. Seth, , Standard Publications, Delhi.
3. A Textbook of Fluid Mechanics & Hydraulic Machines by Dr. R.K.Bansal, Laxmi Publications (P) Limited.
4. Fluid Mechanics by Dr.Garde and Mirajgaokar.
5. Introduction to Fluid Mechanics and Fluid Machines by Som S K and Biswas G, Tata McGraw-Hill Publishing Company Ltd., New Delhi.

BUILDING DESIGN AND DRAWING

Lab course outline

Semester-IV

Course Title	Short Title	Course Code
Building Design and Drawing	**BDD**	

Practical: 2 Hours/Week **ICA (Term Work) : 25 Marks**
ESE (Oral) : 25 Marks

Course Description:
In this laboratory course emphasis is on the planning, design and drawing of various class buildings.

	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	2	13	26	1

Total Semester Credits: 1

Prerequisite Course(s): Engineering Graphics, Building construction techniques

Lab course content

Group A

a. Planning of a small residential buildings/bungalow/duplex from given data (load bearing or framed structure).

a. Draw furniture arrangement
b. Draw front elevation, sections (preferably through staircase)
c. Site plan, built up area calculations
d. Schedules of area & openings.

b. Perspective view of plan drawn in sheet no- 1 with suitable scale

a. Draw real perspective view of residential building in sheet No. 1

Group B

Project work

Project work shall consist of preparation of working drawings after planning and designing of any one building mentioned in Unit II, III, IV & V. Every student shall select different type mentioned in above units; individual work is expected from the students.

1. **Layout plan of project building**
   a. Showing internal roads ,other structures (if any) Compound walls
   b.Entrance gate, garden, electrical Line & poles, Tree plantation etc. (project sheet no -1)

2. **Typical floor plans.**
   a. Draw all details units of each floor.

3. **Foundation Plan**
   a. Draw all foundation details
4. **Front and Road side elevations**
   a. Draw all detail elevation with elegance
5. **Sections.**
   a. Draw section through staircase and toilet with all constructional details
6. **Layout plan showing water supply and drainage arrangements**
   a. Draw plan showing water supply line from municipal connection to various required tap connections within project building
7. **Drawings-**
   a. Layout/Floor plan and elevation using computer drafting software on A4 size sheets.
   b. Assembly & dissembling of starter.
   c. Connection of starter according to wiring diagram.
8. **Line plans –**
   a. Various public buildings. (any five types) using computer drafting software on A4 size Sheets.
9. **Visit report-**
   a. Report regarding visit of any advanced building construction site, preferably visit to the site of building given for the project work with photos/drawings etc.
   (visit is mandatory)

Guidelines for ICA:
ICA shall be based on continuous evaluation of students' performance throughout the semester and term work drawing sheets submitted by the students.

Guide lines for ESE:
ESE will be based on drawing sheets submitted by the student. In ESE the student may be asked to answer questions based on term work /assignments. Evaluation will be based on performance in **oral** examination.

Reference Books:

1. Building Drawing - M.G. Shah, C.M. Kale, S.Y. Patki - Tata Mcgraw Hills pvt. Ltd.New Delhi.
2. Y.S.Sane - Planning & Designing Building.
3. Building Science and Planning by Dr . S.V. Deodhar
4. National building Code (Latest)

Surveying- II
Lab course outline

Semester-IV

Course Title	Short Title	Course Code
Surveying- II LAB	**SUR-II LAB**	

ICA (Term Work) : 25 Marks
ESE (Oral) : 25 Marks

Course Description:
It covers experiments related to measurement of horizontal angle, vertical angle, oblique angle, horizontal distance by using 1" theodolite . Use of nautical sextant, stereoscope and EDM/ Total station.

	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
Practical	2	13	26	1

Total Semester Credits: 1

Prerequisite Course(s): Surveying-1

Lab course content

1. **Measurement of horizontal and vertical angles by One Second Theodolite**

a. Study the component parts of One Second Theodolite.
b. Measurement of horizontal angles by face left and right position.
c. Measurement of vertical angles by face left and right position.

2. **Measurement of horizontal angles by reiteration method.**

a. Measurement of horizontal angles by face left and right position.
b. Verification of check by reiteration method.

3. **Study and use of mirror stereoscope and finding out the air base distance**

a. Find out the location of principal point on photograph
b. Fix the photograph along the line of principal point and conjugate principal point
c. Measurement of air base distance by mirror sterescope

4. **Hydrographic survey**
i) Study and use of nautical sextant for measurement of angles.
ii) Solution of three point problem.

a. Study of components parts of nautical sextant
b. Measurement of horizontal, vertical and oblique angle
c. Find out the location of station point by three well defined points (three point problem)

4. **Measurement of angles and elevation by Total Station / Study and use of E.D.M**

a. Study of components parts of total station
b. Measurement of horizontal and vertical angles by total station
c. Measurement of vertical elevation by total station
d. Measurement of horizontal distance by total station.

Note: The practical examination will be based on the above exercises.

Guidelines for ICA:
ICA shall be based on continuous evaluation of students' performance throughout the semester and practical assignments submitted by the students in the form of field book.

Guide lines for ESE:-
ESE will be based on laboratory field book submitted by the student. In ESE the student may asked to answer questions based on experiments/assignments. Evaluation will be based on performance in **oral/ practical** examination.

REFERENCE BOOKS –

1. Surveying and leveling (vol-II) by T.P. Kanitkar, & S.V. Kulkarni, Pune Vidarthi Griha Prakashan, Pune,
2. Surveying Vol. II and Vol .III by B.C.Punmia, Laxmi Publication (P) New Delhi.
3. Advance surveying by P.Som , B.N.Ghosh, TMH Publication.
4. Surveying by Norman Thomas
5. Elements of Photogrammetry by Paul Richard Wolf, McGraw-Hill Education (India) Pvt Limited.
6. Plane and geopdesic surveying by David Clark, J. E. Jackson
7. Principal of remote sensing by A. N. Patel

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Third Year Engineering

(CIVIL)

Faculty of Engineering and Technology

COURSE OUTLINE

TERM – V

W.E.F 2014 – 2015

TE (Civil): Semester–V

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs/ week	Tutorial Hrs/ week	Practical Hrs/ week	Total	ISE	ESE	ICA	ESE		
Structural Design I	D	3	---	---	3	20	80	---	---	100	3
Infrastructural Engineering I	D	3	---	---	3	20	80	---	---	100	3
Fluid Mechanics II	D	3	---	---	3	20	80	---	---	100	3
Environmental Engineering I	D	3	---	---	3	20	80	---	---	100	3
Construction Management I	C	3	---	---	3	20	80	---	---	100	3
Structural Design I lab	D	---	---	2	2	---	---	25	25	50	1
Infrastructural Engineering I lab	D	---	---	2	2	---	---	25	---	25	1
Fluid Mechanics II lab	D	---	---	2	2	---	---	25	25	50	1
Environmental Engineering I lab	D	---	---	2	2	---	---	25	25**(PR)**	50	1
Testing of Materials I lab	B	1	---	2	3	---	---	50	---	50	2
Industrial Training/EDP/Special Study	D	---	---	---	---	---	---	25	---	25	2
Total		**16**	**---**	**10**	**26**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

Note 1: For branches like Chemical Engineering and Biotech Engg, two laboratory hours can be merged to form a four hour slot.

Note 2: Out of 3 practical ESE heads, at least 1 head should be practical.

TE (Civil): Semester–VI

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs/ week	Tutorial Hrs/ week	Practical Hrs/ week	Total	ISE	ESE	ICA	ESE		
Structural Design II	D	3	--	---	3	20	80	---	---	100	3
Theory of Structures II	D	3	---	---	3	20	80	---	---	100	3
Geotechnical Engineering I	D	3	---	---	3	20	80	---	---	100	3
Infrastructural Engineering II	D	3	---	---	3	20	80	---	---	100	3
Construction Management II	C	3	---	---	3	20	80	---	---	100	3
Structural Design II lab	D	---	---	2	2	---	---	25	25	50	1
Geotechnical Engineering I lab	D	---	---	2	2	---	---	25	25	50	1
Infrastructural Engineering II lab	D	---	---	2	2	---	---	25	25	50	1
Testing of Materials II lab	B	---	---	2	2	---	---	25	---	25	1
Minor Project	D	---	---	2	2	---	---	50	---	50	2
Seminar-I	D	---	---	2	2	---	---	25	---	25	2
Total		**15**	**---**	**12**	**27**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

Note 1: For branches like Chemical Engineering and Biotech Engg, two laboratory hours can be merged to form a four hour slot.

Note 2: Out of 3 practical ESE heads, at least 1 head should be practical.

STRUCTURAL DESIGN - I

Structural Design - I **SD–I**

Course Description:

The primary aim of this course is to provide an introduction to the analysis and design of reinforced concrete structures, by limit state method conforming to IS 456:2000. The course covers design of various elements viz. beams, slabs, columns, footing and the students should independently design a RCC Structure of a residential or commercial building up to 3 stories.

Lecture	**Hours / Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	13	39	03
Tutorial	--	--	--	

General Objective:

The primary course objective is to equip the students with the tools necessary for designing Concrete structures and to familiarize them with the relevant national design codes such as IS 456:2000. It deals the concepts of various limit states such as limit state of collapse, serviceability and durability etc. It also covers design of various components of structure.

Learning Outcomes:

Upon successful completion of this course the student will be able to:

- Understand various design philosophies for reinforced concrete structures
- Understand the concepts of limits states of collapse, serviceability, durability, characteristics strength, characteristics load, partial safety factors for material and loads.
- Use IS 456:2000 code requirements for reinforced concrete structures.
- Design of singly, doubly and flanged reinforced concrete sections
- Design various components of structures such as beam, column, slab, footings, etc

COURSE CONTENT

Structural Design - I **Semester – V**

Teaching Scheme	**Examination Scheme**
Lecture: 3 hours / week	**End Semester Examination (ESE) : 80 Marks**
Practical: 02/week	**Paper Duration (ESE) : 04 Hours**
	Internal Sessional Exam (ISE) : 20 Marks

UNIT - I **(07 Hours, 16 Marks)**

a) Introduction: Introduction to various design philosophies of R.C structures, working stress method, ultimate load method, limit state method , limit state of collapse, limit state of serviceability, limit state of durability, characteristic strength, characteristic load, partial safety factors for material strengths and loads, structural properties of concrete.

b) Singly Reinforced section: Limit state method for flexure, Assumptions, stress & strain diagram, Balanced, under reinforced & over reinforced RC sections, Analysis and design of rectangular section.

UNIT - II **(08 Hours, 16 Marks)**

a) Doubly Reinforced section Analysis and design of doubly reinforced sections.

b) Flanged Section: Analysis and design of flanged sections.

UNIT - III **(08 Hours, 16 Marks)**

a) Design of beams for flexure, shear and bond: simply supported, cantilever beams & continuous beams using IS code coefficient method.

b) Design of slabs: One way simply supported, cantilever slab & continuous slab

UNIT - IV **(08 Hours, 16 Marks)**

a) Design of two way slabs: Two way simply supported & continuous slabs.

b) Design of staircase: Design of dog legged stair case.

UNIT - V **(08 Hours, 16 Marks)**

a) Column: Introduction, strain and stress variation diagrams, axially loaded short column with minimum eccentricity requirements, Design of short column for axial load.

b) Footings:-Design of isolated pad footing for axial load & uniaxial bending.

ICA: - shall consist of Design of G + 2 building (Residential/Commercial) covering slab, beam, column, footing & stair case.

1) A design report shall be prepared along with showing details on half imperial drawing sheets.
2) A few typical details of beam column etc. shall be shown on A4 / A3 size sheets using drafting software also.
3) A report on at least one site visit shall be submitted in ICA.
4) Design of column should be done for uniaxial and biaxial bending in ICA

RECOMMENDED BOOKS:

1) B. C. Punmia, Ashok Kr. Jain, Arun Kr. Jain, Limit State Design of Reinforced Concrete, Laxmi Publication, 1st edition 2007
2) P. C. Varghese ,Limit State Design of Reinforced Concrete, PHI, 2nd Edition 2006
3) S. Ramamrutham, R. Narayan ,Design of Reinforced Concrete Structures (conforming to IS 456), Dhanpat Rai Publication, 7th Edition 2013
4) Dr. V. L. Shah and Dr. S. R ,Limit State Theory and Design . Karve, Pune Vidharthi Gruh Publication, Pune, 6th Edition
5) P. Dayaratnram, Limit State Analysis and Design, Wheeler Publishing company, Delhi.,12th edition 2009
6) Pillai Menon ,Reinforced Concrete Design, Tata Mc Graw Hill, New Delhi., 3rd edition 2013

INFRASTRUCTURAL ENGINEERING-I

Infrastructural Engineering I **IE – I**

Course Description:

This course introduces the students about concepts in Infrastructure Engineering which includes

- Transport Sector in India, Development plans, permanent way, Material requirement for permanent way, Geometric design of track, Construction and Track maintenance, Points and crossings, Signaling and interlocking, stations & yards, Modernization of Railway.
- Airport engineering, requirements, runway, taxiway, Wind rose diagram, basic runway length & corrections, Terminal building requirements, airport drainage, heliports.
- Harbors, jetty, tides winds & waves, dry dock, wet dock, signals, light house.

	Hours/ week	No. of weeks	Total hours	Semester credit
Lectures	**03**	**13**	**39**	**3**
Tutorial	**---**	**---**	**---**	

General Objectives:

The general objective of this course is to study permanent way, its requirements, geometric design of track, Station & Yards, Basic requirements of airport & heliport, Harbors and port.

Learning Outcomes:

Upon successful completion of course the student will be able to

- Know the permanent way and its gauges.
- Identify various components of permanent way.
- Design the track geometries like gradients, alignment curve etc.
- Plan the track management systems.
- Suggest the types and extent of preliminary survey for construction and maintenance of railway track.
- Understand the basics involved in the crossing and turnout of railway track.
- Know the type of signals, principle of interlocking and their working.
- Understand the Civil Engineering aspects of airport.
- Describe working and procedures adopted in airport management systems in India.
- Know the basics of docks and harbors and its construction.

Course Content

Infrastructural Engineering I **Semester V**

Teaching Scheme **Examination Scheme**

Lectures: 3 hours / week **End Semester Examination (ESE):-80 marks**

Paper Duration (ESE): 3 hours **Internal Sessional Exam.(ISE):-20 marks**

Unit-1 (8 hours, 16 marks)

a. **Introduction:** Role of Civil Engineers in Infrastructure Development, Advantages of Railways as mode of transport, Organizational structure, Permanent Way**,** definition of track, basic components, and ideal requirements.
b. **Railway Track Gauge:** Different gauges on Indian Railways, loading gauge, construction gauge, Unigauge , Problems caused by change of gauge.
c. **Track and Track stresses:** requirements, forces acting on Track, coning of Wheels, Tilting of Rails, Rails: Functions, types of rails, rail joints, rail failure, function suitability and drainage, treatment, Defects, Standard rail sections,
d. **Sleeper:** Functions, requirements, types of sleepers; Concrete sleepers, Pre stressed, sleeper density, manufacturing and spacing of sleepers, Ballast: Function, specifications of track ballast, Track fittings: Fittings and fastening

Unit-2 (7 hours, 16 marks)

a. **Alignment of Railway lines:** Importance, Basic requirements of an ideal alignment, selection of a good alignment, Geometric design of Track: Necessity for geometric design, Gradients, Grade compensation on curves, Super elevation, equilibrium cant, cant deficiency, maximum permissible speed, negative super elevation
b. **Resistance to Traction:** Resistance to-friction, wave action, Causes of creep, Effects of creep, Measures to reduce creep. Speed, track irregularity, wind, gradient, curvature. Stress in rails, sleepers, ballast and formation,
c. **Construction and Track maintenance:** Plate laying method, operations involved Tools & common items of track maintenance.

Unit-3 (7 hours, 16 marks)

a. **Points and crossings:** Important terms, types of track layouts and sketches of turn out, diamond crossing, triangle, double junction, scissors cross over, Single slip, Double slip, Gathering line, Signaling and interlocking: objectives of signaling, classification of signals, CTC and ATC system, Interlocking & it's Principles.
b. **Railway Stations and yards:** Classification of Railway stations, Purpose, facilities required at railway stations, Requirements of station yard, Types of Yards,
c. **Modernization in railways:** Types of railways, high speeds, improvements in track structure: components, Automation, Safety aspects, Introduction to Skybus, Monorail & Metro rails.

Unit-4 (7 hours, 16 marks)

a. **Basic definition & terms:** Runway, Taxiway, Apron, Hanger, Airport obstruction, Airport Classification (ICAO), selection of site for airport.
b. **Wind Rose Diagram**, characteristics of aircraft, corrections to basic length of runway, Runway Geometrics, Taxiway Geometrics
c. **Terminal Building requirements**, Airport Drainage, Heliports, Main characteristics of Helicopters, nature of helicopters transport, site selection for helicopters

Unit-5 (7 hours, 16 marks)

a. **Introduction**: Classification of harbors, selection of site for harbor. Definitions/ methods of Breakwater, Quay walls, Bulkhead, Wharves, Jetty, Dolphins, Dock fenders, piers, slips, moles, berths , pier heads, Jetties, , mooring accessories- function
b. **Natural Phenomena**: Inland water transport in India, tide winds and waves erosion, littoral drift, coast protection,
c. **Other Facilities**: Dry Dock, Wet docks-purpose, Lift docks, repair docks, graving docks, floating docks, marine railway, signals, buoys, beacons, light house, ware house and Transit sheds.

RECOMMENDED BOOKS:

1) Saxena S.C. & Arora S. P. A course of Railway Engineering, Dhanpat Rai & Sons, New Delhi.,7th edition,2010
2) Agarwal M. M. – Indian Railway Track, Sachdeva Press, Mayapuri, New Delhi.,5th edition 2013
3) Khanna & Arora, Airport planning & design, Nemchand Bros, Roorkee, Delhi.,3rd edition 2005
4) Rangwala, Airport Engineering, 13th edition,2013
5) G. Venkatappa Rao, Airport Engineering,1st edition,1992.
6) Rao G. V., Airport Engineering, Tata Mc Graw Hill
7) Bindra S. P., Docks & Harbour Engineering, Dhanpat Rai & Sons,1992
8) R. Shrinivasan, Harbour dock & tunnel Engineering, New Delhi.,26th edition,2013
9) Rangwala, Docks and Harbour ,3rd editon,2004
10) K. L. Bhanot & S. B. Sehgal, Highway Engineering & Airport.,3rd edition 1996
11) S. Ponnuswamy, Bridge Harbour.2nd edition,2012

FLUID MECHANICS-II

Fluid Mechanics II **FM II**

Course Description:

This course provides the elementary level knowledge of Fluid mechanics which includes:-

- Study of boundary layer and fluid flow around submerged bodies.
- Analysis of turbulent flow in pipes and pipe flow systems.
- Analysis of open channel flows: Uniform, critical, gradually and rapidly varied flows.
- Study of impact of jet and hydraulic turbines and centrifugal pumps.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	**3**	**13**	**39**	**3**
Practical	**2**	**13**	**26**	**1**

Prerequisite Course(s):

Knowledge of fluid properties and fluid statics. Ability to solve simple fluid flow problems using fluid kinematics and dynamics. Concepts of dimensional analysis.

General Objective:

The general objective of course is to teach elementary concepts of boundary layer and to analyze and solve turbulent pipe flow and open channel flow problems. Also it aims to explain impact of jet and introduce hydraulic turbines and centrifugal pumps to students.

Learning Outcomes:

Upon successful completion of this course the student will be able to:

- Identify various thicknesses of boundary layer.
- Analyze laminar and turbulent boundary layers (B.L.) and compute local and overall skin friction drags in laminar and turbulent B.L. on flat plate using approximate empirical formulae.
- Compute drag and lift forces on moving submerged bodies in fluid such as cylinder, airfoil etc.
- Analyze turbulent flow and compute velocity distributions in smooth and rough pipes.
- Explain Moody's diagram and solve pipe flow problems for pipes in series and parallel.
- Analyze uniform and critical flows in open channels.
- Determine the most economical sections of open channels using Manning's and / or Chezy's equations.
- Analyze Gradually Varied Flow in open channels for various applications.
- Assess and compute hydraulic jump in open channels.

- Discuss impact of fluid jet on stationary and moving, flat and curved plates using momentum principle.
- Explain hydraulic turbines such as Pelton, Francis and Kaplan turbines and working and various efficiencies of these turbines.
- Identify centrifugal pump; its classification, working and various efficiencies.
- Discuss performance of hydraulic turbines and centrifugal pumps in terms of unit and specific quantities and demonstrate their characteristics curves.

COURSE CONTENT

FLUID MECHANICS II **FM II**

Teaching Scheme:-
Lectures:- 03 hours / week
Credits:- 03
Practical:- 02 hours / week

Examination Scheme:-
ESE (Theory paper):- 80 marks
Paper duration:- 03 hours
ISE (Class tests):- 20 marks
ICA (Term work):- 25 marks
ESE (Oral):- 25 marks

Unit I **No. of lectures: 09, Marks: 16**

a. **Boundary Layer Theory**: Concept of boundary layer, various thicknesses of boundary layer, applications of Von Karman momentum equation (no derivation of the equation), boundary layer over a flat plate, laminar and turbulent boundary layers, local and average drag coefficients, separation of boundary layer and control of separation.

b. **Fluid Flow around submerged Bodies**: Practical problems involving fluid flow around submerged objects, definitions and expressions of drag & lift, drag & lift coefficients, types of drags, drag on cylinder. Circulation, Magnus effect and lift on cylinder and airfoil, polar diagram.

Unit II **No. of lectures: 08, Marks: 16**

a. **Turbulence Flow Theory**: Turbulence phenomenon, instantaneous & temporal mean velocities, Reynolds's expression for turbulent shear stress, introduction to Prandtl's mixing length theory, Karman-Prandtl equation (no derivation), hydro-dynamically smooth and rough boundaries and mentions of equations for velocity distributions; (no derivations of equations of velocity distributions).

b. Darcy-Weisbach equation (no derivation), only mention of different equations (no derivations) for friction factors for smooth, rough & transition boundaries, Moody's diagram.

c. **Pipe flow systems**: major and minor losses, pipes in series & parallel and their equivalent pipes, siphon.

Unit III **No. of lectures: 08, Marks: 16**

a. **Open Channel flow** – Classification of open channels, geometric elements, steady and unsteady, uniform and non uniform flows, continuity and energy equations, kinetic energy correction factor.
b. **Uniform flow**: Chezy's and Manning's equations, concept of normal depth, calculation of normal depth for triangular & wide rectangular channels. Hydraulically efficient sections.
c. **Critical flow**: Specific energy, specific energy diagrams, fundamental equation of critical flow, calculation of critical depth in rectangular and triangular channels.

Unit IV **No. of lectures: 07, Marks: 16**

a. **Gradually varied flow:** Types of non-uniform flows, differential equation of gradually varies flow (GVF) - alternate forms, introduction to different types of GVF profiles and practical examples of their occurrence, control sections; (no mathematical treatment for gradually varied flow).

b. **Hydraulic Jump :** Phenomenon of hydraulic jump, application of momentum equation to hydraulic jump in horizontal, frictionless, rectangular channel, specific force, conjugate depths & relation between conjugate depths, energy loss in hydraulic jump, length of jump, classification & practical uses of hydraulic jump.

Unit V **No. of lectures: 07, Marks: 16**

a. **Impact of Jet**: Impact of jet on stationary & moving, flat & curved plates using linear momentum principle, work done, introduction to principle of angular momentum, mention of Euler's momentum equation for turbine & pumps (no derivation).

b. **Hydraulic Turbines:** Elements of hydro electric power plant, unit & specific quantities, classification of hydraulic turbines, introduction to work done, heads & efficiencies of turbines, (no mathematical treatment for hydraulic turbines).

c. **Centrifugal Pumps:** Classification of centrifugal pumps, specific speed, priming, introduction to work done by impeller, heads & efficiencies. Characteristics of hydraulic turbines and centrifugal pumps (no mathematical treatment for centrifugal pumps).

RECOMMENDED BOOKS:-

1. Dr. A. K. Jain, Fluid Mechanics, Khanna Publishers, Delhi, Edition – 2011.
2. Dr. K. Subramanya, Flow in Open Channels, Tata McGraw-Hill Education Pvt., Ltd., New Delhi, 3rd Edition-2012.
3. Dr. K. Subramanya, FM & HM-Problems & Solutions, Tata McGraw-Hill Education Pvt. Ltd. New Delhi, 6th reprint-2013.
4. Dr. Jagdish Lal, Hydraulic Machines, Metropolitan Book Co. Pvt. Ltd., New Delhi.
5. Dr. P.N.Modi , Dr. S.M. Seth, Hydraulic and Fluid Mechanics, Standard Publications, Delhi, Edition – 2011.
6. Dr. R.K.Bansal, A Textbook of Fluid Mechanics & Hydraulic Machines, Laxmi Publications (P) Limited, 9th Edition, 2012.
7. Streeter V.L. & Wylie E.B., Fluid Mechanics, Tata McGraw-Hill Education Pvt., Ltd., New Delhi, 6th reprint - 2012.
8. Dr.Garde and Mirajgaokar. - Fluid Mechanics.---
9. Rajput -Hydraulic Machines
10. Som S K and Biswas G – Introduction to Fluid Mechanics and Fluid Machines, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
11. John M. Cimbala, Yunus A. Cengel – Fluid Mechanics : Fundamentals and Applications, McGraw-Hill Higher Education. Second Edition 2010.

ENVIRONMENTAL ENGINEERING-I

Environmental Engineering I **EE I**

Course description:

The course is designed to develop awareness about water quality and its impact on public health, and to appraise of the water treatment technologies. It deals with estimation of water requirements of a community, identification of appropriate sources of water, collection of water from source, transportation of water, examination of water as per standard methods, purification of water to meet the standard norms, and to supply the water to the community, including municipalities and industrial zones.

Lectures	Hours/week	No. of weeks	Total hours	Semester credit
	03	13	39	03

General Objective:

The basic objective of this course is to make students aware about importance of water& its purification and know the methods used for purifying the water to make it fit for drinking purpose as per the standards. Students should also be aware about principles related to public health engineering .

Learning Outcomes:

- An ability to apply scientific and engineering principles as well as contemporary technology to the discipline.
- An ability to analyze and interpret data in several areas which include resources like air, water and land .and energy systems and environmental and human health impacts.
- An ability to identify, formulate and solve engineering problems and to design a system, component, or process to meet desired needs.
- An ability to convey technical material through oral presentations and written communications.
- A knowledge of contemporary and emerging environmental issues and a recognition of the need for, and an ability to engage in, life-long learning.
- An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice with an integrated understanding of professional, societal, and ethical responsibilities and the importance of, and role for, multidisciplinary teams in professional practice.

COURSE CONTENT

Environmental Engineering I **EE I**

Lecture: 3 hours / week **End Semester Examination (ESE) : 80 Marks**

Practical: 2 Hour/Week **Paper Duration (ESE) : 03 Hours**

Internal Sessional Exam (ISE): 20 Marks

ICA: 25 Marks **Oral: 25 Marks**

UNIT-I **(7 Hours 16 marks)**

A: Introduction to water supply schemes: data collection for water supply scheme, components and layout, design period, factors affecting design period.

B: Water intake structures: General design considerations, intake structures, such as river intake, canal and reservoir intake, conveyance of raw water, hydraulic design of pumping station.,

C: Water demand, rate of water consumption for various purposes, like domestic, industrial and institutional and commercial. Fire demand. Water system losses. Factors affecting the rate of demand. Population forecasting: arithmetical increase method geometrical increases method, incremental increase method logistic curve methods.

UNIT-II **(7 Hours 16 marks)**

A: Water quality: impurities in water, physical, chemical and biological characteristics, water quality standards as per IS 10500-1991, USEPA and WHO.

B: Water treatment processes: introduction to different water treatment processes, flow sheets, aeration- principle, concept, necessity, methods and design of aeration fountains (Stepped aerators), Flash mixer, function, design and power requirements.

C: Flocculation and sedimentation: coagulation, flocculation theory, zeta potential and its significance, mean velocity gradient G, power consumption, common coagulants, coagulant aids, principle of sedimentation, efficiency of ideal settling basin, types of settling and related theory. Design of settling tanks, clariflocculators, tube settlers.

UNIT-III **(7 Hours 16 marks)**

A: Filtration: theory of filtration, mechanism of filtration, filter materials, types of filters, rapid Sand Filter, Slow Sand Filter, multimedia and dual media filters, components- under drainage system, working and cleaning of filters. Operational troubles, design of filters-RSF and SSF. Design of under drainage system.

B: Disinfection- objectives, theory, types of disinfection, chlorination, free and combined chlorine, effect of pH, types of chlorination, pre and post chlorination, break point chlorination, de-chlorination bleaching powder estimation.

UNIT-IV **(7 Hours 16 marks)**

A: water softening- theory, methods, lime soda, zeolite, and ion exchange processes, quantity estimation of lime soda process, re-carbonization. Demineralization-methods like reverse osmosis, electro-dialysis

B: Miscellaneous methods- adsorption: theory, Frendlich isotherms design. effect of fluoride, fluoridation and de-fluoridation.

C: Water treatment of swimming pool.

UNIT-V **(7 Hours 16 marks)**

A: Water distribution system, types of distribution system, continuous and intermittent system, gravity, pumping and combined system. Wastage of water-detection and prevention. Lay out of distribution system. Design of hydraulic network. Residual pressure, Hardy-Cross method, design of ESR capacity.

B: Service reservoir, ESR, GSR, balancing reservoir- necessity, location, capacity calculation by arithmetic and mass curve method. types of pipes. types of valves, Functions and locations.

C: presence of heavy metals in water, their effects and remedy. Presence of non-biodegradable organics in water, their effects, halide formations. Their removal methods including osmosis, ultra-filtration, and adsorption Basic idea of photo-catalysis technology from removal of non-degradable organics.

RECOMMENDED BOOKS:-

1. E W Steel and Terence J McGhee : Water supply and Sewerage" Tata McGraw Hill Publishing Co.
2. Water supply and Sanitary Engineering by J S Birdie, Dhanpat Rai and Sons Publication, New Delhi
3. Physici-chemical processes for water quality control by Walter J Weber, Wiley Inter-science Publications.
4. Garg S.K., "Water Supply Engineering", Khanna Publisher, New Delhi
5. Punamia, Jain & Jain, "Water Supply Engineering", Laxmi Publications, New Delhi
6. Manual on Water Supply & Treatment, Central Public Health & Environmental Engineering, Organization, Ministry of Urban Affairs, Government of India
7. Therous, Eldridge & Mallmann, "Laboratory Manual for Chemical & Bacteriological Analysis of Water & Sewage", Agro Botanic Publisher, India
8. Benergee & Jain, "Handbook of Technical Analysis", Jain Brothers New Delhi.
9. Laboratory Manual for Environmental Quality Testing, Environmental Protection Research Foundation, Sangli

CONSTRUCTION MANAGEMENT-I

Construction Management – I **CM – I**

Course Description: The subject deals with principles of management in construction industry which will enable the students to become familiar with organizational structures, modern techniques to complete the project, cost analysis, application of economics in engineering and various equipments.

Lectures	Hours / Week	No. of weeks	Total hours	Semester credit
	03	13	39	03
Tutorial	--	--	--	--

General Objective:

The general objective of course is to understand concepts in construction industry and analyze activities involved using CPM & PERT methods with respect to cost, Engineering economics etc. Also it aims to explain various excavating and hauling equipments.

Learning Outcomes:

Upon successful completion of this course the student will be able to:

- To indentify construction activities.
- To indentify organization chart of various construction industries with their forms.
- Analyze network techniques by using PERT, Bar charts, etc.
- To analyses Optimization and crashing of networks.
- Discuss Engineering economics, banking systems, profit and loss accounts concepts.
- Discuss the various Excavating & Hauling Equipments like power shovel, Dragline, etc

Course Content

Construction Management – I **C M-I**

Teaching Scheme **Examination scheme**

Lectures: 3 hours / week **End Semester Examination (ESE) : 80 marks**

Paper Duration (ESE): 3 hours

Internal Session Exam. (ESE) : 20 marks

UNIT–I (07 Hours, 16 marks)

Construction industry, construction team, Construction activities, classification of construction, stages in construction, Need of management in construction, Job layout and value engineering.

Leadership and its quality, Organization, meaning and function, forms of organization - line, line and staff, functional, Type A, Type B and Type C

UNIT–II (10 Hours, 16 marks)

Network Technique: - History, Advantages, Bar charts, S –Curve etc. various terms used in network technique, activity, event, critical path, duration etc Development of networks, network scheduling, to find various times and float, EST, EFT, TF etc Monitoring of Network, Three phases of network technique.

PERT - its concept and PERT Time.

UNIT–III (08 Hours, 16 marks)

Cost analysis, Cost Curve, Optimization and crashing of networks. Updating of network During monitoring, resource leveling, allocation, leveling and smoothening.

Line of balance- Concept and uses. (no problems on crashing of network)

UNIT – IV (07 Hours, 16 marks)

Engineering economics, its definition and importance, demand and supply, factors affecting demand and supply, cost concept.

Bank, its type, uses and functions, banking systems, profit and loss account, appreciation and depreciation of money.

UNIT – V (07 Hours, 16 marks)

Excavating & Hauling Equipments:-

a) Power shovels; size, basic parts, selection ,factors affecting output.

b) Draglines: - types, size, basic parts.

c) Bulldozers-types, moving earth with bull dozers.

d) Clamshells – Clamshell buckets.

BOOKS RECOMMENDED:-

1) Mahesh Varma - Construction planning and management,6th edition,2002.
2) S.V.Deodhar - Construction equipment and job planning,Khanna publishers,4th edition 2010 reprint2012.
3) U.K.Shrivastava - Construction Management, 3rd edition 2005 reprint 2013.
4) Gehlot and Dhir - Construction Management.,2nd edition 1992 reprint 2002.
5) L.S.Srinath - CPM and PERT,PHI, 3rd edition,2012.
6) Peurifoy - Construction Planning and Management,McGraw-Hill,2002
7) Tarachand - Engineering Economics,14th edition 2007
8) Chitkara - Construction Project Management, TMH,NewDelhi,2009
9) R.L.Peurifoy - Construction planning ,Equipments and Methods.
10) Mahesh Verma - Construction equipments and its planning and application, vikas publication

STRUCTURAL DESIGN -I

LAB COURSE OUTLINE

Structural Design – I **SD-I**

ICA (Term Work): 25 Marks

ESE (Oral) : 25 Marks

Course Description:-

In this Laboratory course emphasis is given on analysis & design of different RCC structural members such as beam, slab, column, footing etc. using Indian Standard (IS 456:2000) design code and to prepare detailed drawings of the same

	Hours/ Week	No. Of weeks	Total Hours	Semester Credits
Lectures	2	13	26	1

General Objective:

The primary lab course objective is to analyze and design G+2 building with all the details and relevant drawings for various components of the structure.

Learning Outcomes:

Upon successful completion of this course the student will be able to:

- Calculate various load on the given building structure
- Analyze internal forces in the components of the structure
- Design individual components of structures
- Use IS 456:2000 code requirements for reinforced concrete structures.
- Prepare details and drawing of the given project.

Lab course content:-

1) Structural Layout

a) To prepare a plan of G+2 building (Residential/ Commercial).

b) To draw layout of Ground beam, plinth bean, floor beam, column, slabs etc.

2) Analysis and design of various beams and slabs

a) To calculate of loads and internal forces on beams and slabs.

b) To decide the sections and calculate steel reinforcement.

c) Detailing & drawing of beams, slab.

3) Analysis and design of column and footing

a) To calculate loads and internal forces on columns and footings.

b) To decide the sections and calculate steel reinforcement.

c) Detailing & drawing of column, footings.

4) Analysis and design of dog-legged staircase

a) To calculate loads and internal forces.

b) To calculate steel reinforcement.

c) Detailing & drawing of staircase.

5) A report on at least one site visit.

a) A report on at least one site visit shall be submitted in ICA.

Note-

a) A design report shall be prepared along with showing details on half imperial drawing sheets.
b) A few typical details of beam column etc. shall be shown on A4 / A3 size sheets using drafting software also.

Guidelines for ICA:

ICA shall be based on continuous evaluation of students performance throughout the semester and ICA drawing sheets submitted by the students.

Guide lines for ESE:

ESE will be based on drawing sheets submitted by the student. In ESE the student may be asked to answer questions based on ICA. Evaluation will be based on performance in **oral** examination.

RECOMMENDED BOOKS:

1) B. C. Punmia, Ashok Kr. Jain, Arun Kr. Jain, Limit State Design of Reinforced Concrete, Laxmi Publication, 1st edition 2007
2) P. C. Varghese ,Limit State Design of Reinforced Concrete, PHI, 2nd Edition 2006
3) S. Ramamrutham, R. Narayan ,Design of Reinforced Concrete Structures (conforming to IS 456), Dhanpat Rai Publication, 7th Edition 2013
4) Dr. V. L. Shah and Dr. S. R ,Limit State Theory and Design . Karve, Pune Vidharthi Gruh Publication, Pune, 6th Edition
5) P. Dayaratnram, Limit State Analysis and Design, Wheeler Publishing company, Delhi.,12th edition 2009
6) Pillai Menon ,Reinforced Concrete Design, Tata Mc Graw Hill, New Delhi., 3rd edition 2013

INFRASTRUCTURAL ENGINEERING-I LAB

Lab course outline

Infrastructural Engineering I Lab **I. E. I Lab**

ICA (Term Work) : 25 Marks

Course Description:

This lab course covers the assignments related to theory units about

- Permanent way, track gauges in India, sleepers, ballast & track fittings
- Alignment & geometric design, construction & maintenance of track
- Points & crossings, Stations & yards
- Airport, planning, runway taxiway, heliports
- Harbors, Dry & wet docks, facilities

Practical	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credit**
	02	**13**	**26**	**1**

General Objective:

In this laboratory work student will be introduced to railway Engineering, Airport Engineering & Docks and harbors.

Learning outcomes

Upon successful completion of course the student will be able to

- Understand the permanent way and its gauges.
- Identify various components of permanent way.
- Design of track geometries like gradients type, alignment curve etc.
- Plan the track management systems.
- Suggest type and extent of preliminary survey for construction and maintenance of railway track.
- Know basics involved in the crossing and turnout of railway track.
- Describe the type of signals, principle of interlocking and their working.
- Understand the Civil Engineering aspects of airport.
- Realize working principles and procedures adopted in airport management systems .
- Know basics of docks and harbors and familiar with its construction.

Lab Course Content

Infrastructural Engineering I lab

1. Draw neat labeled sketches of railway track in cutting and in embankment

2. Draw neat labeled sketches of left hand turnout, right hand turnout and different type of crossings.

3. Draw neat labeled plans of different types of railway stations

4. Numerical on geometric design of railway tracks

5. Wind rose diagrams: types and their uses

6. Planning of a terminal building showing all the accessories and spaces

7. Numerical on basic runway length & corrections
8. A Visit to Railway/Airport/ port site& preparation of report

Guide line for ICA:

ICA shall be based on continuous evaluation of student performance throughout the semester and ICA submitted by the student.

RECOMMENDED BOOKS:

1) Saxena S.C. & Arora S. P. A course of Railway Engineering, Dhanpat Rai & Sons, New Delhi.,7th edition,2010
2) Agarwal M. M. – Indian Railway Track, Sachdeva Press, Mayapuri, New Delhi.,5th edition 2013
3) Khanna & Arora, Airport planning & design, Nemchand Bros, Roorkee, Delhi.,3rd edition 2005
4) Rangwala, Airport Engineering, 13th edition,2013
5) G. Venkatappa Rao, Airport Engineering,1st edition,1992.
6) Rao G. V., Airport Engineering, Tata Mc Graw Hill
7) Bindra S. P., Docks & Harbour Engineering, Dhanpat Rai & Sons,1992
8) R. Shrinivasan, Harbour dock & tunnel Engineering, New Delhi.,26th edition,2013
9) Rangwala, Docks and Harbour New Delhi.,3rd editon,2004
10) K. L. Bhanot & S. B. Sehgal, Highway Engineering & Airport.,3rd edition 1996
11) S. P. Bindra, Bridge Engineering, latest edition
12) S. Ponnuswamy, Bridge Harbour.2nd edition,2012

FLUID MECHANICS II

LAB COURSE OUTLINE

FLUID MECHANICS II LAB **FM II LAB**

ICA (Term Work): 25 Marks
ESE (Oral) : 25 Marks

Course Description:

This laboratory covers experiments related to measurement of drag and lift, flow properties in pipes and open channels and also characteristics of hydraulic turbines and centrifugal pump. These include:-

- Study of boundary layer on a flat plate.
- Measurement of drag and lift on airfoil and cylinder.
- Determination of friction factor in pipe flow.
- Study of uniform flow formulae in open channel (Chezy's & Manning's formulae).
- Measurement of Velocity distribution, specific energy, specific force and parameters of hydraulic jump in open channel flow.
- Calibration of Venturi flume / standing wave flume.
- Characteristics of hydraulic turbines and centrifugal pump.

Laboratory	Hours/week	No. of weeks	Total hours	Semester credit
	02	13	26	1

ESE Pattern: Oral

General Objective:

In this laboratory students will be introduced to the applications of viscous property of fluid to measure drag and lift. Also students are introduced to pipe and open channel flows and characteristics of hydraulic turbines and centrifugal pump.

Objective to develop following Intellectual skills:

1. To understand basic laws of fluid friction and to apply the same to solve pipe and open channel flow problems.
2. To learn working of hydraulic turbines and centrifugal pump.
3. To identify principles and working of different apparatus in laboratories.

Objective to develop following Motor skills:

1. Ability to draw diagrams of equipments and characteristics curves of machines on graphs.
2. Ability to perform the experiments and record the observations of pressure, forces, velocity, rotational speed, volume, time, discharge etc.
3. Ability to apply various discharges and measure the corresponding effects.
4. Ability to apply the basic principles in various field conditions.

Learning Outcomes: Upon successful completion of these experiments the student will be able to

- Plot velocity profiles and hence analyze development of boundary layer on flat plate.
- Measure drag and lift forces on airfoil and explain their variation with angle of attack.
- Measure and assess pressure variation over surface of circular cylinder and hence analyze development of drag and lift on cylinder.
- Determine friction factor and hence to develop calibration equation for pipe.
- Measure average velocity, depth in open channel flow and hence to explain uniform flow formulae, specific energy, specific force and hydraulic jump.
- Explain venturiflume and its calibration for discharge measurement in open channel.
- Plot and identify velocity distribution in open channel flow.
- Measure discharge, head, input and output power for different hydraulic turbines and centrifugal pump and hence analyze their various characteristics.

Outline of Content: These experiments contain

1. **Study of boundary layer on flat plate.**
   a. To measure velocities of flow by Pitot tube at various points along the length over a flat plate at various depths (in wind tunnel).
   b. To plot velocity profiles at various points along the length and hence analyze development of boundary layer on flat plate.
2. **Measurement of drag and lift on airfoil.**
   a. To measure drag and lift forces on an airfoil at various angles of attack in wind tunnel with the help of digital force measuring transducer.
   b. To calculate coefficients of drag and lift at various angles of attack and plot polar diagram for studying characteristics of the airfoil.
3. **Determination and analysis of Pressure distribution over circular cylinder.**
   a. To measure pressure at various points on surface of circular cylinder in wind tunnel by multi-limbed manometer.
   b. To calculate coefficients of pressure at these points and plot pressure distribution diagram for analyzing development of drag and lift on cylinder.
4. **Determination of friction factor and calibration equation for given pipe**
   a. To measure pressure difference between two points on a horizontal pipe.
   b. To calculate discharge experimentally through the pipe by measuring volume of water and the required time and hence to calculate the average velocity.

c. To compute friction factor by using Darcy-Weisbach equation.
d. To develop the calibration equation for given pipe by plotting graph of log h_f versus log Q and also compute the graphical value of friction factor.

5. **Study of uniform flow formulae in open channel (Manning's and Chezy's formulae).**
   a. To measure depths of flow at two sections by pointer gauge in an open channel.
   b. To calculate discharge experimentally through the open channel by measuring volume of water and the required time and hence to calculate the average velocity.
   c. To compute Manning's and Chezy's coefficients by knowing the bed slope of the channel.
6. **Study of specific energy and specific force in open channel flow.**
   a. To measure depths of flow at two sections by pointer gauge for a given discharge and for various bed slopes of an open channel.
   b. To calculate discharge experimentally through the open channel by measuring volume of water and the required time and hence to calculate the average velocity.
   c. To calculate specific energies and specific forces and plot these diagrams on graph papers.
7. **Determination of velocity distribution in open channel flow.**
   a. To measure velocity of flow by pitot tube at various points in a cross section.
   b. To plot velocities at these points and draw contours of equal velocities, i.e. isovels.
   c. To calculate discharge experimentally through the open channel by measuring volume of water and the required time and hence to calculate the average velocity.
8. **Calibration of venturiflume.**
   a. To measure depths of flow at inlet and throat of venturiflume by pointer gauge in an open channel.
   b. To calculate discharge experimentally through the open channel by measuring volume of water and the required time.
   c. To compute the discharge analytically by knowing the depths of flow at inlet and throat.
   d. To calculate the coefficient of discharge of the venturiflume.
9. **Measurement of different parameters of hydraulic jump in laboratory or on site.**
   a. To calculate discharge experimentally through the open channel by measuring volume of water and the required time.
   b. To measure conjugate depths of the hydraulic jump.
   c. To compute velocities, Froude numbers, energy loss, length and height of the jump.

10. Study of operating characteristics of Pelton wheel

a. To measure (i) discharge (Q) supplied to the turbine with the help of venturimeter or any other equipment, (ii) pressure by pressure gauge at inlet to turbine, (iii) load on turbine by spring balance and attached loads on brake drum and (iv) speed of the turbine by tachometer.
b. To compute head on turbine, input power (P_a) and output power ($P_{t)}$, specific speed and overall efficiency ($\eta_{t)}$ of the turbine.
c. To plot the operating characteristics (i.e. constant speed) curves for the Pelton wheel, i.e. graphs of (i) P_t and η_t versus Q and (ii) η_t versus P_t.

11. Study of main characteristics of Kaplan turbine.

a. To measure (i) discharge (Q) supplied to the turbine with the help of orificemeter or any other equipment, (ii) pressures by pressure gauge at inlet of turbine and by vacuum gauge at outlet of runner, (iii) load on turbine by spring balance and attached loads on brake drum and (iv) speed of the turbine by tachometer.
b. To compute net head across turbine, input power (P_a) and output power ($P_{t)}$, specific speed (N_S) and overall efficiency ($\eta_{t)}$ of the turbine.
c. To plot the main characteristics (i.e. constant head) curves for the Kaplan turbine, i.e. graphs of (i) unit discharge, unit output power and overall efficiency versus unit speed and (ii) overall efficiency versus specific speed.

12. Study of operating characteristics of Francis turbine.

a. To measure (i) discharge (Q) supplied to the turbine with the help of triangular notch installed in the sump or any other equipment, (ii) pressures by pressure gauge at inlet of turbine and by vacuum gauge at outlet of runner, (iii) load on turbine by spring balance and attached loads on brake drum and (iv) speed of the turbine by tachometer.
b. To compute net head across turbine, input power (P_a) and output power ($P_{t)}$, specific speed (N_S) and overall efficiency ($\eta_{t)}$ of the turbine.
c. To plot the operating characteristics (i.e. constant speed) curves for the Francis turbine, i.e. graphs of (i) P_t and η_t versus Q and (ii) η_t versus P_t.

13. Study of performance of centrifugal pump

a. To measure (i) discharge (Q) supplied to the pump with the help of triangular notch installed in the sump or any other equipment, (ii) pressures by pressure gauge installed on delivery pipe at outlet of pump and by vacuum gauge installed on suction pipe at inlet of pump, (iii) time for one revolution of the energy meter for calculating input power to the pump.
b. To compute manomerric head (H_m) developed by the pump, input power (P_a) to the pump and output power (P_t), specific speed (N_S) and overall efficiency (η_o) of the pump.
c. To plot the operating characteristics (i.e. constant speed) curves for the centrifugal pump, i.e. graphs of manometeric head (H_m), overall efficiency

(η_o) and output power (P_t) versus discharge (Q) and hence to find the discharge, manometeric head and the output power corresponding to the maximum efficiency.

14. **Visit to any hydropower plant.**
    a. The students should study layout of the hydropower plant, type of the turbines installed and their salient features and submit a detailed report of the visit.

    Note: The necessary permission and proof of the visit should be obtained from the concerned authorities and should be available with the head of the department of Civil Engineering.

Note: (i) The ICA will consist of a laboratory journal consisting of seven experiments/assignment. At least seven out of 13 experiments/assignment should be performed. At least one site visit compulsory.

(ii) In the experiments of hydraulic turbines (no. 10, 11 and 12) any characteristics of the turbine, i. e. either main or operating characteristics can be carried out.

Guidelines for ICA:

ICA shall be based on continuous evaluation of students' performance throughout the semester and practical assignments submitted by the students in the form of journal.

Guide lines for ESE:-

ESE will be based on laboratory journal submitted by the student. In ESE the student may be asked to answer questions based on experiments/assignments. Evaluation will be based on performance in **oral** examination.

RECOMMENDED BOOKS:-

2. Dr. A. K. Jain, Fluid Mechanics, Khanna Publishers, Delhi, Edition – 2011.
3. Dr. K. Subramanya, Flow in Open Channels, Tata McGraw-Hill Education Pvt., Ltd., New Delhi, 3rd Edition-2012.
4. Dr. Jagdish Lal, Hydraulic Machines, Metropolitan Book Co. Pvt. Ltd., New Delhi.
5. Dr. P.N.Modi , Dr. S.M. Seth, Hydraulic and Fluid Mechanics, Standard Publications, Delhi, Edition – 2011.
6. Dr. R.K.Bansal, A Textbook of Fluid Mechanics & Hydraulic Machines, Laxmi Publications (P) Limited, 9th Edition, 2012.
7. Som S K and Biswas G – Introduction to Fluid Mechanics and Fluid Machines, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
8. John M. Cimbala, Yunus A. Cengel – Fluid Mechanics : Fundamentals and Applications, McGraw-Hill Higher Education. Second Edition 2010.

ENVIRONMENTAL ENGINEERING I

LAB COURSE OUTLINE

Environmental Engineering Lab. I **EE-I lab**

ICA (Term Work): - 25 Marks

ESE(Practical):- 25 Marks

Course description:-

In this Laboratory the emphasis is given on determining various properties and characteristics of water, design of water supply scheme, design of water distribution scheme and to prepare report on site visit to water treatment plant.

	Hours/week	No. of weeks	Total hours	Semester credit
Practical	**02**	**13**	**26**	**1**

General Objectives:-

To determine various properties & characteristics of water the laboratory & to design water supply scheme.

Learning outcome:-

Upon successful completion of this course the student will be able to

1 Determine various properties of water such as pH value, Acidity, Alkalinity, DO content, Residual Cl_2 etc.

2 Design water supply scheme for various townships.

Lab course content:-

Environmental Engineering I Lab:

ICA consists of

(A) Experiments (minimum eight)

List of Experiments

1. Determination of pH in given water samples
2. Determination of turbidity and optimum dose of coagulant
3. Determination of total solids, dissolved, volatile and fixed solids
4. Determination of alkalinity and acidity of given sample
5. Determination of carbonate and non-carbonate hardness of water
6. Determination of chlorine demand and residual chlorine of water
7. Determination of dissolved oxygen present in the given water samples
8. Determination of Fluoride//iron content in given water sample
9. Determination of Sodium/Potassium/Calcium using flame photometer
10. Most probable number(MPN) Test
11. Determination of conductivity/salinity of water

(B) Assignments (minimum two).

1. Design of water treatment scheme for medium size township
2. Design of water distribution scheme for medium size township.
3. A complete report on site visit to a Municipal Water Treatment Plant.

RECOMMENDED BOOKS:-

1. Physici-chemical processes for water quality control by Walter J Weber, Wiley Inter-science Publications.
2. Garg S.K., "Water Supply Engineering", Khanna Publisher, New Delhi
3. Manual on Water Supply & Treatment, Central Public Health & Environmental Engineering, Organization, Ministry of Urban Affairs, Government of India
4. Therous, Eldridge & Mallmann, "Laboratory Manual for Chemical & Bacteriological Analysis of Water & Sewage", Agro Botanic Publisher, India
5. Laboratory Manual for Environmental Quality Testing, Environmental Protection Research Foundation, Sangli.

TESTING OF MATERIAL I LAB

Lab course outline

Course Title / Subject Title **Short Title**

Testing of Material I Lab **TOM- I Lab**

ICA (Term Work) : 50Marks

Course Description:

This laboratory course introduces students to various types of concrete and alternative construction materials, related laboratory tests and non destructive tests.

	Hours/ week	No. of weeks	Total hours	Semester credit
Theory	**1**	**13**	**13**	**2**
Practical	**02**	**13**	**26**	

Lab Course Content

Prerequisite Course: Concrete Technology.

General Objective: - In this laboratory work students will be introduced to concrete mix design by IS & IRC codes. They will also know various alternative construction materials and their applications**.**

Learning Outcomes:-

Upon successful completion of this course the student will be able to:

- Perform laboratory testing of civil engineering materials.
- Plan and execute testing schedule for Civil Engineering project.
- Know the provisions of Indian standard codes for related civil engineering materials
- Understand different Non Destructive tests and their applications.

COURSE CONTENT

Unit – I **No. of Lect. – 5, Marks: 10**

Concrete Mix Design by IS and IRC/Road Note No.4 Method

Unit – II **No. of Lect. – 2, Marks: 10**

Concept & use of non destructive testing such as Ultrasonic pulse velocity, rebound hammer, half cell potential, carbonation depth, and core test etc.

Unit – III **No. of Lect. – 2, Marks: 10**

Study of Precast and Pre stressed Concrete – Precast concrete and its uses, introduction to Pre stressed concrete, types of pre stressing methods.

Unit – IV **No. of Lect. – 2, Marks: 10**

Fiber Reinforced Concrete – Introduction, classification, mechanism, role of fiber size, and its application

Unit – V **No. of Lect. – 2, Marks: 10**

Alternative materials (Fly ash,stabilized soil , construction and demolition waste, Fibre Reinforced Polymer, Glass Fibre Reinforced Plastics, Bamboo as construction material: uses and suitability, ferro-cement etc.)

Lab Course Content

Group A) It will contain of any **Five** experiments out of following set-

1) Concrete Mix Design (M15/M20/M25) by IS Method and compressive strength at 7days and 28days.
2) Concrete Mix Design (M15/M20/M25) by IRC Method and compressive strength at 7days and 28days.
3) Rebound hammer test on concrete.
4) Ultrasonic Pulse velocity test.
5) Determination of Modulus of Elasticity of Concrete by extensometer.
6) Effect of admixtures on concrete strength
7) Experimental investigation of effect of aggregate gradation and fineness on concrete properties.
8) Compressive strength of Paver blocks
9) Compressive strength of Solid/ Hollow blocks

Group B) At least one site visit to civil engineering project/ready mix concrete plant should be arranged.

Guide line for ICA:
ICA shall be based on continuous evaluation of student performance throughout the semester and ICA submitted by the student.

RECOMMENDED BOOKS:

1. M L Gambhir Neha Jamwal : Building & construction materials lab manual : McGraw Hill Education (India) Pvt. Ltd.
2. Dr. Janardan, Jha, Engineering Materials, Khanna Publishers
3. R. K Rajput, Engineering Materials, S. Chand
4. Parbin Singh, Civil Engineering Materials, S. K.Kataria & Sos New Delhi.
5. Dr. A. V. Narasimha Rao, Fundamentals of Soil Mechanics, University Science press.
6. S.K. Duggal, Building Materials, New Age International Publishers.
7. M. S. Shetty, Concrete Technology, S Chand Publication.
8. M. L. Gambhir, Concrete Technology, TMH Publication.

9. S. V. Deodhar, Concrete Technology, Central Techno Publication
10. N.V. Nayak & A.K. Jain, Concrete Technology, Narosa Publishing House Pvt. Ltd.
11. Kulkarni P.D. Ghosh, R.K. Phull Y.R., Concrete Technology, New Age International.
12. M.L. Gambhir, Concrete Manual, Dhanpat Rai & Co.

Industrial Training/EDP/Special Study

COURSE CONTENT

Course Title	Short Title	Course Code
Industrial Training / EDP / Special Study	**IT/EDP/SS**	

Semester-V **Examination Scheme**

Total Semester Credits: 02 **Internal Continuous Assessment (ICA): 25 Marks**

Teacher should facilitate learning of following real life working environment, new knowledge, skills, and current technologies.

Industrial Training	• Student shall undergo industrial training for a minimum period of **two weeks** during summer vacations between fourth semester and fifth semester. • The industry in which industrial training is taken should be a medium or large scale industry • The paper bound report on training must be submitted by the student in the beginning of Fifth semester along with a certificate from the company where the student took training. • Every student should write the report separately. • Institute / Department/T&P Cell have to assist the students for finding Industries for the training. • Students must take prior permission from Department before joining for Industrial Training.
EDP (Entrepreneurship Development Program)	• Student has to participate in Entrepreneurship Development Program for a minimum period of **One week** during summer vacations between fourth semester and fifth semester. • Every student must submit the paper bound report based on the program in the beginning of Fifth semester along with a certificate (Course / Program completion) from the program organizers. • Every student should write the report separately. • Institute / Department may arrange Entrepreneurship Development Program at their campus. • Students must take prior permission from Department before attending any Entrepreneurship Development Program.
Special Study	• Student has to submit name of three topics of his interest to the department. • Special study in a group shall not be allowed. • The three-member committee appointed by Head of Department shall allot one topic out of the three topics submitted by the student. • Every student must submit the paper bound report based on special study at the end of Fifth semester.

	• Department should allot guide to all such students, for monitoring their progress and guide them for literature survey / report writing etc. • Evaluation of special study shall be done based on presentation made by student, followed by brief question answer session.

Guide lines for ICA:

Assessment shall be based on the active participation of the students in the Industrial Training / EDP / Special study and based on knowledge / skill acquired by the student. The three-member committee appointed by Head of Department in consultation with the Principal shall assess the reports and award marks based on following:

(a) Report	10 marks.
(b) Presentation	10 marks.
(c) Viva-voce at the time of presentation	05 marks.
Total:	**25 marks.**

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Third Year Engineering

(CIVIL)

Faculty of Engineering and Technology

COURSE OUTLINE

TERM – VI

W.E.F 2014 – 2015

STRUCTURAL DESIGN – II

COURSE OUTLINE

Structural Design – II **SD – II**

Course Description:

This course aims to provide an introduction to design of steel structures through the use of the Indian Standard (IS 800:2007) design code. It deals with the design of individual members and connections, such as, the design of riveted/bolted and welded connections, design of tension members, compression members, beams, and beam columns; plate girders, also to equip the students with the tools necessary for designing steel structures and to familiarize them with the relevant national design code.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	13	39	03
Tutorial	--	--	--	

General Objective:

This course is to serve as an introduction to the concepts in structural steel design through the use of the Indian Standard IS 800:2007 design code. It deals with analysis and design of individual members and connections such as the design of tension members, compression members, beams, and beam columns; plate girders and bolted and welded connections, etc. The primary course objective is to equip the students with the tools necessary for designing steel structures and to familiarize them with the relevant national design codes.

Learning Outcomes:

Upon successful completion of this course the student will be able to:

- Understand types of steel structures, grades of structural steel, various rolled steel sections, relevant IS specifications.
- Understand types of Connections, bolted & welded Connections.
- Analyze & design axially loaded tension, compression members.
- Analyze & design built-up compression members.
- Analyze & design roof truss.
- Analyze & design flexural members and column bases.
- Analyze & design of compound beams.
- Analyze & design welded plate girder.

COURSE CONTENT

Structural Design – II **SD-II**

Lecture: 03 hours / week **End Semester Examination (ESE): 80 Marks**
Practical: 02 hrs/week **Paper Duration (ESE) : 04 Hours**
Internal Sessional Exam (ISE) : 20 Marks

Design should be based on IS 800-2007

UNIT – I **(07 Hours 16 marks)**

a) Introduction: Types of steel structures, grades of structural steel, various rolled steel sections, relevant IS specifications such as IS 800-2007, IS:808-1989, IS:875 part I to III & V, SP: 6(1), SP: 6(6), IS:4000-1992, codes for welded connections. Limit state method of design for strength and serviceability, partial safety factor for load and resistance, various design load combinations.

b) Types of Connections: Strength of bolted & welded Connections, Design of connections subjected to Axial Forces & Moments. Beam to beam & beam to column connection (framed connections)

UNIT – II **(08 Hours 16 marks)**

a) Tension member: Behaviour, Modes of failure – Yielding of cross-section, Rupture, block shear. Design of single and double angle sections with gusset plate with bolted and welded end connections.

b) Compression member: Behaviour – effective length, slenderness ratio, Modes of failure- failure with full strength, local buckling, torsional buckling. Classification of cross sections, Buckling curves, Design of compression members with bolted and welded connection using single and double angle sections.

UNIT – III **(08 Hours 16 marks)**

a) Design of built-up column: Built up Column. Design of lacing. Introduction to battened column, design of connections.

b) Roof truss: Design of members for DL, LL and WL, detailing of typical joints and supports.

UNIT – IV **(08 Hours 16 marks)**

a) Flexural member- Laterally supported beams using single rolled steel section with and without flange plate, strength in flexure, low and high shear, check for deflection. Secondary and main beam arrangement for floor of a building, design of beam to beam and beam to column connections using bolt / weld. Design of purlin.

b) Column bases: Column bases under axial load: design of slab base, gusseted base

UNIT – V **(08 Hours 16 marks)**

a) Compound beams: Design of compound beams.

b) Design of welded plate girder: design of cross section, curtailment of flange plates, stiffeners and connections

RECOMMENDED BOOKS:-

1. Subramanian N.,Design of Steel Structures., Oxford University Press, New Delhi, 2008
2. Shah V. L. & Gore ,Limit state design of Steel Structure, Structures Publication, Pune, 5th Edition.
3. Duggal S. K.,Limit State Design of Steel Structures, Tata Mc Graw Hill publishing company Ltd., New Delhi, 3rd Edition, 2009
4. Bhavikatti S. S ,Design of Steel Structure by Limit State Method as per IS: 800-2007., I K International Publishing House, New Delhi, 3rd Edition
5. Ram Chandra, Design of Steel Structures Vol.I & Vol.II, Standard Book House, New Delhi, 10th Edition, 2011

THEORY OF STRUCTURE - II

Theory of Structure - II **TOS – II**

Course Description:

This course covers the introduction to the analysis of statically indeterminate beams and rigid frames. Methods taught include slope deflection, moment distribution, approximate analysis of frames, matrix analysis and plastic analysis.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	13	39	03
Tutorial	--	--	--	

General Objective:

The primary course objective is to equip the students with the methods necessary for analyzing various types of structures such as trusses, continuous beams and frames. It deals with the fundamental concepts of flexibility and stiffness method of structural analysis. The course also covers introduction to plastic analysis for steel structures

Learning Outcomes:

Upon successful completion of this course the student will be able to:

- Know basic concepts and principles for analysis of structures
- Understand the basic methods of analysis in structural engineering.
- Determine internal forces in various structures such as trusses, continuous beams and frames
- Solve statically indeterminate structures using flexibility and stiffness method
- Understand various concepts in plastic analysis such as shape factor, plastic hinge, collapse mechanism and applications of plastic theory to beams and single story rectangular frames

COURSE CONTENT

Theory of Structure - II **Semester – VI**

Teaching Scheme	**Examination Scheme**
Lecture: 3 hours / week	**End Semester Examination (ESE) : 80 Marks**
	Paper Duration (ESE) : 03 Hours
	Internal Sessional Exam (ISE) : 20 Marks

UNIT – I **(08 Hours 16 marks)**

a) Basic concepts of Structural Analysis:- Types of skeletal structures, static and kinematics indeterminacy, equilibrium and compatibility conditions, stress-strain relations, force-displacement relations, concept of linear/non-linear structures. Energy theorem, Miller Breslau principle, Concept of complementary energy, Fundamental concept of Force and the displacement method of analysis.

b) Slope deflection method:- Applied to continuous and rigid jointed frames, transverse and rotational yielding of supports.(up to three unknown).

UNIT – II **(08 Hours 16 marks)**

a) Moment distribution method: - Applied to continuous beams and rigid jointed rectangular frames, transnational and rotational yielding of supports.

b) Approximate Analysis of Multistory Frames: - Vertical and lateral loads, substitute frame, portal frame and cantilever method.

UNIT – III **(08 Hours 16 marks)**

Fundamental concept of flexibility: - Method for structural analysis , flexibility coefficient, matrix formulation for flexibility methods, degree of freedom. Influence coefficients, physical significance, choice of basic determinate structure and redundant forces, compatibility equations, effect of settlement and rotation of supports, temperature and lack of fit, hand solution of simple problems on beams, pin jointed plane truss and rigid jointed frames (Involving not more than three unknown)

UNIT – IV **(07 Hours 16 marks)**

Fundamental concept of Stiffness: - Method of structural analysis, stiffness coefficient, matrix formulation for stiffness methods, Degree of freedom.

Influence coefficients, physical significance, effect of settlement and rotation of trusses and rigid jointed plane frames (involving less than three unknown)

UNIT – V **(08 Hours 16 marks)**

Plastic Analysis of Steel Structures :- Introduction, Shape factor, plastic hinge, collapse mechanism, upper bound and lower bound theories, application to continuous, fixed and single bay single storey rectangular frames.

Assignments

It shall consist of at least one assignments based on each unit.

RECOMMENDED BOOKS

1. Punmia B. C. – Theory of Structure, Laxmi Publication.
2. Bavikatti S. S. - Structural Analysis, New Age Publicatio.
3. Ramamruthum S. Theory of Structure, Dhanpat Rai & Sons Publication.
4. Pandit & Gupta -Structural Analysis,TataMcGrawHill,Pub. Co.Ltd ., New Delhi
5. Wang C.K.-Intermediate structural analysis, McGraw Hill, New York.
6. Kinney- Streling J. Indeterminate structural Analysis, Addition Wesley.
7. Reddy C.S.-Basic Structural Analysis, Tata McGraw Hill Pub. Co. New Delhi.
8. Weaver W & Gere J.M-Matrix Method of framed Structures CBS Publishers & Distributors, Delhi.
9. Ghali A & Neville M. Structural Analysis- A Unified classical and matrix Approach, Chapman and Hall, New York.
10. Vaidyanathan & Perumal – Theory of Structure Vol. I & II, Laxmi Publication.
11. Negi L. S. & Jangid - Theory of Structures, Tata McGraw Hill Pub. Co. New Delhi.

GEOTECHNICAL ENGINEERING – I

Geotechnical Engineering-I **GTE-I**

Course Description

The aim of this course is to equip the students about the principles of mechanics and hydraulics needed to understand soil behavior such that they can apply those abilities to solve more complex problems in practice.

Teaching Scheme
Lecture: 3 hours / week
Credits: 3
Practical: 2 hours / week

Examination Scheme
ESE (Theory Paper) : 80 Marks
Paper Duration (ESE) : 03 Hours
ISE (Class Test) : 20 Marks
ICA (Term work): 25 marks
ESE (Oral): 25 marks

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	3	13	39	3
Practical	2	13	26	1

General Objective:

The primary objectives of this course is to

- Introduce the subjects of soil mechanics, basic terms and relationship between them.
- Classify soils based on soil classification systems in the lab and on the field.
- Define various properties of soil
- Define soil permeability, carry out seepage analysis and understand the characteristics of flow nets.
- Describe compaction and consolidation of soils and difference between them
- Introduce to effective stress principle and describe shear strength of soil, types of shear tests, principal stresses and relation between them

Learning Outcomes:

Upon successful completion of this course the student will be able to:

- Know the basic principles of soil mechanics,
- Describe various index / engineering properties of soil and measurements of the same.
- Predict soil behavior under the application of loads.
- Solve problems in practice.

Course Content

Geotechnical Engineering I **Semester-VI**

Teaching Scheme

Lecture: 3 hours / week
Credits : 3
Practical: 2 hours / week

Examination Scheme

ESE(Theory Paper) : 80 Marks
Paper Duration (ESE) : 03 Hours
ISE (Class Test) : 20 Marks
ICA (Term work) : 25 marks
ESE (Oral) : 25 marks

Unit – I **No. of Lect. – 8, Marks: 16**

a) Soil as Engg. Material: Origin and formation of soil, geotechnical problems, volume-weight relationships, three phase system, definitions, functional relationships.

b) Geotechnical Properties: Index properties, engineering properties, Atterberg's limits, sieve analysis and its classification systems, and identification of soil.

Unit – II **No. of Lect. – 8, Marks: 16**

a) Stresses in Soil: Geostatic stresses, Boussinesq's Theory, point load, circular load, pressure bulb and its significance, Introduction to Westergaard's theory and Newmark's chart, stress strain relationship soil modulus, elastic settlement.

b) **Soil Compaction and Stabilization:** Methods of Compaction, M.D.D. and O.M.C., standard proctors test, heavy compaction test, Concept of stabilization and its methods.

Unit – III **No. of Lect. – 9, Marks: 16**

a) Consolidation Theory: Terzaghi's theory, consolidation test, rate of settlements, Normal consolidated and over consolidated deposits, Pre consolidation pressure.

b) Flow of water through soils: soil water, capillarity, Darcy's law, laboratory measurement of permeability, simple field measurement, flow net, its construction and uses, seepage force, quick sand, critical gradient.

Unit – IV **No. of Lect. – 7, Marks: 16**

a) Shear resistance in soil: Pore pressure and effective stresses failure theories, Mohr stress circle, Mohr's Coulomb's failure theory, law of shear strength,

b) Measurement of Shear Strength: Direct shear test, Tri-axial test, Unconfined compression test, Vane shear test, factors affecting the shear strength, effect of drainage conditions.

Unit – V **No. of Lect. – 7, Marks: 16**

a) Introduction to Earth Pressure: Introduction, Rankine's state of Plastic Equilibrium in soils, Active and Passive states due to wall movement, Earth Pressure at rest.

b) Earth Pressure determination: Rankine's Theory- Earth pressure on Retaining wall due to submerged backfill, Backfill with uniform surcharge, backfill with sloping surface, layered backfill. Coulomb's Wedge theory, Rebhann's and Culmann's graphical method of determination of earth pressure.

RECOMMENDED BOOKS:

1) Dr. B.C.Punmia, Soil Mechanics and Foundation Engineering, Laxmi Publications,16th Edition 2005.
2) Gulhati and Datta , GeoTechnical Engineering, 2000 4th Edition,Tata McGraw Hill.
3) Dr. Alam Singh, Soil Engineering in Theory and Practice (Vol.II), CBS Publication,2006 2nd Edition Delhi.
4) Dr. Alam Singh, Modern Geotechnical Engineering & Foundation, CBS Publication, Delhi.
5) Ramamurthy T.N. and Sitharam T.G., GeoTechnical Engineering,5th Edition,S.CHAND publication.
6) Venkatramaiah C., Geotechnical Engineering,2013 4th Edition.
7) V. N. S. Murthy, Soil Mechanics and Foundation Engineering, Saitech Publications.2004 1st Edition.
8) K. R. Arora, Soil Mechanics and Foundation Engineering, Standard Publishers and Distributors, New Delhi.2010 7th Edition.
9) Taylor, D. W., Fundamentals of Soil Engineering, John Wiley & Sons
10) K. Terzaghi, Soil Mechanics in Engg. Pracice, John Wiley & Sons
11) Relevant Indian Standard Specifications & Codes, BSI Publications, New Delhi.

INFRASTRURAL ENGINEERING II

Infrastructural Engineering II **IE – II**

Course Description

This course introduces the students to various concepts in highway, bridge & traffic engineering and advanced urban technologies. Also it deals with techniques of tunneling in soft and hard rocks and alignment of tunnel.

Lectures	**Hours/ week**	**No. of weeks**	**Total hours**	**Semester credit**
	03	**13**	**39**	**3**
Tutorial	**---**	**---**	**---**	

General Objectives:

The basic objective of this course is to introduce the students about

- Highway planning for rural and urban road.
- Various types of field surveys.
- Highway geometric deign
- Construction of roads and suitability of various materials.
- Traffic engineering and advanced urban transport technologies.
- Types of bridges and suitability of each type.
- Tunneling in soft and hard rocks and alignment of tunnel.

Learning Outcomes:

Upon successful completion of this course the student will be able to

- Understand developments, classification of roads and highway planning in India.
- Select the material for use in different road layers.
- Know the construction techniques for rural and urban roads.
- Recognize traffic studies, traffic control devices and traffic operation.
- Design road geometries as per IRC conditions.
- Provide effective suggestions for construction and maintenance of any type of road.
- Know classification, construction and maintenance of bridges.
- Understand basics of tunneling and its construction.

Course Content

Infrastructural Engineering II **Semester VI**

Teaching Scheme **Examination Scheme**

Lectures: 3 hours / week **End Semester Examination (ESE):-80 marks**

Paper Duration (ESE): 3 hours **Internal Sessional Exam.(ESE):-20 marks**

Unit-1 (8 hours, 16 marks)

a. **Highway Planning and Development:**
   Highway planning in India, development, rural and urban roads, road, departments in India, road classification, road authorities i.e. IRC, CRRI, NHAI, etc., Financing of road projects, road safety audit.
b. **Field Surveys:** Reconnaissance, aerial surveys, location surveys, location of bridges.
   Highway alignment: Basic requirements of an ideal alignment and factors controlling it, special requirements for hill roads.
c. **Highway Geometric Design:** Topography and physical features, cross section elements like carriageway width, formation width, right of way, etc., friction, Light reflecting characteristics, roughness, camber, sight distances, horizontal alignment, design speed, super-elevation, transition curve, gradients.

Unit-2 (8 hours, 16 marks)

a. **Road Materials:** Aggregates and their types, physical and engineering properties, Fillers, bitumen, characteristics, emulsions and cutbacks, basic tests on all materials, soil investigation, test on soil; CBR, plate load test.
b. **Construction of Roads:** Stabilized earth, gravel roads, W.B.M. roads, high cost Roads: bituminous roads, cement concrete roads.
   Highway Drainage: Surface and sub-surface drainage arrangements,
c. **Highway Pavements:** Design of Flexible (G.I. method and CBR method using IRC recommendations) and rigid pavements (Westergaurd wheel load analysis), Maintenance & Strengthening of pavements.

Unit-3 (8 hours, 16 marks)

a. **Traffic Engineering:** Road user characteristics, vehicular characteristics, traffic flow characteristics, speed, traffic volume studies, parking studies - definition, purpose, types, survey methods. Accident studies - purpose, types, causes, collision diagram, condition diagram, preventive measures
b. **Traffic control devices**: pavement marking, signs, signals, Traffic management, various types of intersection and their design criteria, Traffic Simulation & it's advantages,
   Roadside Developments: Arboriculture, street lighting.

c. **Advanced Urban Transport Technology:** Classification, mass and rapid transit system, introduction to intelligent transportation System (ITS), electronic toll Collection.

Unit-4 (8 hours, 16 marks)

a. Bridges: Site investigation, waterway calculations, scours depth, afflux, and economic span.
b. Classification & suitability: Classification of superstructures with respect to structural behavior and material used types of substructures, flooring joints, movable bridges, and temporary bridges.
c. Construction methods & Maintenance: Methods of erection of various types of bridges, testing and strengthening of bridges.
d. Bridge Bearings & Foundation: Suitability for each type of bridges

Unit-5 (7 hours, 16 marks)

a. **Introduction to Tunneling**: Need, classification, advantages and disadvantages of tunnels compared to open cuts, shape and size of tunnel shafts, pilot tunnels, Alignment of Tunnel.
b. **Tunneling in hard rock:** Meaning of the term 'Faces of Attack', Mucking, methods of removal of muck, heading and benching method, drilling-patterns, blasting, tunnel lining(rock bolting and strata anchoring), methods of Ventilation, Lighting and aspects of drainage, Dust control, Safety in tunnel construction

   Tunneling in soft materials: mucking, forepoling and shield methods, needle beam method, modern tunneling methods.

RECOMMENDED BOOKS:

1. L. R. Kadiyali, N B. Lal, Principles & practice of Highway Engineering, Khanna Publication, 2005.
2. Khanna & Justo, Highway Engineering, Nemchand Bros
3. Rangwala, Highway Engineering, Charotar
4. K. L. Bhanot & S. B. Sehgal, Highway Engineering & Airport
5. S. P. Bindra, Bridge Engineering, Khanna Publication
6. S. Ponnuswamy, Bridge Harbour.
7. Rangwala, Tunnel Engineering,Charotar
8. S. C. Saxena, Tunnel Engineering,Charotar
9. L. R. Kadiyali, Traffic Engineering & Transport Planning, Khanna Publishers

CONSTRUCTION MANAGEMENT – II

Construction Management – II **CM – II**

Course Description: This subject deals with various laws and acts applicable to construction industry, safety measures in construction works, material management, tender and contract systems, various pile driving and compacting equipments.

Lectures	Hours / Week	No. of weeks	Total hours	Semester credit
	03	13	39	03
Tutorial	--	--	--	--

General Objective:

The general objective of this course is to know the important acts and laws related to Construction Industry and safety measures with respect to material handling, managing the materials using different analysis methods, contract and tendering system in construction sector. Also it aims to explain various pile driving, compacting and hoisting equipments.

Learning Outcomes:

Upon successful completion of this course the student will be able to:

- Know various acts in construct on industry like Factory act, Workman compensation act, etc.
- Understand safety measures in handling of building materials. Causes of accidents and their reports.
- Explain material management and inventory analysis by using various analysis methods like ABC Analysis, FSN Analysis, etc.
- Discuss technical terms like buffer stock, EOQ, Material planning, etc.
- Describe quality control management as per ISO.
- Explain and understand the concept of Contract and tendering systems in the construction industry.
- Discuss the various pile driving, compacting, hosting equipments also explain the advance construction equipments like crushers, RMC plants and cranes.

Course Content

Construction Management – II **Semester VI**

Teaching Scheme **Examination scheme**

Lectures: 3 hours / week **End Semester Examination (ESE) : 80 marks**

Paper Duration (ESE): 3 hours **Internal Session Exam. (ESE) : 20 marks**

UNIT –I (07 Hours, 16 marks)

a) Important acts and laws related to constructions Industry- factory act, the employees provident fund Act, minimum wage act, workman compensation act, Indian trade union act, arbitration act,

b) Safety measures in handling of building materials, construction of elements of building, demolition of buildings, hot bituminous works, scaffolding, formwork and other equipments, excavation, causes of accidents and preparing accident reports.

UNIT–II (08 Hours, 16 marks)

Materials management, its aims and functions, inventory analysis, inventory models, ABC analysis, inventory management, buffer stock, lead time, EOQ, material requirement, planning, market research, system of purchase of materials, stock of material at site, MAS account, supervision and quality control, concept of quality, stages of control, measures of control, quality control management, introduction to ISO 9000 and ISO 14000.

UNIT—III (10 Hours, 16 marks)

Contract, essentials, types, registration and law of contract, free consent, contract documents, performance of contract, breach of contract, advances to contractor, bills of contract and payments , subletting , inspection of works, tender, tender notice ,various terms used in tender notice such as SD, EMD, estimated cost, time period of work ,cost of tender form, invitation of tender, concept of e-tendering, time schedule of calling tender, tender documents two envelopes system, scrutiny and acceptance , revocation of tender, extra items , additions and alterations , defect liability , liquidated and un-liquidated damages , escalation of rates, work order.

UNIT IV (07 Hours, 16 marks)

a) Pile driving Equipments:-

Pile hammers, drop, single acting steam, double acting steam, differential acting steam, diesel, vibratory , hydraulic hammers , sonic hammers, selection of pile driving hammers.

b) Crushers – types, primary, secondary, tertiary crushers, jaw, gyratory, cone crushers, hammer mills, roll crushers, rod and ball mills Screening aggregate, revolving, vibrating screens

c) Ready mix concrete plant- central concrete batch plant, portable concrete batch plant, ready mixed concrete – central mixed , shrink mixed, truck mixed concrete, concrete pumps.

UNIT –V (07 Hours, 16 marks)

a) Compacting Equipments:-

Types of compacting equipments such as tamping rollers, smooth wheel rollers, pneumatic tired rollers,

b) Hoisting equipments:

Cranes: Classification, derrick crane, mobile crane, Tower crane, Hydraulic crane, overhead or gantry crane, use of cranes in steel construction, use of cranes in concrete construction and safety in crane operation.

RECOMMENDED BOOKS:

1) R.L.Peurifoy - Construction planning, Equipments and Methods.
2) Mahesh Verma - Construction equipments and its planning and application, Vikas publication
3) U.K. Shrivastava - Construction planning and Management, 3rd edition 2005 reprint 2013
4) S.V.Deodhar - Construction equipment and job planning,Khanna publishers,4th edition 2010 reprint2012.
5) Chitkara - Construction Project Management, TMH,NewDelhi,2009
6) B.N.Dutta - Estimating and Costing, UBS Publishers
7) M.Chakroborty - Estimating and Costing, EWP
8) B.S.Patil - Estimating and Costing -Vol-1& 2, Orient Blackson
9) Seetharaman – Construction Engineering and Management, Umesh Publication.
10) P.S.Gahlot & B.M.Dhir – Construction Planning & Management-2010

STRUCTURAL DESIGN – II

LAB COURSE OUTLINE

Structural Design – II **SD – II**

ICA (Term Work): 25 Marks

ESE (Oral) : 25 Marks

Course Description:-

In this Laboratory course emphasis is given on analysis & design of different structural members such as roof truss, components of industrial building, welded plate girder, etc. using Indian Standard (IS 800:2007) design code and to prepare detailed drawings of the same

	Hours/ Week	No. Of weeks	Total Hours	Semester Credits
Lectures	2	13	26	1

General Objective:

The primary lab course objective is to analyze and design Roof Truss, an Industrial Building, Welded Plate Girder and prepare relevant drawings and details for these structures.

Learning Outcomes:

Upon successful completion of this course the student will be able to:

- Analyze dead load, live load, wind load as per IS: 875 Part I to III & design of various components of roof truss as per IS 800:2007.
- Calculate member forces, design main beam & secondary beams, connections, columns, column bases for an industrial building.
- Analyze & design welded plate girder
- Prepare details and drawing of the above project.

Lab course content:-

1) Design of Roof Truss

a) Load analysis-dead load, live load, wind load as per IS: 875 part I to III

b) Design of various components roof truss by IS 800:2007

c) Detailing & drawing of roof truss.

2) Design of an Industrial Building

a) Analysis of industrial building: Calculations of member forces.

b) Design of main beam & secondary beams, connections, columns, column bases.

c) Detailing & drawing of various components of industrial building.

3) Design of Welded Plate Girder

a) Analysis of welded plate girder- Calculation of maximum shear force and maximum bending moment.

b) Design of web plate for shear, design of flange plate for bending moment, design of web stiffeners, design of intermediate stiffeners, design of bearing stiffeners, curtailment of flange plate

4) A report on at least one site visit.

Drawing shall be on half imperial sheets. At least one sheet of above three designs shall be in A3/A4 size sheets using drafting software.

Guidelines for ICA:

ICA shall be based on continuous evaluation of student's performance throughout the semester and ICA drawing sheets submitted by the students.

Guide lines for ESE:

ESE will be based on drawing sheets submitted by the student. In ESE the student may be asked to answer questions based on ICA. Evaluation will be based on performance in **oral** examination.

RECOMMENDED BOOKS:-

6. Subramanian N.,Design of Steel Structures., Oxford University Press, New Delhi, 2008
7. Shah V. L. & Gore ,Limit state design of Steel Structure, Structures Publication, Pune, 5th Edition.
8. Duggal S. K.,Limit State Design of Steel Structures, Tata Mc Graw Hill publishing company Ltd., New Delhi, 3rd Edition, 2009
9. Bhavikatti S. S ,Design of Steel Structure by Limit State Method as per IS: 800-2007., I K International Publishing House, New Delhi, 3rd Edition
10. Ram Chandra, Design of Steel Structures Vol.I & Vol.II, Standard Book House, New Delhi, 10th Edition, 2011

GEOTECHNICAL ENGINEERING–I

Geotechnical Engineering I Lab **GTE -I Lab**

Course Description:

This laboratory course covers experiments related to properties of soils and measurement of the same.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Practical	2	13	26	1

Lab Course Content:

Any **eight** experiments out of following set-

1. Field density by core cutter method, sand replacement method.
2. Sieve analysis and particle size determination or hydrometer analysis.
3. Specific gravity determination by voluminometer/ pycnometer method.
4. Determination of liquid limit and plastic limit
5. Determination of shrinkage limit
6. Determination of co-efficient of permeability by constant head and falling head method.
7. Direct shear test.
8. Unconfined compression test
9. Vane shear test.
10. Proctor's test (MDD / OMC)
11. Tri- axial shear test
12. C.B.R. test or Consolidation test
13. Differential free swell test or swelling test.
14. Any one of the following assignments using software / programming –
    a) Classification of Soils.
    b) Construction of Pressure bulb.
15. Assignments on the following topics
    a) Rebhann's and Cullman's graphical method for determination of earth pressure.
    b) Solution of problems on shear strength parameters using graph.

Guidelines for ICA :

ICA shall be based on continuous evaluation of students' performance throughout the semester and practical assignments submitted by the students in the form of journal.

Guide lines for ESE:-

ESE will be based on laboratory journal submitted by the student. In ESE the student may be asked to answer questions based on experiments/assignments. Evaluation will be based on performance in **oral** examination.

RECOMMENDED BOOKS:

1. Dr. B.C.Punmia, Soil Mechanics and Foundation Engineering, Laxmi Publications,
2. Gulhati and Datta , GeoTechnical Engineering, Tata McGraw Hill.
3. Dr. Alam Singh, Soil Engineering in Theory and Practice (Vol. -1), CBS Publication, Delhi.
4. Dr. Alam Singh, Modern Geotechnical Engineering & Foundation, CBS Publication, Delhi.
5. Ramamurthy T.N. and Sitharam T.G., GeoTechnical Engineering,
6. Venkatramaiah C., Geotechnical Engineering,
7. V. N. S. Murthy, Soil Mechanics and Foundation Engineering, Saitech Publications.
8. K. R. Arora, Soil Mechanics and Foundation Engineering, Standard Publishers and Distributors, New Delhi.
9. Taylor, D. W., Fundamentals of Soil Engineering, John Wiley & Sons
10. K. Terzaghi, Soil Mechanics in Engg. Pracice, John Wiley & Sons
11. Relevant Indian Standard Specifications & Codes, BSI Publications, New Delhi.

INFRASTRUCTURAL ENGINEERING II

Lab course outline

Infrastructural Engineering II **IE – II**

ICA (Term Work) : 25Marks

ESE (oral) : 25Marks

Course Description:

The course in infrastructural engineering incorporates experimental methods, assignments and site visits. The experimental methods are as it is given by the Indian standard code for practice. It includes assignments based upon the data analysis and design, in order to fill the gap between theory and practice through real world exposure. It proposes a site visit to a major road project and also to a hot mix plant. Such site visits will enable the students with the real engineering constraints faced by a civil engineering at site.

Practical	**Hours/ week**	**No. of weeks**	**Total hours**	**Semester credit**
	02	**13**	**26**	**1**

General objectives:

The basic objective of this syllabus is to appraise the students with experimental methods as applicable for various civil engineering materials used for road construction. It also includes the introduction to the IS practices applicable at every stage of the Lab work including sampling, testing in the laboratory and data interpretation. Over and above, the syllabus also aims to introduce the students with the real world situation through site visit. The experimental data can be used for design and this aspect is covered by assignments on certain topic of the syllabus.

Learning outcomes:

- Student will be aware of the IS codes prevailing in the testing of road construction materials
- Student will be well versed with the experimental methods as applicable for the testing of common road construction material.
- Student will be able to design flexible and rigid pavement.
- Student will be aware of the site constraints and real working environment situations.

Lab Course Content

A) Any **six** experiments on bitumen out of following set.

1. Penetration test
2. Ductility of Bitumen
3. Softening point of Bitumen
4. Flash & fire point

5. Specific gravity of Bitumen
6. Viscosity of Bitumen
7. Stripping value of road aggregates.
8. Bitumen extraction test(on premix sample)

B) Bituminous mix design Marshal Stability test

C) Numerical based on Flexible Pavement Design

D) Numerical based on Rigid Pavement Design

E) A report on at least one site visit.

Visit to construction site of major road projects, hot mix plant etc.

Guide line for ICA:

ICA shall be based on continuous evaluation of student's performance throughout the semester and ICA submitted by the student.

Guide line for ESE:

ESE will be based on ICA submitted by the student. In ESE the student may ask to answer questions based on practical performed/ assignments. Evaluation will be based on performance in oral examination.

Recommended Books:

1. L. R. Kadiyali, N B. Lal, Principles & practice of Highway Engineering, Khanna Publication, 2005.
2. Khanna & Justo, Highway Engineering, Charotar Publishers
3. Rangwala, Highway Engineering, Charotar Publishers,
4. Khanna S.K, Highway Materials And Pavement Testing, Nem Chand & Brothers-Roorkee

TESTING OF MATERIAL II LAB

Lab course outline

Testing of Material II Lab **TOM – II**

ICA (Term Work) : 25 Marks

Course Description:

The present syllabus includes the IS code prescribed methods of testing of various building materials used in civil engineering. The emphasis is given on aggregate materials like bricks, cement, tiles, timber etc. The course includes experimental methods, data interpretation techniques, and design approaches. It recommends a site visit also for transition of students from the theory to the real application.

Practical	Hours/ week	No. of weeks	Total hours	Semester credit
	02	13	26	1

General Objectives

The basic objective of the syllabus is to appraise the students with the IS code permissible limits, IS code methods of experimentations, safety norms of laboratory and general protocols of material sample collections, preservations, testing and data interpretations. The students should also develop skill in the actual implementation aspect of the experimental observations through design. The student should be exposed to the real working environment also.

Learning Outcomes:-

- Student is expected to perform laboratory testing of any Civil Engineering material.
- Student is expected to plan the testing program me's for any Civil Engineering project.
- Student is expected to know the Indian standard codal provision of testing laid in various codes.
- Student is capable to deduce the Engineering behavior based on laboratory testing of Civil Engineering material.
- Student can deliver the results of laboratory testing according to the industry standards

Lab Course Content

Group A)

It will contain of any **Six** experiments out of following set-

1) Water Absorption by Burnt Brick / Fly ash bricks.
2) Compressive strength of Brick/ Fly ash bricks.
3) Abrasion test on tile.
4) Transverse test on flooring / roof tile.
5) Moisture content in timber.
6) Bending/Flexural test on timber.
7) Compressive strength of timber (load parallel to grain and perpendicular to grain and comparison of results)
8) Tensile strength, Bend/Re-bend test on tor Steel.

B) Minimum three assignments / Study Report on following topics.

1. Study of High-Strength concrete design
2. Study of Polymer Modified Bitumen (PMB)
3. Study of Crumb rubber Modified Bitumen (CRMB)
4. Study of New Building Construction Materials
5. Study of Low-cost Building Construction Materials
6. Study of Eco-Friendly material

RECOMMENDED BOOKS:

1. L. R. Kadiyali, N B. Lal, Principles & practice of Highway Engineering, Khanna Publication, 2005.
2. Khanna & Justo, Highway Engineering, Nemchand Bros
3. Rangwala, Highway Engineering, Charotar Publication
4. M.S.Shetty, Concrete Technology, S Chand
5. M.L.Gambhir, Concrete Technology, TMH Publcation.
6. A.N.Neville, J.J.Books- Concrete Technology
7. R.S.Varshney, Concrete Technology-Oxford & IBH
8. Handbook of Low-Cost Housing, A.K.Lal, New Age International Publishers
9. Pacheco Torgal, Fernando et.al, Eco-efficient Construction & Building Materials, Springer
10. M L Gambhir Neha Jamwal : Building & construction materials lab manual : McGraw Hill Education (India) Pvt. Ltd.

MINOR PROJECT

COURSE CONTENT

Minor Project	**MIP**	
Course Title	Short Title	Course Code

Semester-VI

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	**10**	**20**	**2**

Examination Scheme
Internal Continuous Assessment (ICA): 50 Marks

Teacher should facilitate learning of self study, enhance analytical ability, promote research oriented activity by developing ability of extracting the material from the different sources and writing comprehensively and exhaustive report on an allotted topic and ability to explore and present a topic in systematic manner.

Following should be considered:

1	Every student shall undertake the Minor Project in semester VI. It is expected that the broad area of major project shall be finalized by the student in the beginning of the VI semester and Minor project undertaken may be a part of Major Project
2	Each student shall work on an approved project, a group of 05 students (maximum) shall be allotted for the each minor project and same group may be continued for major project
3	Minor project may involve fabrication, design or investigation of a technical problem that may take design, experimental or analytical character or combine element of these areas. The project work shall involve sufficient work so that students get acquainted with different aspects of fabrication, design or analysis
4	Each group of students is required to maintain separate log book for documenting various activities of minor project
5	The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of minor project. Maximum four minor project groups shall be assigned to one teaching staff

Guide lines for ICA: Assessment of the project for award of ICA marks

Shall be done jointly by the guide and departmental committee as per the guidelines given in Table-A.

Assessment of Minor Project

Name of the Project: _____

Name of the Guide: _____

Table-A

SN	Exam Seat No	Name of Student	Project Selection	Documentation	Design /Simulation/Logic	PCB/hardware/programming	Result Verification	Presentation	Total
			5	10	10	10	10	5	50

SEMINAR-I

COURSE CONTENT

Seminar-I Course Title **S-I** Short Title Course Code

Semester-VI

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**10**	**20**	**2**

Examination Scheme
Internal Continuous Assessment (ICA): 25 Marks

Teacher should facilitate learning of communication ability of an individual and to improve technical knowledge through study of specific topic. Teacher should also facilitate understanding ability, ability to listen, proper language, oral presentation skill amongst students.]

Following should be considered:

1	For Seminar-I every student will individually study a topic assigned to him / her and submit a report and shall deliver a short lecture / Seminar on the topic during the term
2	The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Seminar-I. Seminar shall be related state of the art topic of his choice approved by the committee
3	Seminar topic should not be repeated and registration of the same shall be done on first come first serve basis
4	Topic of Seminar shall be registered within a two week from commencement of VI Semester and shall be approved by the committee
5	Maximum six seminar supervision shall be allotted to each teacher
6	At the end of semester, student should submit the seminar report (paper bound copy)in following format: a. Size of report shall be about 25 pages. b. Student should preferably refer minimum five reference books / magazines/standard research papers. c. Format of Report i. Introduction ii. Literature survey iii. Theory 1) Implementation 2) Methodology 3) Application 4) Advantages, Disadvantages iv. Future scope v. Conclusion

Guide lines for ICA: ICA shall be based on evaluation of student performance by a seminar presented by the student. Every student shall be required to present a seminar in presence of Panel of teachers constituted by the Head of Department in consultation with the Principal. The evaluation shall be based as per the guidelines given in Table- B

Title of Seminar: _____
Name of Guide: _____

Table-B

SN	Exam Seat No	Name of Student	Topic Selection	Literature survey	Report writing	Depth of understanding	Presentation	Total
			5	5	5	5	5	25

SYLLABUS OF

FOURTH YEAR (CIVIL)

N O R T H M A H A R A S H T R A
U N I V E R S I T Y , J A L G A O N .

(w.e.f. 2008-09)

N O R T H M A H A R A S H T R A U N I V E R S I T Y , J A L G A O N

STRUCTURE OF TEACHING AND EVALUATION

B.E. (Civil) w. e. f. 2008 - 09

FIRST TERM

Sr. No	Subject	Teaching Scheme Hours/Week			Examination Scheme				
		Lectures	Tutorial	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Construction Management- I	4	-	2	3	100	25	-	25
2	Water Resources Engineering –I	4	-	-	3	100	25	-	-
3	Quantity Surveying & Valuation	4	-	2	3	100	25	-	25
4	Environmental Engineering - II	4	-	2	3	100	-	-	25
5	Elective- I i) Open Channel & Conduit Flow ii) Water Shed Management iii) Finite Element Method	4	-	2	3	100	25	-	--
6	Seminar	-	-	-	-	-	25	-	-
7	Project –Stage I	-	-	2	-	-	25	-	25
	Total	20	-	10	-	500	150	-	100
	Grand Total	30			750				

SECOND TERM

Sr. No	Subject	Teaching Scheme Hours/Week			Examination Scheme				
		Lectures	Tutorial	Practical	Paper Duration Hours	Paper	TW	PR	OR
01	Structural Design & Drawing – III	4	-	4	4	100	25	-	25
02	Construction Management- II	4	-	2	3	100	25	-	25
03	Water Resources Engineering. –II	4	-	2	3	100	25	-	25
04	Elective–II i) Water Power Engineering ii) Geographical Information System iii) Industrial Pollution & Control	4	-	2	3	100	25	-	-
05	Site Visit /Case Study	-	-	-	-	-	25	-	-
06	Project–Stage II	-	-	4	-	-	100	-	50
07	**Total**	16	-	14	-	400	225	-	125
	Grand Total	30			750				

N O R T H M A H A R A S H T R A U N I V E R S I T Y , J A L G A O N
SYLLABUS OF FOURTH YEAR (CIVIL)
TERM-IST (w.e.f. 2008-09)

CONSTRUCTION MANAGEMENT-I

Teaching Scheme:
Lectures: 4 Hours/Week
Tutorial: 2 Hour/Week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)
Term Work: 25 Marks
Oral: 25 Marks

UNIT--I **(10 Hours, 20 marks)**

Construction industry, construction team, Construction activities, classification of construction ,stages in construction, Need of management in construction, Ownership and entrepreneurship , Small scale industries in construction .

Jab layout, mass housing and value engineering.

Scientific management, Management technique and uses, Definition and objectives of management, levels of management, Leadership and its quality.

Organization, meaning and function , forms of organization - line, line and staff , functional ,Type A, Type B and Type C

UNIT—II **(10 Hours, 20 marks)**

Network Technique :- History, Advantages, Bar charts, S –Curve etc. various terms used in network technique, activity,. event, critical path, duration etc. Development of networks, network scheduling, to find various times and float. EST, EFT, TF etc. Monitoring of Network, Three phases of network technique.

PERT - its concept and PERT Time.

UNIT–III **(10 Hours, 20 marks)**

Cost analysis, Cost Curve, Optimization and crashing of networks. Updating of network During monitoring, resource leveling, allocation, leveling and smoothening.

Line of balance - Concept and uses.

UNIT – IV

Engineering economics, its definition and importance, demand and supply, factors affecting demand and supply. Production, its meaning, different factors of production, economics of production, cost concept, relationship of cost to level of production.

Bank, its type, uses and functions, banking systems, profit and loss account, appreciation and depreciation of money.

UNIT - V

a) Pile driving Equipments:-

Pile hammers, drop, single acting steam, double acting steam, differential acting steam, diesel, vibratory , hydraulic hammers , sonic hammers, selection of pile driving hammers.

b) Crushers – types , primary, secondary ,tertiary crushers, jaw, gyratory, cone crushers, hammer mills, roll crushers, rod and ball mills Screening aggregate, revolving, vibrating screens

c) Ready mix concrete plants :- central concrete batch plant , portable concrete batch plant, ready mixed concrete – central mixed , shrink mixed, truck mixed concrete, concrete pumps.

TERM WORK:- It shall consist of assignments based on each unit of above syllabus.

BOOKS RECOMMENDED:-

1. Mahesh Varma - Construction planning and management
2. S.V.Deodhar - Construction equipment and job planning
3. U.K.Shrivastava - Construction Management

4. Gehlot and Dhir - Construction Management
5. L.S.SrinathEngineering - CPM and PERT
6. Peurifoy - Construction Planning and Management
7. Tarachand - Engineering Economics
8. Sengupta - Construction Management and planning
9. Chitkara - Construction Project Management
10. Mukund Mahajan - Engineering Economics
11. R.L.Peurifoy - Construction planning ,Equipments and Methods.
12. Dr. Mahesh Verma - Construction equipments and its planning and application

WATER RESOURCES ENGINEERING - I

Teaching Scheme:
Lectures: 4 Hours/Week
Practical: 2 Hour/Week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)
Term Work: 25 Marks

UNIT I **(10 Hours, 20 marks)**

Hydrologic cycle, Hydrology & Water resources development, Surface hydrology and sub-surface hydrology

Precipitation – Mechanism, essential requirement for occurrence, Different Forms, Types,

Measurement of Precipitation – Different types of rain gauges- non-automatic and automatic, Radar measurement, Methods to find out the areal average depth of precipitation, Mean monthly precipitation, annual average precipitation, Optimum number of rain gauge stations, Estimation of missing data, Checking for consistency of data

Rainfall Intensity analysis, Frequency Curve, Depth Area Duration Curve

Disposal of precipitation - Factors affecting disposal, Evaporation Losses, Evapo-transpiration, Factors affecting evapo-transpiration, methods for measurement of evaporation and evapo-transpiration, Infiltration – methods for determination, factors affecting, infiltration indexes

UNIT II **(10 Hours, 20 marks)**

Discharge Measurement in Streams – Methods (Area Velocity, Moving Boat, Chemical), Selection of gauge site, Stage Discharge Relationship, Extension of Rating Curves, Slope Area Method

Run-off – Runoff Process, Runoff Cycle, Factors affecting Runoff, Estimation

Catchment -Classification & Salient Characteristics

Floods – Necessity, Causes, Factors affecting, Classification, Frequency, Estimation

Hydrographs – Definition, Components, Factors affecting the shape, Base flow separation, Flood Hydrograph, Unit Hydrograph, U.H.methods, S-hydograph (S-curve technique), Synthetic Unit Hydrograph

UNIT III **(10 Hours, 20 marks)**

Ground water hydrology: - Occurrences and distribution of ground water, specific yield of aquifers, movement of ground water, Darcy's law, permeability, yield of basins. Hydraulics of well sunder steady flow, condition in confined and unconfined aquifers, specific capacity a well, well irrigation: tube wells, open wells, their design and construction.

Water logging and drainage engineering - Causes of water logging, preventive and curative measures, drainage of irrigated lands, reclamation of water logged, alkaline and saline lands, design and spacing of the tile – drain.

UNIT IV **(10 Hours, 20 marks)**

Reservoir Planning – Advantages, Classification, Types of developments: Storage and diversion works. Single and multi-purposes reservoir, investigation for locating a reservoir, selection of site, height of the dam, reservoir, economics of reservoir planning, Benefit – cost ratio,

Reservoir Sedimentation – Process of Erosion, Factors affecting erosion, Mechanism of Sediment Transport, Sediment Yield, Distribution of sediment in reservoir, Factors affecting silting, Estimation of silt load, & Mode of sedimentation, Trap efficiency of reservoir, Control of reservoir sedimentation

Necessity and layouts of Lift Irrigation Schemes, Drip & sprinkler irrigation system

UNIT V **(10 Hours, 20 marks)**

Introduction to Irrigation - Definitions, functions, necessity, benefits, Ill effect, Irrigation System & its classification, Irrigation Methods & its classification, (Surface & Sub-sub surface Methods), Factors affecting choice of method,

Soil Water Plant Relationship – Classification of soil water, Soil moisture stress, Soil moisture tension, Saturation capacity, Field capacity, Determination of field capacity,
Major Soil Groups in India, Maintaining the soil fertility, Essential Elements for Plant Growth, Quality of Irrigation Water
Water requirement of crop :- Limiting soil moisture condition, Depth of irrigation water and frequency, Principal Indian Crops and their season, Crop and base period, Duty of water and delta, Factors affecting & methods of improving the duty of water, Commanded area their classification, Intensity of Irrigation, Paleo Irrigation, Kor watering, kor depth and kor period, outlet factor, capacity factor, time factor, crop ratio, overlap allowance, Consumptive use of water, factors affecting consumptive use, calculations of canal capacities.
Application of water, water management and distribution, National water policy, warabandi, rotational application.
Various Methods of Assessment of Canal Revenue
TERM WORK:- From each of the following groups minimum two assignments shall be performed. (At least one assignments from group 1 to 3 shall be done by using spread sheet on computer.)
Group 1: -
1) Marking catchment area on a topo-sheet and working out average annual rainfall and determining yield.
2) Checking for inconsistency of precipitation record by double mass curve technique.
3) Frequency analysis of precipitation data (plotting on semi-log graph paper)
Group 2: -
1) Development of flood hydrograph from unit hydrograph and complex storm.
2) Development of unit hydrograph from isolated and composite flood hydrograph.
3) Development of unit hydrographs of different durations use s- curve method.
Group 3: -
1) Determination of canal and reservoir capacity for water requirement of crops.
2) Determination of reservoir capacity from mass inflow and mass demand curve.
3) Benefit cost analysis of water resources project.
4) Determination of yield of well by recuperating test data.
Group 4: -
1) Design of drainage system in water logged area.
2) Design of micro – irrigation system; either sprinkler of drip irrigation system.
3) Design of lift- irrigation system.

BOOKS RECOMMENDED –

- Garg S.K., "Irrigation Engineering, Dams and Hydraulic Structure", Dhanpat Rai & Sons, New Delhi
- Modi P.N., "Water Resources, Irrigation & Water Power Engineering", Standard Publisher, New Delhi
- Punamia B.C., "Irrigation & Water Power Engineering", Laxmi Publications, New Delhi
- Raghunath H.M., "Hydrology", New Age Publications, New Delhi
- Raghunath H.M., "Ground Water", New Age Publications, New Delhi
- Mutreja, "Applied Hydrology", Tata McGraw Hill Company, New Delhi
- Arora K.R., "Irrigation Engineering", Standard Publications, New Delhi
- P.Jayaram Reddi, "A Text Book of Hydrology", Laxmi Publications, New Delhi
- Sharma R.K., "A Text Book of Hydrology & Water Resources", Dhanpat Rai and Sons

QUANTITY SURVEYING & VALUATION

Teaching Scheme:
Lectures: 4 Hours/Week
Practical: 2 Hour/Week

Examination Scheme:
Theory Paper: 100 Marks (4 Hrs)
Term Work: 25 Marks
Oral: 25 Marks

UNIT I **(08 Hours, 20 marks)**

Estimate, Detailed Estimate, types of detailed estimate, purpose, data required for preparing detailed estimate, factors to be consider during preparation of detailed estimate, methods of taking out quantities, abstracting, units of measurements, building cost index, prime cost, provisional sum, centage charges, work charged Establishment, administrative approval, technical sanction.

Approximate estimate: - Importance, purposes, approximate methods of building estimating and various civil engineering works.

UNIT II **(11 Hours, 20 marks)**

Detailed estimate of buildings (load bearing and framed structure specially RCC flat roof buildings.)

Detailed estimate of community well, septic tank, pipe culvert, earthwork in roads / cannels.

UNIT III **(11 Hours, 20 marks)**

Detailed estimate of reinforcement quantities of R.C.C. elements like slab, beam, column & Isolated column footing, staircase and preparation of bar bending schedule.

UNIT IV **(10 Hours, 20 marks)**

Task work, factors affecting task work, schedule of rate, Task work of various items of construction, Analysis of rates, factors affecting cost of an item of work, material, labour etc. Analysis of various items of construction.

Specifications, purposes, types, drafting of specifications, and specifications of a few main items of civil engineering works.

UNIT V **(10 Hours, 20 marks)**

Valuation, purposes, price cost and value, factors affecting value of a property, various types of value like market value, sentimental value, mortgage, year's purchase and outgoings, legal aspects of valuation and easement act. Methods of valuation, land and building method, rental method, belting method of valuation of land. Standard rent and Standard rent fixation.

depreciation, various methods of depreciation, sinking fund, book value, free hold and lease hold properties.

TERM WORK: - It shall consist of following

1) Units of Measurement of various items of Civil Engg. Works.
2) Approximate estimate of: -
   i) Residential Building. ii) Public Building (Any Two Types).
   iii) Elevated water service reservoir. iv) Road and Bridge.
3) Detailed estimate of a load bearing residential single story structure.
4) Detailed estimate of framed residential double story structure.
5) Detailed estimate of any two of the following:
   a) Community well. b) Pipe Culvert. c) Septic tank. d) Earth work in roads /cannels.
6) Detailed Specifications for any five items of construction.
7) Rate analysis for any five items for buildings.
8) Estimation of detailed quantities of reinforcement for any two of the following:
   i) Slab. ii) Beam. iii) Column and isolated column footing.

BOOKS RECOMMENDED

a) B.N. Dutta - Estimating and Costing.
b) M. Chatroboty - Estimating and Costing.
c) G.S. Birdie - Estimating and Costing for Civil Engg.
d) B.S.Patil - Estimating and Costing , Vol.I & II.
e) S.C Rangwala - Estimating , costing and valuations.

ENVIRONMENTAL ENGINEERING - II

Teaching Scheme:
Lectures: 4 Hours/Week
Practical: 2 Hour/Week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)
Oral: 25 Marks

UNIT –I **(10 Hours, 20 marks)**

Definition of sewage, Necessity of sewage treatment, Requirement of a sewage management system. Composition of sewage,

Characteristics of sewage – Physical (Colour, Odour, Solids and Temperature), Chemical (Organic - Carbohydrates, Fats, Oil and Grease, Pesticides, Phenols, Proteins, Surfactants. Inorgainic – Alkalnity, Chlorides, Heavy Metal, Nitrogen, pH, Phosphorous, Sulphur, Toxic Compounds, Gases – Hydrogen Sulfide, Methane, Oxygen), Biological Characteristics

Cycle of Decomposition – Anaerobic and aerobic, Nitrogen and Carbon Cycle

Tests for determining the Oxygen Demand - Biochemical Oxygen demand, (First and Second Stage BOD), Chemical Oxygen Demand, Total Oxygen Demand. Limitation of BOD test, Population Equivalent

Self Purification of Natural Stream – Dilution, Oxidation, Reduction, Sedimentation, Action of Sunlight,

Zones of Pollution – Degradation, Active decomposition, recovery, clear water

Oxygen sag analysis – Deoxygenation and reoxygenation

UNIT –II **(10 Hours, 20 marks)**

SEWER DESIGN – Estimation of dry weather and rain water flow, hydraulic formulae, minimum and maximum velocity of flow, effect of variation in flow of sewage in velocity of flow , Forms of sewers, Design of storm water drains

CONSTRUCTION OF SEWERS – Factors affecting selection of material for sewer construction, materials & shape of sewers, Structural Loads on Sewers, Maintenance, Cleaning and ventilation of Sewers.

APPURTENANCES – Purposes and location of Inlets, catch pits, cleanouts, manholes, drop-manholes, lamp-holes, flushing devices, grease and oil traps, inverted siphons, storm water overflow devices.

UNIT –III **(10 Hours, 20 marks)**

Preliminary & Secondary Treatment of Sewage –

Screening – Purpose, Classification, Types, Cleaning, Design Consideration & Management of screenings material

Comminutors – Purpose and types

Grit Removal – Purpose, Quality and quantity of grit, Types and Design Criteria

Grease Removal – Necessity, Skimming Tanks, Vacuum Floatation, Disposal of skimmings

Flow Equalization – Location, volume Requirement and Benefits

Sedimentation – Characteristics of settleable solids, Types of settling – (Discrete, Flocculent, Zone and Compression Settling), Classification of Settling tanks, Design criteria of settling tanks, Chemical aided settling, coagulants used

UNIT –IV **(10 Hours, 20 marks)**

Biological Treatment of Sewage – Objective and classification

Activated Sludge Process – Process of Treatment, Operations and units, methods of aeration, Loading rate, oxygen requirement and transfer, Design consideration of aeration tank, secondary settling, operational difficulties

Sewage Filtration – Types of and basic functioning of different filters, Constructional features and design of standard trickling filter, Performance and efficiency of standard trickling filter, Troubles and remedies, Comparison of Tricking Filter Process versus ASP

Stabilization Ponds – Purpose and types of stabilization ponds and their functioning (aerobic, anaerobic and facultative ponds

UNIT –V **(10 Hours, 20 marks)**

Solid Waste Management –

Necessity of solid waste management, Types and Sources of solid waste

Properties – Sampling procedure, Determination of Physical (Individual Components, Particle size, Moisture content, Density) and chemical composition (Energy content, chemical content) of solid waste

Elements of Solid Waste Management - Materials flow in society, Reduction in raw material usage, reduction in solid waste quantities, reuse in solid waste material, material recovery, energy recovery.

Functional Element of SWM & their interrelationship –

Waste generation – factors affecting, estimation of quantities

Onsite handling, storage and processing – Municipal and industrial waste, Containers and their locations,

Collection – Collection service, Types of Collection system (Hauled Container System & Stationary Container System – Machine and manually loaded), Determination of Vehicle and Labour requirement, Collection route

Transfer and transport – Transfer stations, factors affecting design, classification (Direct, Storage and combined discharge), Requirements, Locations of Transfer stations, Transfer means and methods

Processing Techniques – Volume Reduction (mechanical, thermal) and recovery, Disposal – Land filling with solid waste – Methods and operations (area, trench method, depression land fills), Occurrence of gases and leachate in land fills

TERM-WORK -

The term-work shall consist of minimum seven experiments and four assignments and one technical report from the list below –

(A) Experiments – (Minimum Seven)

(1) Determination of Total solid, settleable solid, dissolved solid, fixed Soild, filterable & non filterable solids, Mixed Liquor suspended solids in a sample of waste water
(2) Determination of oil and grease in sample of sewage
(3) Determination of BOD of sewage sample
(4) Determination of COD of sewage sample
(5) Determination of Sulphate / Chloride Content
(6) Determination of Salt Content by electrical conductivity Measurement
(7) Determination of Total Nitrogen/Different forms Nitrogen
(8) Determination of Sulphate / Phosphate Content
(9) General techniques of microbiology : Determination of microbial quality of water-
    - standard plate count,
    - standard coliform test,
    - determination of coliform density by MPN method
    - fecal coliform test

(B) Assignments – (Minimum Four)

(1) Estimation of sewage quantity and design of sewer line
(2) Design of Grit Chamber & Settling Tank
(3) Design of Activated Sludge Plant / Standard Trickling Filter
(4) Drawing of Stabilization Pond showing all details
(5) Estimation of Overall Chemical Composition of Solid Waste
(6) Analyzing Hauled/Stationary - Container Collection System of Solid Waste
(7) Economic Comparison of Transport Alternative for SW

(C) Report –

(1) Technical Visit Report of a Waste Water Treatment Plant or Industrial Water Treatment Plant or Solid Waste Management System/Treatment Plant

Books Recommended –

- Punamia & Jain, "Waste Water Engineering", Laxmi Publications, New Delhi
- Modi P.N., "Sewage Treatment & Disposal and Waste Water Engineering", Standard Publications, New Delhi.
- Pevy, Rowe & Tchobanoglous, "Environmental Engineering", McGraw Hill International, New Delhi
- Garg S.K., "Sewage Disposal & Treatment & Air pollution Engineering",Khanna Publisher, New Delhi
- Hammer & Hammer, "Water & Waste Water Engineering", Prentice Hall International, New Delhi
- Sincero & Sincero, "Environmental Engineering – A Design Approach", Prentice Hall International, New Delhi
- Therous, Eldridge & Mallmann, "Laboratory Manual for Chemical & Bacteriological Analysis of Water & Sewage", Agro Botanic Publisher, India
- Benerjee & Jain, "Handbook of Technical Analysis", Jain Brothers New Delhi.
- Laboratory Manual for Environmental Quality Testing, Environmental Protection Research Foundation, Sangli

NORTH MAHARASHTRA UNIVERSITY JALGAON
UNDER GRADUATE COURSE IN CIVIL ENGINEERING (ELECTIVE– I)

OPEN CHANNEL AND CONDUIT FLOW

Lectures : - 04 Hours/ Week	Theory paper :- 100 Marks
Practical : - 02 Hours / Week	Duration :- 3 Hours
Term Works: - 25 Marks	Oral :- 25 Marks

UNIT – I **(12 Lectures, 20 Marks)**

1) Uniform flow in trapezoidal and circular channel, calculation of normal depth and critical depth in trapezoidal and circular, the first and second hydraulic exponents, hydraulically – efficient channel section for trapezoidal and circular channel sections.
2) Transitions – Rectangular channel with a hump and with change in width.

(10 Lectures, 20 Marks)

UNIT –II

1) Gradually varies flow theory and computation for trapezoidal and rectangular Prismatic channels, differential equation of G.V.F., alternate forms, different types of G.V.F. profiles and their characteristics and examples of their occurrence, control section.
Computation of G.V.F. profiles in trapezoidal channel by standard step method, Direct Integration Methods: Ven Te Chow method & Bresse's method & Bresse's method.

UNIT- III **(10 Lectures, 20 Marks)**

1) Rapidly varied flow due to weirs, sluice gates, end depths, hydraulic jump in rectangular channel, standing- wave flume, Parshall flume.
2) Unsteady flow in open channel : - Equation of continuity and equation of motion for GVUF, surges and waves in open rectangular channels – simple cases. Neglecting friction.

UNIT – IV **(08 Lectures, 20 Marks)**

1) Pipe flow : - Three reservoir problem, pipe network. Practical design methods of rising mains and gravity mains using nomograms/ charts, economical diam. Of rising main.

UNIT – V **(10 Lectures, 20 Marks)**

1) Unsteady flow in conduits: - Mention of types, equation of motion, establishment of flow, water hammer, celerity of pressure wave thought rigid and elastic pipes, sudden and gradual and partial opening and closing of valves, details of pressure cycles.
2) Surge tanks : - Necessity, location, function, types, analysis of simple cylindrical surge tank considering frictional effects.

TERM WORK: - Any six of following assignment should be performed

1) Calculation of normal depth & critical depth in trapezoidal / circular channel using graphs/ tables.
2) Example on transition in rectangular channel
3) Computation of G.V.F. profile in trapezoidal channel by standard step method or by Ven Te Chow method.
4) Developing and running computer programming for numerical method for obtaining G.V.F. profile.
5) Calculation of hydraulic jump in open rectangular channel.

6) Calculation of surges in open rectangular channel.
7) Design of gravity/rising main (Dead end system in case of gravity mains).
8) Calculation of water hammer pressures.
9) Design of simple cylindrical surge tank.

ORAL EXAM: - Based on above term work.

Book Recommended: -

1. Flow in open channels:- Dr.K.Subramanya.
Tata McGraw – Hill publishing company Ltd. New Delhi.
2. Fluid Mechanics:- V.L Streeter and E.B. Wylie.
Tata McGraw- Hill publishing company Ltd. New Delhi.
3. Fluid Mechanics: - Dr. A.K. Jain.
Khanna Publishers, Dhelhi.
4. Theory and Application of Fluid Mechanics:- Dr. K. Subramanya.
Tata McGraw – Hill publishing company Ltd. New Delhi.
5. Water power Engg.:- M.M. Dandekar and K.N. Sharma
Vikas Publishing House, Pvt. Ltd. Delhi.
6. Open Channel Hydraulics:- Ven Te Chow.
Tata McGraw – Hill Publishing Company, Ltd. New Delhi.

WATERSHED MANAGEMENT

Lectures : - 04 Hours/ Week — Theory paper :- 100 Marks

Practical : - 02 Hours / Week — Duration :- 3 Hours

Term Works: - 25 Marks

UNIT -I

Concept of Watershed. Significance of watershed based development, Watershed characteristics – geomorphology and hydrology. Drainage basin, network and channel morphology.

UNIT- II

Watershed Hydrology - Hydrologic cycle, water balance, climate and precipitation, soils and infiltration, interception and evapotranspiration, groundwater, streamflow and runoff, water quality, aquatic ecosystems (eutrophication, habitat disturbance, etc.

UNIT- III

Watershed resource appraisal – Physical, hydrological, land use/cover. Land Capability Classification.

Watershed Management and Planning – objectives

UNIT- IV

Issues in water resources - Point source pollution, agricultural and urban non-point source pollution, erosion, water scarcity, flooding, drinking water protection, wastewater treatment and septic systems

Soil and water conservation measures

Watershed Program – Benefit-Cost Analysis

UNIT- V

Urban Watershed Management – Wet weather flow, Infrastructure Integrity Testing, Effect of discharge to receiving water, Green Roof, Rain water harvesting from urban structures, Urban watershed management – goals & strategies, Sustainability & UWSM, urban stormwater-pollution-abatement technologies and sediment management, Source Loading And Management Model

List of Practical/Term work Assignments -

(Minimum six practicals /Assignments shall be performed)

1. Mapping and demarcation of watershed
2. Morphometric analysis of watershed
3. Areal Precipitation – Thiessen Polygon, Isohyetal methods. Analysis and interpretation of rainfall data.
4. Water balance estimation
5. Estimation of Runoff and streamflow. Flow duration curve, return period. Analysis and interpretation of streamflow data
6. Groundwater contouring and interpretation regarding movement and flow direction
7. Land capability classification

8. Soil loss estimation
9. Visit to a Watershed and submission of report

Text / Reference Books -

1. Murthy, J. V. S. (1994). Watershed Management in India. Wiley Eastern Ltd., New Delhi.
2. Pranjape, S. and Others. (1998). Watershed-based Development, Bharat Gyan Vigyan Samithi, New Delhi.
3. Mutreja, K. N. (1990). Applied Hydrology, Tata McGraw-Hill Pub. Co. Ltd. New Delhi.
4. Singh R. J. (2000): Watershed Planning and Management, Yash Publishing House, Bikaner.

FINITE ELEMENT METHOD

Lectures : - 04 Hours/ Week	Theory paper : 100 Marks
TW/PR : - 02 Hours / Week	Duration : 3 Hours
Term Works: - 25 Marks	Oral : 25 Marks

UNIT I.

Concept of Finite element, Classification of element for discrete and continuum structure , characteristics of an element, Displacement function , General approach for formulation of the problem , Degree of freedom , Assembly rules and boundary conditions. Gradient and divergence theorem.

Matrix's algebra, concept of local and global , coordinates, Rules of transformation of stiffness matrix from local to global axes, Variation methods of Approximations.

Approximation errors in F.E.M. various measures of errors, accuracy of solution.

Advantages and disadvantages of F.E.M.

UNIT - II.

Discretization of the domain into elements, shape function, "Pascal triangle", Selection for the order of polynominal, convergence requirements, inter element compatibility conforming and non conforming element, concept of band width. Principle of minimum potential energy, Rayleighrit method, The method of weight residuals, Saint Vasant Principal. Application of above method to civil engineering fields.

UNIT - III.

One dimensional second order and fourth order equations, Lumped and work equivalent load, Theory of work equivalent load, Shape function for one dimensional analysis, Derivation of element equations.

Analysis of one dimensional structure (beam, coloumn etc.) by F.E.M. with different loading and boundary conditions.

UNIT – IV.

Finite element method for two dimensional problems, second order equation involving scaler-valued function, Two dimensional finite elements and interpolation function.

Direct method for determination of stiffness matrix for plane truss, continuous beams and plane frame elements, solution for displacement unknowns and analysis.

UNIT – V.

Triangular and Rectangular elements for plane stress/strain conditions, effect of element aspect ratio, finite representation of infinite mass.

Formulation of stiffness matrix for slabs using triangular or rectangular elements with different boundary condition.

Introduction of Isoparmetric 1 D and 2 D elements, shape function and natural coordinate system, quadrilateral isoparametric elements for plane stress/ strain conditions.

TEXT BOOKS:-

1) The finite element method (fourth edition) Vol – I & II.

By O.C. Zinekiewice & R.L. Taylor.

2) An introduction to the finite element method.

By J.N. Reddy.

3) Introduction to the finite element method.

By C.S. Desai and J.F. Abel.

4) Rudiments of finite element method.

By V.K. Manikar Selvam, Dhanpat Rai Pub.

5) Finite element primer.

By V.K. Manikar Selvam, Dhanpat Rai Pub.

NORTH MAHARASHTRA UNIVERSITY JALGAON
B.E. (CIVIL)

W.E.F : 2008- 09

TERM - I
SEMINAR

Teaching scheme:
Practical: 2 hrs / week

Examination scheme:
Term Work : 25 Marks

1. For seminar every student will individually study a topic assigned to him / her and submit a report and shall deliver a short lecture / Seminar on the topic at the end of term.
2. Selection of topic should be done by students in consultation with concerned guide
3. A typed report should be submitted in paper bound copy.
    a. Size of report depends on advancement of topic.

4. ASSESSMENT OF SEMINAR for TERM WORK
   Title of seminar: _____
   Name of guide : _____

Sr. No.	Exam Seat No.	Name of Student	Assessment by examiners					Grand Total
			Topic Selection 5	Literature Survey 5	Report Writing 5	Depth of understanding 5	Presentation 5	25

5 . Assessment of Literature survey will be based on
    a. Collection of material regarding history of the topic.
    b. Implementation.
    c. Recent applications.

6. Assessment of Depth of understanding will be based on
    a. Questioning by examiners.
    b. Questioning by students.
    c. What the student understands i.e. conclusion regarding seminar.

7. Assessment of presentation will be based on;
    a. Presentation time (10 minutes)
    b. Presentation covered (full or partial)
    c. Way of presentation
    d. Questioning and answering (5 minutes)

8. Examiners should be a panel of two one of them must be guide.

NORTH MAHARASHTRA UNIVERSITY JALGAON
B.E. (CIVIL)

W.E.F : 2008- 09

TERM - I
PROJECT I

Teaching scheme:
Practicals: 2 hrs / week

Examination scheme:
Oral : 25 Marks
Term Work : 25 Marks

1. Every student individually or in a group shall take a project in the beginning of the (B.E. first Term) seventh term in consultation with the guide and the project must be completed in the (B.E. Second Term) eighth term.
2. The project proposal must be submitted in the institute in the beginning of the (B.E. first Term) seventh term. While submitting project proposal care is to be taken that project will be completed within the available time of two term i.e 2 Hrs per week for (B.E. first Term) seventh term and 4 Hrs per week for (B.E. Second Term) eighth semester (total time become 12*2 + 12*4 = 72 Hrs per project partner). The final title of the project work should be submitted at the beginning of the (B.E. Second Term) eighth semester.
3. The guides should regularly monitor the progress of the project work.
4. Assessment of the project for award of TW marks shall be done by the guide and a departmental committee (consisting of minimum two teachers with experience more than three years) as per the guidelines given in the following table.

A) ASSESSMENT OF PROJECT I TERMWORK B.E. FIRST TERM

NAME OF THE PROJECT _____
NAME OF THE GUIDE: _____

Sr No	Exam Seat No	Name Of Student Marks	Assessment by guide (70%)					Assessment by Departmental committee (30%)			Grand Total	Out of 25 Marks
			Literature survey	Topic Selection	Documentation	Attendence	Total	Evaluation (10%)	Presntaion (20%)	Total		
			10	05	15	05	35	05	10	15	50	25

Sign of Guide Sign. of Committee Members Sign. of H. O. D.

5. The guide should be internal examiner for oral examination.

6. The external examiner should be from the related area of the concerned project. He should have minimum of five
years of experience at degree level / industry.

7. The evaluation at final oral examination should be done jointly by the internal and external examiners.

SYLLABUS OF FOURTH YEAR (CIVIL)
TERM-IIND (w.e.f. 2008-09)
STRUCTURAL DESIGN AND DRAWING-III

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hours/Week	Theory Paper: 100 Marks (4 Hrs)
Practical: 4 Hour/Week	Term Work: 25 Marks
	Oral: 25 Marks

UNIT I **(12 Hours, 25 marks)**

R.C. STRUCTURES

i) Ductile detailing of RC members as per Is 13920.
ii) Design of rectangular combined footing.
iii) Design of flat slabs.

UNIT II **(12 Hours, 25 marks)**

i) Design of cantilever retaining wall.
ii) Design of circular water tanks resting on ground.

UNIT III **(12 Hours, 25 marks)**

PRESTRESSED CONCRETE STRUCTURES

a) Introduction :- Basic concept, materials, prestressing systems, stages of loading, stresses in tendons.
b) Losses in prestresses :- Nature of losses, loss due to classic shortening of concrete, successive prestressing of straight cables, relaxation of stress in steel friction in a curved cable anchorage.
c) Design of one way and two way prestressed concrete slabs.

UNIT IV **(12 Hours, 25 marks)**

a) Transfer of prestres in pretensioned members, transmission length, end zone reinforcements. Anchorage Zone stresses in post –tensioned members – Guyan's method.
b) Limit state design of prestressed concrete members philosophy of design, various criteria for limit. States, design loads, strength and serviceability.
c) Design of pretensioned and post tensioned flexural members – Rectangular and flanged sections, cable profile, Design of shear reinforcement, bond partial prestressing limit state method.

TERM WORK:- It shall be based on above syllabus and will consist of

i) At least three numbers of imperial size sheets based on prestressed & R.C. structures.
ii) Demonstration of computer softwares for design of structures.
iii) Report on site visit to at least one structure based on above syllabus

TEXT BOOKS:-

1) N. Krishnaraju - Prestressed Concrete
2) S.R. Karve & V. L. Shah- 'Limit State Analysis & Design of Reinforced Concrete', Structures PublicatinsR.C.C. Structures.
3) Punmia, Jain & Jain – 'Comprehensive R.C.C. Design', Laxmi Publications.
4) S. K. Duggal – 'Earthquake Resistant Design of Structures', Oxford University Press.
5) N. C. Sinha & S. K. Roy – 'Fundamentals of Reinforced Concrete',

CONSTRUCTION MANAGEMENT –II

Teaching Scheme:
Lectures: 4 Hours/Week
Tutorial: 2 Hour/Week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)
Term Work: 25 Marks
Oral: 25 Marks

UNIT –I **(10 Hours, 20 marks)**

A) Important Acts and Laws related to Constructions Industry- Factory act, The Employees Provident Fund Act, Minimum wage Act, Workman Compensation Act, Industrial Dispute Act, Indian Trade Union Act, arbitration act, employees state insurance act.

B) Safety in Construction : Causes of accidents, Classification costs of accident, measurements of accidents ,Injury frequency rate, injury severity rate, injury index, safety programme, accident report,

Safety measures in handling of building materials, construction of elements of building, demolition of buildings, hot bituminous works, scaffolding, formwork and other equipments, excavation.

UNIT–II **(10 Hours, 20 marks)**

Materials management , its aims and functions, inventory analysis , inventory models, ABC analysis, inventory management, buffer stock, lead time, EOQ.

Material requirement, planning , market research, system of purchase of materials, stock of material at site , MAS account, working capital management.

Supervision and quality control, concept of quality, stages of control , measures of control, organization for control, quality control management, sample and sampling technique, inspection, introduction to ISO 9000 and ISO 14000.

UNIT—III **(10 Hours, 20 marks)**

Contract, essentials, types, registration and law of contract, free consent, contract documents , performance of contract, breach of contract, advances to contractor, bills of contract and payments , subletting , inspection of works, tender, tender notice ,various terms used in tender notice such as SD, EMD, estimated cost, Time period of work ,cost of tender form, invitation of tender, time schedule of calling tender, tender documents two envelopes system, scrutiny and acceptance , revocation of tender , extra items , additions and alterations , defect liability , liquidated and unliquidated damages , escalation of rates, work order.

UNIT IV **(10 Hours, 20 marks)**

Excavating & Hauling Equipments :-

a) Power shovels; size, basic parts, selection ,factors affecting output.

b) Draglines:- types, size, basic parts, effect of job and management conditions on the out put of dragline.

c) Clamshells – clamshell buckets

d) Hoes- basic parts working ranges

e) Bulldozers-types, moving earth with bull dozers.

UNIT –V **(10 Hours, 20 marks)**

a) Compacting Equipments:-

Types of compacting equipments. Such as tamping rollers, smooth wheel rollers, pneumatic tyred rollers,

b) Hoisting equipments :Chain, hoist, fork trucks

Cranes : Classification, derrick crane, mobile crane, Tower crane, Hydraulic crane, overhead or gantry crane.

Safety in crane operation
Use of cranes in steel construction
Use of cranes in concrete construction

TERM WORK : Term work shall consist of assignments based on each unit of the above syllabus

BOOK RECOMMENDED

1) R.L.Peurifoy - Construction planning ,Equipments and Methods.
2) Dr. Mahesh Verma - Construction equipments and its planning and application
3) Dr.U.K. Shrivastava - Construction planning and Management
4) Dr. S.V. Deodhar - Construction equipment and planning
5) Sengupta - Construction Management and planning.
6) Chitkara - Construction Project Management
7) B.N.Dutta - Estimating and Costing
8) M.Chakroborty - Estimating and Costing
9) S.C.Rangwala - Estimating and Costing
10) B.S.Patil - Estimating and Costing -Vol-1& 2.

WATER RESOURCES ENGINEERING - II

Teaching Scheme:
Lectures: 4 Hours/Week
Practical: 2 Hour/Week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)
Term Work: 25 Marks
Oral: 25 Marks

UNIT I **(11 Hrs., 20 marks)**

1. Dams: - Introduction, types of dams, selection of site for dam, choice of a dam, economical height of dam.
2. Gravity dams: - Introduction, forces acting on dam, elementary and practical profile, modes of failure and stability analysis and design of gravity dam, low and high dam. Construction and materials of construction, control of cracking, galleries, Joints and keys.

UNIT II **(09 Hrs., 20 marks)**

1. Introduction to arch dams (only elementary)
2. Spillways: - Introduction, spillway capacity, different types of spillways: their construction and suitability, design principles of Ogee spillway and siphon spillway.
3. Energy dissipation below spillway, types of hydraulic jump, jump height curves and tail water rating curves, various types of energy dissipators: Indian Standard stilling basins and buckets.
4. Gates: - Various types of spillway crest gates and their uses.

UNIT III **(10 Hrs., 20 marks)**

1. Earth dams :- Introduction, types ,elements of earth dam, basic design considerations, causes of failures, piping and its prevention, control of seepage, drainage in earth dams, phreatic line, stability of U/S and D/S slopes under various situations, introduction to rock-fill dam.
2. Diversion headworks :- Introduction, selection of site, types of weirs and barrages, layout of diversion headwork and its components and functions, causes of failures of weirs on permeable foundations and remedies, Hydraulic design of weir w.r.t. subsurface flow, safety against piping and uplift, Bligh`s, Lane' s and Khosla' theories.

UNIT IV **(10 Hrs., 20 marks)**

Canal irrigation :- Types of canals, canal alignment.

Design of c/s of unlined stable channels in alluvium: Kennedy's and Lacey's theory and their merits and demerits.

Preliminary sediment transport theory, critical tractive force, suspended and bed loads.

Design of c/s of unlined channels in alluvial soil according to IS 7112 – 1973 : Lacey's method and tractive force approach.

Design procedure for L – section for an irrigation canal, balancing depth, losses in canals, schedule of area statistics and channel dimensions, Garret's and Lacey's diagrams.

Lining of irrigation canals, advantages of lining, economics of linings, types of linings. Design of lined Channel, land drainage, discharge and spacing of closed drain.

UNIT V **(08 Hrs., 20 marks)**

1. Canal Masonry Works:- Cross drainage works: necessity, types, selection, comparative merits and demerits. Various types of falls: introduction and necessity (no mathematical treatment for any of above structures)

2. River training works:- necessity and types of river training works and bank protection and their construction details. (No mathematical treatment)
3. Hydropower: - general features of hydropower development, advantages of hydropower, types of hydropower plants and their layouts, assessments of power potential, load factor, capacity factor, diversity factor.

TERM WORK

Minimum six out of following assignments should be performed:-

1. Stability analysis of a gravity dam.
2. Stability analysis of slope of earth dam.
3. Design of Ogee spillway with energy dissipator
4. Analysis of weir on permeable foundation by using Khosla's charts.
5. Design of unlined canal in alluvium by using Garret;s /Lacey 's diagrams (at least three sections
   along the alignment.) and ploting L-section, also preparing schedule of area statistics and Channel dimensions.
6. Any one of the following :
   1. Analysis and layout and section of any one type of cross drainage work or fall or regulator .
   2. Any one type of river training work.
   3. A typical layout of high head hydropower plant and functions of components.
7. Report based on visit to any dam or hydropower plant.
8. Benefit - cost analysis of a water resources engineering project.

ORAL EXAM:- Based on the above T.W.

Imp. Note:- Following charts should be provided to students of B.E. (civil) during theory paper.

i) Dr. A.N. Khosla's curves for design of weir on permeable foundation.
ii) Gaarret's & Lacey's diagrams for design of canals

BOOKS RECOMMENDED:-

- Dr. P.N. Modi, Standard Book House , Delhi. - Irrigation, Water Resources and Water Power Engg.
- S.K.Garg - Irrigation Engg. and Hydraulic Structures .
- Dr. B.C.Punmia - Irrigation Engg. and Water Power Engg..
- Varshney ,Gupta, Gupta -Theory and design of Irrigation structures, Volume I and II .
- Bharat Singh - Irrigation Engg.
- K.B.Khushlani - Irrigation Engg. .
- Justin , Hinds - Irrigation Engg. and Practice

NORTH MAHARASHTRA UNIVERSITY JALGAON
UNDER GRADUATE COURSE IN CIVIL ENGINEERING (ELECTIVE– II)

WATER POWER ENGINEERING

Lectures : - 04 Hours/ Week — Theory paper :- 100 Marks
Practicals : - 02 Hours / Week — Duration :- 3 Hours
Term Works: - 25 Marks

UNIT -I

General – Conventional Source of Energy, Status of Electrical Power in the World and India, Advantages and dis-advantages of hydro-electric power over other conventional sources, Place of hydropower in the power system, Investigation and studies for hydro power development.

Estimation of Water Power Potential – Mass Curve, Flow Duration Curve, Firm Power & Secondary Power, Power Duration Curve (Available Power)

Power Plant Economics – Types, Factors affecting outline design, Useful Life, Connected Load, Maximum Demand, Demand Factor, Load Factor, Load Curve, Base & Peak Load, Plant Capacity Factor, Plant Use Factor, Diversity Factor, , Economic Load Sharing between Base Load & Peak Load Power Stations., Cost of Electrical Energy, Energy Rates (Tariff)

UNIT- II

Classification of Hydro-electric Power Plants – Run-Of -River Plant, Valley Dam Plant, Diversion Canal Plant, High Head Diversion Plant – General Arrangements & Different Layouts

Storage and Pondage, Pondage Factor

Pumped Storage Plants – Essential Requirements, Necessity, Advantages, Classification of PSP development, Relative Merits of Different Arrangements, Problems in Operation, Layout & Economics

Tidal Power Plants - Principles of power generation - components of power plant – Single and two basin systems – Turbines for tidal power - Estimation of energy – Maximum and minimum power ranges

UNIT- III

Surface Power Stations – Structure, Dimensions, Lighting & Ventilation, Variations in design Underground Power Station – Location, Types of Layout, Components, Advantages

Penstock & Accessories – Classification, Design Criteria, Economical Diameter, Anchor Blocks, Conduit Valves, Bends & Manifolds Water Hammer & Surges in Penstocks – Phenomenon, Resonance, Surge Tanks Intakes – Types, Losses, Air Entrainment, Inlet Aeration

UNIT- IV

NON CONVENTIONAL ENERGY -

Biomass energy - Bio fuel classification – Examples of thermo chemical, Pyrolysis, biochemical and agrochemical systems – Energy farming – Direct combustion for heat – process heat and electricity – Ethanol production and use – Anaerobic digestion for biogas – Different digesters – Digester sizing – Applications of Biogas

Solar Energy - Availability - Solar radiation data and measurement - Estimation of average solar radiation - Solar water heater types - Heat balance – Flat plate collector efficiency – Efficiency of heat removal - Thermo siphon flow calculation - Forced circulation calculation - Evacuated collectors - Basics of solar concentrators Solar Energy Applications - Solar air

heaters – Solar Chimney - Crop driers - Passive solar system - Active solar systems - Water desalination - Output from solar still – Principle of solar ponds.

UNIT- V

Wind Energy – Nature of wind – Characteristics – Variation with height and time – Power in wind –Aerodynamics of Wind turbine – Momentum theory – Basics of aerodynamics – Aerofoils and their characteristics – HAWT – Blade element theory – Prandtl's lifting line theory (prescribed wake analysis) VAWT aerodynamics – Wind turbine loads – Aerodynamic loads in steady operation – Yawed operation and tower shadow.

Wind Energy Conversion System – Siting – Rotor selection – Annual energy output – Horizontal axis wind turbine (HAWT) – Vertical axis wind turbine (VAWT) – Rotor design considerations – Number of blades – Solidity - Blade profile – Upwind/Downwind – Yaw system – Tower – Braking system - Synchronous and asynchronous generators and loads – Integration of wind energy converters to electrical networks – Inverters – Control system – Requirement and strategies – Noise – Applications of wind energy

Term Work - Assignment –

The term work shall consist of eight assignments, which should include minimum one assignment from each unit.

The term work shall include a visit report on Hydroelectric Power Station and Wind Farm.

References:

1. Water Power Engineering / M. M. Dandekar & K. N. Sharma
2. A text Book of Water Power Engineering / R.K.Sharma & T.K.Sharma
3. Renewable Energy Resources / John Twidell and Tony Weir / E & F.N.Spon
4. Solar Energy - Principles of thermal collection and storage/ S.P. Sukhatme / TMH
5. Solar Heating and Cooling / Kreith & Kreider

Wind Energy Handbook / Tony Burton, David Sharpe, Nick Jenkins and Ervin Bossanyi / WileyWind Electrical Systems / S.N.Bhadra, D.Kastha and S.Banerjee / Oxford

GEOGRAPHICAL INFORMATION SYSTEM (GIS)

Lectures : - 04 Hours/ Week
Practical : - 02 Hours / Week
Term Works: - 25 Marks

Theory paper :- 100 Marks
Duration :- 3 Hours

UNIT -I

Introduction to GIS – Definition, Sources & types of data, Concept of Space and Time, Spatial Information Theory, History of GIS, Objectives, Elements, Hardware & Software requirements and applications of GIS

Data Models of Spatial Information – Layers and Coverages, Conceptual model, Object based network and field model,

Representation of SDM in computer – Raster & Vector models, Comparision

Data Models of Non-Spatial Information – Database Management Systems, Hierarchical Structures, Network Structures, Relational Structures

UNIT- II

Digitizing Editing and Structuring of Map Data – Digitizing manual, semi-automatic

Editing – Error detection and correction

Tolerances – TIC Match, Fuzzy, Node Snap, Arc Snap, Weed, Grain Tolerance

Topology creation, Attribute Map Generation

Digital Elevation Model – Needs of DEM, Various Structures of DEM- Line, TIN, Grid, Products derived from DEM

UNIT- III

Spatial Data Analysis –

General – Attribute quarry, and spatial quarry, Single and Multi-layer operations, Spatial modeling, Network and surface analysis

Vector based spatial data analysis – Topographical overlays, logical operators, conditional operators, proximity operators.

Raster based spatial data analysis – Local functions, focal functions, zonal functions, global functions, area numbering, cost surface analysis, optimal path analysis, proximity search

UNIT- IV

Use of GIS for Water Resources and Management – Water Resources Potential Estimation, Analysis & Estimation of Sediment in Reservoirs, Water Supply Systems Planning and Management, Waste Water Planning and Management, Role of Remote Sensing and GIS in Ground Water exploration, Use of GIS for Watershed Planning and management

UNIT- V

LAND RESOURCES: Land evaluation and suitability studies by Remote Sensing and GIS. Techniques of Landuse/Land cover map preparation. Landuse/ Landcover mapping and planning.

Municipal GIS - Landuse - Statistics as a basis for Environmental Planning, Solid and Hazardous waste disposal site selection.

Use of GIS for Agricultural Practices and Management

List of Practical / Term work Assignments –

The term work shall consist of any six practical/ assignments.

1. Data quality and sources of errors
    i) Nature of sources of geographical data

ii) Sources of errors in GIS database

iii) Data quality parameters

2. Map scale and projections

i) Information on various scales

ii) Need of projection

iii) Spherical co-ordinate system

iv) Properties of map projections

3. Preparation of vector database and maps: manual method for point line and area entities.
4. Preparation of a raster database and map: manual method for point line and area entities.
5. Measurement of distance between two points for vector and raster data.
6. Measurement of area - vector and raster data.

i) Image enhancement

ii) Filtering - Low Frequency

iii) Linear edge enhancement

iv) Band rationing

v) Ground truth data collection

7. GIS operations

i) Overlay Analysis

ii) Buffer Analysis

iii) Map Algebra

iv) Multicriteria and Querry Analysis

v) GPS

Text / Reference Books -

1. Burroughs, P. A (1986): Principles of Geographical Information Systems for land Resources Assessment, Oxford University Press
2. Environmental Systems Research Institute (1993): Understanding GIS: The Arc Info method
3. Training Course for GIS for resource management and development planning: Lecture notes, V1: GIS Fundamentals and Techniques, Government of India
4. Bernhardsen, Tor (1999): Geographic Information Systems: An Introduction, John Wiley and Sons
5. Clarke, Keith C. (1999): Getting Started with Geographic Information Systems, Prentice Hall
6. Demers, Michael N. (2000): Fundamentals of Geographic Information Systems, John Wiley
7. Haywood, Ian (2000): Geographical Information Systems, Longman
8. Chang, Kang-taung (2002): Introduction to Geographic Information Systems, Tata McGraw-Hill
9. Williams, Jonathan (1995): Geographic Information from Space: Processing and Applications of Geocoded Satellite Images, John Wiley and Sons

10. Geographic information Systems by Jeffery star, John Esstes Prentice Hall 2004.
11. Fundamental of Geographic Information Systems -Demers 2001 Edition.
12. Geographic Information Systems: An Introduction, By Tor Bernhardsen, Jhon Wiley and Sons, 2005
13. Remote Sensing and Image Interpretation by T.M.Lillesand and R.W.Kiefer, John Wiley, Third Edition, 2005
14. GIS Applications for Water, Wastewater, and Stormwater Systems, U.M. Shamsi, A CRC Press Book, 2004

INDUSTRIAL WATER POLLUTION CONTROL

Lectures : - 04 Hours/ Week
Practical : - 02 Hours / Week
Term Works: - 25 Marks

Theory paper :- 100 Marks
Duration :- 3 Hours

UNIT -I

Sources and Characteristics of Industrial water – Source and characteristics of waste water, Industrial waste survey, In-plant waste control and water reuse, Estimation of organic contents, Measurement of effluent toxicity.

Different water quality requirements of various industries for different pressure boiler feed waters, cooling water and process water. Waste generation and characterization from different industries like paper and pulp, breweries and distilleries, tanneries, textile, dairy, fertilizer, sugar mill, steel, oil refinery, petrochemical and pharmaceutical industries.

Pre & Primary Treatment – Equalization, Neutralization, Sedimentation, Oil separation, Sour water strippers, Floatation, Coagulation, Precipitation and Heavy Metal Removal

UNIT- II

Aeration and Mass Transfer – Mechanism, Equipment, Air Stripping of VOC.

Aerobic Biological Oxidation – Mechanism of Organic Removal,, Bio-oxidation mechanism, Sludge Quality Consideration, Soluble Microbial Product formation, Bio inhibition of ASP, Nitrification and De-nitrification, Development of Process Design Criteria

Biological WW Treatment Process – Lagoons and Stabilization basins, Aerated Lagoons, Activated Sludge Process, Tricking Filtration, Anaerobic Decomposition, Rotating Biological Contractor, Evaluation of Anaerobic Treatment

UNIT- III

Adsorption – Theory of Adsorption, Properties of activated carbon, The PACT process

Ion Exchange – Theory of Ion Exchange, Plating Waste Treatment

Chemical Oxidation – Introduction to stereochemistry and applicability, Hydro thermal process

Sludge Handling & Disposal – Characteristics of Sludge for disposal, Aerobic digestion, Gravity thickening, Floatation thickening, Gravity belt thickener, Centrifuge – Disk, Basket,

Filtration – Vacuum, Pressure

Sand Bed Drying, Land disposal of sludge, Incineration

UNIT- IV

Air Pollution – Definition of Air Pollution, Definition of Air Pollutants, Measurement of Air Pollution, Classification of Air Pollutants, Primary and Secondary Air Pollutants, Properties of major air pollutants,

Effects of Air Pollutants on Man, Vegetation, Animals and Materials

Meteorology and Plume Dispersion – Atmosphere, Zones of Atmosphere, Scale of Meteorology and different meteorological parameters affecting pollutnant's dispersion in atmosphere, Temperature Lapse Rate, Plume behavior, Gaussian Plume Model, Plume Rise in Atmosphere, Different formulae for estimation of stack height.

UNIT- V

Global Effects of Air Pollution – Green House Effect, Effects of Particulate on earth-atmosphere heat balance, Heat Islands, Acid rains and Ozone holes

Air Pollution Control – Atmospheric Cleansing Process, Approaches to Contaminant Control, Control Devices for Particulate Contaminants – Gravitational Settling Chambers, Centrifuge Collectors, Wet Collectors, Bag house filters & Electrostatic Precipitators
Control Devices for Gaseous Contaminants – Adsorption, Absorption, Condensation, Combustion, Automotive Emission Control

Practical & Term Work - Assignment –
(Total 12 = 7 Experiments + 3 Assignments)

GROUP – A "Experiments" - (Minimum Seven Practical should be performed – (4 from Water Pollution Monitoring and 3 from Air Pollution Monitoring)

WATER POLLUTION MONITORING - Estimation of -

i) Hardness by EDTA Method
ii) Ammonia/Nitrogen
iii) Nitrite/Nitrogen
iv) Estimation of phosphates
v) Sulfate by Spectrophotmetric & Turbiditimetric Method
vi) Biological Oxygen Demand
vii) Chemical Oxygen Demand
viii) Fluorides by SPADNS Reagent
ix) Heavy metals by AAS
x) Pesticide Residue Estimation

AIR POLLUTION MONITORING : Estimation of -

i) NOx
ii) SOx
iii) Particulate matter
iv) Hydrocarbon

GROUP – B "Assignments" - (Minimum three assignments)

1. Determination of Concentration of Air Pollutants by using the Air Pollution Dispersion Models
2. Design of Height of Stacks
3. Design Problems on Air Pollution Control Equipments

References:

1. Pevy et al Environmental Engineering, McGraw Hill International, New Delhi, 2004,
2. W.Wesley Eckenfelder, Industrial Water Pollution Control, McGraw Hill International Edition, 2003
3. Sincero & Sincero, Environmental Engineering – A Design Approach, Prentice Hall India, 2002
4. Sewage Disposal and Air Pollution Engineering, Khanna Publisher, New Delhi, 2004
5. Goel PK, Water Pollution – Causes, Effects and Control, New Age Publications, New Delhi 2001
6. Waste Water Treatment , M.N.Rao and A.K. Dutta, 1987, Oxford & IBH Pub.Co.
7. Environmental Pollution Control, C.S.Rao, 1993, Wiley Eastern Ltd.
8. Industrial wastes their disposal and treatment W. Rudolfs 1997.
9. Industrial environment, assessment and strategies S.K. Agarwal 1996.

NORTH MAHARASHTRA UNIVERSITY JALGAON
B.E. (CIVIL)

W.E.F : 2008- 09

TERM - II
SITE VISIT / CASE STUDY

Teaching scheme:
NIL

Examination scheme:
Term Work : 25 Marks

EDUCATION TOUR / TECHNICAL VISITS / CASE STUDY AND ITS EVALUATION

1. During (B.E. First Term / Second Term) seventh and / or eighth terms or during vacation between (B.E. First Term / Second Term) seventh and eighth terms, every student; shall visit minimum two construction sites / industries arranged by college and accompanied by teachers. The colleges should obtain appropriate certificates of visit from the concerned organizations just after the visits.

2. Students should submit written report about the visits individually at the end of (B.E. Second Term) eighth term.

3. The report should contain information about the following points:

   (a) The organization - activities of organization and administrative setup technical personnel and their main duties.
   (b) The project / industry brief description with sketches and salient technical information.
   (c) The work / processes observed with specification of materials, products, equipments etc. and role of engineers in that organization.
   (d) Suggestions (if any) for improvement in the working of those organizations.

4. The evaluation of the report of technical visits will be made by panel of two teachers appointed by principal.

NORTH MAHARASHTRA UNIVERSITY JALGAON
B.E. (CIVIL)

W.E.F : 2008- 09

TERM - II
PROJECT II

Teaching scheme:
Practicals: 4 hrs / week

Examination scheme:
Oral : 50 Marks
Term Work :100 Marks

1. The Project group in (B.E. first Term) seventh term will continue the project work in (B.E. Second Term) eighth term and complete project in all respect .
2. The guides should regularly monitor the progress of the project work.
3. The project work along with project report should be submitted as part of term work in (B.E. Second Term) eighth term on or before the last day of the (B.E. Second Term) eighth term
4. Assessment of the project for award of TW marks shall be done by the guide and a departmental committee (consisting of minimum two teachers with experience more than three years) as per the guidelines given in the following table.

B) ASSESSMENT OF PROJECT II TERMWORK (B.E. SECOND TERM)

NAME OF THE PROJECT: _____

NAME OF THE GUIDE: _____

Sr. No	Exam. Seat No	Name Of Students	Assessment by guide (70%)						Assessment by department (30%)			Grand Total
			Fabrication /software / actual work	Execution of project	Project report	Scope/ Cost / Utility	Attende-nece	Total	Evaluation (10%)	Prese-ntaion (20%)	Total	
		Marks	20	10	20	10	10	70	10	20	30	100

Sign of Guide Sign. of Committee Members Sign. of H. O. D.

7. The guide should be internal examiner for oral examination.
8. The external examiner should be from the related area of the concerned project.
9. The evaluation at final oral examination should be done jointly by the internal and external examiners.

Syllabus

S.E. Chemical Engineering

(With effect from 2013-14)

Faculty of Engineering and Technology

North Maharashtra University, Jalgaon

NORTH MAHARASHTRA UNIVERSITY, JALGAON
STRUCTURE OF TEACHING & EVALUATION
S.E. (CHEMICAL ENGINEERING) W.E.F.2013-2014

SEMESTER III

COURSE CODE	NAME OF THE COURSE	GROUP	TEACHING SCHEME				EVALUATION SCHEME					CREDITS
							THEORY		PRACTICAL		TOTAL	
			THEORY HRS/week	TUTORIAL HRS/week	PRACTICAL HRS/week	TOTAL	ISE	ESE	ICA	ESE		
	Engineering Mathematics-III	A	3	1	--	4	20	80	--	--	100	4
CHL 301	Chemical Engineering Materials	B	3	--	--	3	20	80	--	--	100	3
CHL 302	Fluid Flow Operation	D	3	1	--	4	20	80	--	--	100	4
CHL 303	Applied Inorganic Chemistry	D	3	--	--	3	20	80	--	--	100	3
CHL 304	Applied Organic Chemistry	D	3	--	--	3	20	80	--	--	100	3
	Soft Skills-III	C	1	--	2	3	--	--	50	--	50	2
CHP 305	LAB Chemical Engineering Materials	B	--	--	2	2	--	--	50	--	50	1
CHP 306	LAB Fluid Flow Operation	D	--	--	2	2	--	--	25	25(OR)	50	1
CHP 307	LAB Applied Inorganic Chemistry	D	--	--	2	2	--	--	25	25	50	1
CHP 308	LAB Applied Organic Chemistry	D	--	--	2	2	--	--	25	25	50	1
	TOTAL		**16**	**2**	**10**	**28**	**100**	**400**	**175**	**75**	**750**	**23**

SEMESTER IV

COURSE CODE	NAME OF THE COURSE	GROUP	TEACHING SCHEME				EVALUATION SCHEME					CREDITS
							THEORY		PRACTICAL		TOTAL	
			THEORY HRS/week	TUTORIAL HRS/week	PRACTICAL HRS/week	TOTAL	ISE	ESE	ICA	ESE		
CHL 401	Chemical Engineering Processes-I	D	3	--	--	3	20	80	--	--	100	3
CHL 402	Process Calculations	D	3	1	--	4	20	80	--	--	100	4
CHL 403	Mechanical Operation	D	3	1	--	4	20	80	--	--	100	4
CHL 404	Applied Physical Chemistry	D	3	--	--	3	20	80	--	--	100	3
CHL 405	Chemical Engineering Processes-II	D	3	--	--	3	20	80	--	--	100	3
CHP 406	*LAB Computer Applications	B	1	--	2	3	--	--	50	--	50	2
CHP 407	#LAB Chemical Processes	D	--	--	2	2	--	--	50	25	75	1
CHP 408	LAB Mechanical Operation	D	--	--	4	4	--	--	50	25(OR)	75	2
CHP 409	LAB Applied Physical Chemistry	D	--	--	2	2	--	--	25	25	50	1
	TOTAL		**16**	**2**	**10**	**28**	**100**	**400**	**175**	**75**	**750**	**23**

NOTE: As Mechanical Operation practical requires 4 hrs workload for performance of practical hence two laboratory hours are merged to form a four hours slot.

*computer based Numerical Methods in Chemical Engineering.

should include practicals of Chemical Engineering Processes-I & Chemical Engineering Processes-II.

S.E. Chemical Engineering

Semester-III

Faculty of Engineering and Technology

North Maharashtra University, Jalgaon

Course Outline

Engineering Mathematics -III | **EM-III**

Course Title | Short Title | Course Code

Course Description:

This course is aimed at introducing the fundamentals of basic Mathematics to undergraduate students. The background expected includes a prior knowledge of Mathematics from first year engineering or diploma and familiarity with various laws, principles and theories. The goals of the course are to understand the basic principle of Mathematics and its application in different area.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**45**	**03**
Tutorial	**01**	**15**	**15**	**01**

Prerequisite Course(s): EM-I, EM-II/ Diploma Mathematics.

General Objective:

The basic necessity for the foundation of Engineering and Technology being Mathematics, the main aim is to teach mathematical methodologies and models, develop mathematical skill and enhance thinking and decision making power of student.

Learning Outcomes: After completion of this course learner will be able to:

1. Apply knowledge of mathematics in engineering and technology.

2. Identify, formulate and solve engineering problems.

3. Design Mathematical models for engineering problems and solve them.

SE Chemical Engineering **Semester – III**

Engineering Mathematics-III
(Course Content)

Teaching Scheme
Theory : 3 hours/ week
Tutorial : 1 hour/ week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Examination (ISE) : 20 Marks

UNIT-I: Linear Differential Equations: **(08 Hours, 16 marks)**

- Solution of LDE of order n with constant coefficients.
- Method of variation of parameters (Only second order).
- Cauchy's linear equation.
- Legendre's linear equation.

UNIT-II: Applications of Linear Differential Equations and Partial Differential equations

(08 Hours, 16 marks)

- Applications of linear differential equations to Chemical Engineering.
- Applications of Partial Differential equations to

  i) One dimensional heat flow equation $\frac{\partial u}{\partial t} = C^2 \frac{\partial^2 u}{\partial x^2}$

  ii) Two dimensional heat flow equation $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = 0$

UNIT-III: Laplace Transform **(08 Hours, 16 marks)**

- Definition and Existence of Laplace transforms.
- Laplace Transform of elementary/standard functions.
- Theorems & Properties of Laplace Transform (without proof).
- Inverse Laplace Transform.
- Laplace Transform of Unit step function.
- Solution of differential equations using LT.

UNIT-IV: Statistics and Probability distributions (08 Hours, 16 marks)

- Introduction to Mean, Mode, Median standard deviation, Variance, Coefficient of variation.
- Moments, Skewness and kurtosis.
- Correlation and Regression.
- Binominal Distribution.
- Poisson distribution.
- Normal distribution.

UNIT-V: Vector Calculus (08 Hours, 16 marks)

- Introduction to Gradient, Divergence, Curl, Solenoidal and Irrotational vector fields.
- Vector integration: Line Integral, Surface and Volume integrals.
- Gauss's, Stoke's and Green's Theorems (without proof).

REFERENCE BOOKS:

1. H.K. Dass - Advanced Engineering Mathematics (S. Chand Publication) New Delhi.
2. Erwin Kreyszig - Advanced Engineering Mathematics (Wiley Eastern Ltd.)
3. B.S. Grewal - Higher Engineering Mathematics, Khanna Publication, Delhi
4. Wylie C.R. & Barrett - Advanced Engineering Mathematics - Mc Graw Hill
5. B.V. Raman - Engineering Mathematics - Tata Mc- Graw – Hill.
6. A Text Book of Engineering Mathematics, By N. P. Bali, Laxmi Publication.

Course Outline

Chemical Engineering Materials **CEM** **CHL 301**
Course Title Short Title Course Code

Course Description: This course provides the knowledge of materials to undergraduate engineering students, and is designed to strengthen the fundamentals so that they can build their own interface of material selection in chemical industries with their industrial applications in the branch of chemical engineering.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	15	40	03

Prerequisite Course(S): Engineering Chemistry-I&II

General Objectives:

1. To introduce the basics of material science and its significance in chemical process industry.
2. To study the metallurgical & mechanical properties of materials in chemical process industry.
3. To study industrially important materials.

Learning Outcomes:

Students completing this course will able to know the sources and importance of materials in context to chemical process industries. They will also study the technique of selection of linings to be used in chemical process industries. Students will be also in a position to identify industrially important materials on the basis of their mechanical, physical and chemical properties.

SE Chemical Engineering Semester – III

Chemical Engineering Materials

(Course Content)

Teaching Scheme

Theory : 3 hours/ week

Practical : 2 hour/ week

Examination Scheme

End Semester Examination (ESE) : 80 Marks

Paper Duration (ESE) : 03 Hours

Internal Sessional Examination (ISE) : 20 Marks

Internal Continuous Assessment (ICA) :50 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Introduction to materials and their properties:

Simple stresses and strains, Concept of stress, strain, shear stress, shear strain, Hooks law, Elastic limit, stress-strain curve for mild steel and elastomeric materials, factor of safety, Poisson's ratio, Strain energy due to axial load and impact. Introduction to determination of mechanical properties of materials ASTM methods.

UNIT-II

No. of Lect. – 08, Marks: 16

Metallic Materials:

Cast iron, Wrought iron and steel, effect of addition of elements such as Si, C,P, Mn,N to Iron. Elastic and plastic deformation, heat treatments alloys such as stainless steel, brass, bronze, duralumin, alnico, Nichrome, solder material.

UNIT-III **No. of Lect. – 08, Marks: 16**

Selection of materials for fabrication and erection of chemical plant:

Testing of materials, destructive and nondestructive tests, structure of atom and chemical bonds, crystal structures and their influence on material properties, Deformation and slip processes

UNIT-IV **No. of Lect. – 08, Marks: 16**

Electrical and Magnetic Materials

Factors affecting the resistivity of conductors, properties of materials such as Ag, Cu, Al, Nichrome and Ca as dielectric characteristics, insulating materials such as mineral oil, PVC, Mica fibers, glass and asbestos, Magnetisation, soft and hard magnetic materials such as a silicon iron, Alnico types alloys and ferrites.

UNIT-V **No. of Lect. – 08, Marks: 16**

Selection of materials and linings

1. Selection of Material of Construction
a) Selection materials of construction for sulfuric acid, Nitric acid, Phosphoric acid & phosphate fertilizers, Hydrogen & Ammonia plants.
b) Selection of materials for Urea synthesis reactors and CO_2 absorption systems.
2. Linings for process equipments
Metal lining, glass linings, ceramic linings & plastic linings.
Glassed steel for process equipment, Thermomechanical properties of glass lined equipments. Membrane linings for vessels holding corrosive liquids.

Textbooks:

1 R.B. Gupta, Material science, Satya Prakashan, 1981
2. V.K. Manchanda, A text book of material science.New India Publishing House
3. V. Raghavan, Material science and engineering, Prentice Hall of India
4. James F. Shacketford, Introduction to material science, McMillan publishing company, New York ISBN 1990.
5. D.Z. Jestrazebaski, Properties of Engg. Materials, 3rd Ed. Toppers.Co. Ltd.
6. J.L.Lee & Evans "Selecting Engineering materials for chemical & process plants" Business Works 1978.
7. Materials Engineering-II-Controlling corrosion in process equipments, Edited by Kenneth J. McNaughton and staff of Chemical Engineering, McGraw Hill Publication Co. ,New York,N.Y.

References:

Don W. Green, Perry's Chemical Engineers Handbook, 8th Edn., McGraw-Hill

Course Outline

Fluid Flow Operation | **FFO** | **CHL 302**
Course Title | Short Title | Course Code

Course Description:

This course provides the students basic understanding of fluids (liquids and gases) and the forces on them. Fluid mechanics can be divided into fluid statics, the study of fluids at rest; fluid kinematics, the study of fluids in motion; and fluid dynamics, the study of the effect of forces on fluid motion. It includes fluids transportation, filtration, and solids fluidization.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	15	40	03
Tutorial	01	15	13	01

Prerequisite Course(S): - Engineering Mechanics, Mathematics

General Objectives:

1. To study fluid properties
2. To study velocity concept, the continuity equation, Eulers equation of motion a long streamline, Bernoullis equations for different conditions.
3. To study flow through pipeline system: Reynolds experiment, Laws of friction, Major and minor losses, friction factor chart, effect of heat transfer on friction factor, distribution of flowing fluids through branched pipes, hydraulic gradient line and total energy line.
4. To understand flow of compressible fluids, Continuity equation, total energy balance, mechanical energy balance, ideal gas equations, flow past immersed bodies , drag coefficient-friction in flow through bed of solids and Boundary layer theory:
5. To study flow and pressure measurement
6. To understand pumping of fluids

Learning Outcomes:

After completing the course the students will able to understand the role of mechanical and hydro dynamical unit operations in the field of chemical engineering. The students will also understand key concepts and fundamental principles, together with the assumptions made in their development, pertaining to fluid behavior, both in static and flowing conditions. The students will learn to deal effectively with practical engineering situations, including analysis and design of engineering systems and devices involving fluids and flow. Students will clearly understand the knowledge of piping & pumping system which is important in chemical industries.

SE Chemical Engineering **Semester – III**

Fluid Flow Operation
(Course Content)

Teaching Scheme

Theory : 3 hours/ week
Practical : 2 hour/ week
Tutorial : 1 hour/ week

Examination Scheme

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Examination (ISE) : 20 Marks
Internal Continuous Assessment (ICA) : 25 Marks
End Semester Examination (ESE) (OR):25 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Fundamental concepts of fluid flow, mechanism of compressible and non compressible fluid flow, equation of continuity, Reynolds number, significance, Bernoulli's theorem, distribution of velocities and fluid flow profiles, friction factor and friction losses in pipes, roughness factor and its significance, pipe fittings, equivalent length of fittings etc. Energy losses due to sudden contraction and expansion.

UNIT-II **No. of Lect. – 08, Marks: 16**

Boundary layer theory, Velocity profile and boundary layer growth along a flat plate, thickness of boundary layer (definition and formulae only), separation of boundary, boundary layer calculations for turbulent flows.
Dimensional analysis and model studies: Dimensional analysis, Buckingham's PI theorem, dimensionless numbers, application to fluid flow problem.

UNIT-III **No. of Lect. – 08, Marks: 16**

Flow measuring devices for incompressible and compressible fluids: orificemeter, venturimeter, pitot tube, rotameters, notches and weirs, gas flow meters, coefficient of discharge and calculations.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Transportation of fluids, reciprocating and centrifugal pumps, pump characteristics, Diaphragm pumps, rotary pumps, screw pumps, gear pumps, pump power calculations, pump selection and trouble shooting of pumps, priming, cavitation , NPSH of pumps.

UNIT-V **No. of Lect. – 08, Marks: 16**

Fluidization, aggregate and particulate fluidization, minimum fluidization velocity, entrainment in fluidization. Packed Bed, pressure drop in packed beds, packing materials and their selection criteria, Loading and flooding in packed beds, Kazenger karma equation,- Industrial application.

Textbooks:

1) Dr.R.K. Bansal, Fluid Mechanics: Laxmi Publications, New Delhi.
2) Coulson J.M. and Richardson J.F.; Backhurst J.R. and Harker J.H.; Chemical Engineering, Vol. I , II & IV, Publishers: Butterworth - Heinmann, 2001-2002.
3) R.P.Vyas Fluid Mechanics, Denett Publication.
4) W.L. McCabe & J.C. Smith, Unit operations in chemical engineering: McGraw Hill/Kogakusha Ltd
5) I P. Chattopadhyay, Unit operations of chemical engineering-volume I: Khanna Publication New Delhi, 2nd edition 1996.

References:

Don W. Green, Perry's Chemical Engineers Handbook, 8th Edn., McGraw-Hill

Course Outline

Applied Inorganic Chemistry **AIOC** **CHL 303**
Course Title Short Title Course Code

Course Description:

This course provides the students basic understanding of theoretical inorganic chemistry and to apply this understanding in how solid-state inorganic materials are used in current and emerging applications.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**40**	**03**

Prerequisite Course(S): Engineering Chemistry-I & II

General Objectives:

1. To differentiate between the essential features and properties of covalent, ionic and metallic bonding & the concept of hybridization and its types.
2. To study the atomic orbital concept, molecular orbital theory, VSEPR theory of chemical bonding.
3. To recognize different types of transition metals and recall their industrially important compounds with basic properties.
4. To study basics of metallurgical operations for extracting metals from ores.
5. To know the Gibb's phase rule with basic terms involved in it and its importance.
6. To study the construction of phase diagrams for alloy systems.
7. To study the inorganic engineering materials & composites.

Learning Outcomes:

Students completing this course will able to differentiate between ionic and covalent interactions observed in molecules. They would also able to construct molecular orbital diagrams for simple molecules and will predict the shapes of small molecules based on VSEPR theory. They will also identify the engineering materials best suited for particular application in industry.

SE Chemical Engineering **Semester – III**

Applied Inorganic Chemistry
(Course Content)

Teaching Scheme
Theory : 3 hours/ week
Practical : 2 hour/ week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Examination (ISE) : 20 Marks
Internal Continuous Assessment (ICA) : 25 Marks
End Semester Examination (ESE) (PR):25 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Chemical Bonding:
Ionic bond : The ionic model, Lattice energy, The Born- Haber cycle, Applications of lattice energy.
Metallic bond: Electron sea model , explanation of metallic properties on the basis of electron sea model.
Covalent bond: Polarity in covalent bonds, important characteristics of covalent bond : Bond length, bond angle, bond strength, Atomic orbital overlap concept, Valence bond & Molecular Orbital treatment of covalent bond, VSEPR theory.
Hybridisation , Wander Wall's forces.
Hydrogen bond: Intramolecular & intermolecular hydrogen bonding.

UNIT-II **No. of Lect. – 08, Marks: 16**

Principal & processes of metallurgy
Occurrence of metals, Mineral wealth of India, Ore dressing, Roasting, Calcination, Smelting, Fluxes, Slag, Types of Furnaces , Refining of metals.
Metallurgical Industries:
Iron & Steel Industries: Production of Pig Iron.
Production of Steel, Heat treatment of steel by annealing, Hardening, Tempering & by normalising
Aluminium Industries: Purification of alumina from bauxite by Bayer process, Production of Aluminium by electrolytic reduction of alumina.

UNIT-III **No. of Lect. – 08, Marks: 16**

Transition metal Chemistry:
Introduction: General characteristics of d block elements.
Titanium: Occurrence, Extraction, Properties and Uses
Preparation of TiO_2,$TiCl_4$, Ziegler Natta catalyst.
Vanadium: Occurrence, Extraction, Properties and Uses.
Preparation of vanadium metal, V_2O_5 , Ferro vanadium alloy.
Chromium: Occurrence, Extraction, Properties, Industrial applications.
Preparation of CrO_3 , $K_2Cr_2O_7$

Nickel : Occurrence, Extraction, Preparation by Mond process, Electrolytic process, Uses
Silver : Occurrence, Extraction, Properties, Uses, Silver Plating.
Platinum: Occurrence, Extraction, Properties, Uses.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Inorganic Engineering Materials & Composites:
Abrasives: Introduction, Natural abrasives & synthetic abrasives
Glasses: Introduction, Manufacture of glass, Types of glasses & their applications
Composite Materials:
Introduction, constituents of composites, Types of composites, Processing of fiber-reinforced composites.

UNIT-V: **No. of Lect. – 08, Marks: 16**

Phase rule: Definition of phase rule, definitions of terms used in phase rule, Derivation of phase rule, one component water system, two component systems.
Phase diagrams: Definition, Usefulness of phase diagrams, Classification of phase diagram, Construction of phase diagrams., Phase diagram of Steel, Phase diagram of brass, Cu-Ni.

Textbook:

1) B. R. Puri & L. R. Sharma ,Principles of Inorganic Chemistry, S.Chand & Co.Delhi.
2) P.C.Jain & Monika Jain, Engineering Chemistry (15^{th} Edn.) , Dhanpat Rai & Sons, New Delhi.

References:

1) J. D. Lee ,Concise Inorganic Chemistry , D.Van Nostrand Co.
2) P.L.Soni ,Textbook of Inorganic Chemistry, S.Chand & Sons ,New Delhi.
3) Dryden's .Outlines of Chemical Technology, Editors Gopal Rao& Marshall Sitting,East West Press, New Delhi.
4) M.M.Uppal , Engineering Chemistry ,Khanna Publications, New Delhi.
5) Raghupati Mukhopadhyay, R.K.Das's Industrial Chemistry: Metallurgy, Kalyani Publishers, New Delhi

Course Outline

Applied Organic Chemistry **AOC** **CHL 304**
Course Title Short Title Course Code

Course Description: This course provides the knowledge of organic concept to undergraduate engineering students, and is designed to strengthen the fundamentals so that they can build their own interface of applied organic chemistry concept with their industrial applications in the branch of chemical engineering.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**40**	**03**

Prerequisite Course(S): Engineering Chemistry-I & II

General Objectives:

1. To introduce the basics of organic chemistry and its significance in chemical process industry.
2. To recognize the factors affecting electron availability in organic reactions and thereby study the characteristics of electrophilic and nucleophilic reagents.
3. To study the name reactions with their mechanisms.
4. To study stereoisomerism in organic compound & influence of it on molecular properties.
5. To study the basic mechanism of electrophilic substitution reactions and its significance in industrially important products preparations.
6. To familiar the students with typical industrial manufacturing processes through flow diagram and procedures.
7. To recognize structure, preparation and applications of heterocyclic compounds.
8. To study industrially important polymers.

Learning Outcomes:

Students completing this course will able to know the sources and importance of organic compounds in context to chemical process industries. They would also study the technique of drawing the three dimensional molecule on two dimensional paper. They will also recognize the influence of spatial arrangement of atoms or groups on the chemical & physical properties of molecules. After finishing the course they will be able to identify industrially important polymers on the basis of their mechanical, physical and chemical properties.

SE Chemical Engineering **Semester – III**

Applied Organic Chemistry
(Course Content)

Teaching Scheme
Theory : 3 hours/ week
Practical : 2 hour/ week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Examination (ISE) : 20 Marks
Internal Continuous Assessment (ICA) :25 Marks
End Semester Examination (ESE) (PR) :25 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Types of Intermediate & Reaction Mechanism:

Concept of organic chemistry. Importance of organic chemistry. Sources of Organic Compounds. Covalent bonds, , Bond fission. Structure & formation of Carbonium ion & Carbanion , Free radicals & their stability. Factors affecting electron availability: Inductive, Resonance, Hyperconjugation & Steric effects., Electrophiles & Nucleophiles,

Study of reactions with reference to the mechanism involved.

Aldol condensation, Cannizzaro & cross Cannizzaro reactions, Claisen ester condensation, Reimer Tiemann reaction, .,Grignard reactions. , SN^1 & SN^2 reactions. Fridel Crafts alkylation& acylations.

UNIT-II **No. of Lect. – 08, Marks: 16**

Stereochemistry:

Basic concept of stereochemistry , Structural Isomerism, Different methods of representation of three dimensional molecule on paper , Conformational isomerism: Conformations of Ethane & n-Butane & their relative stability. Conformations of Cyclohexanes Geometrical isomerism: Cis-Trans isomerism shown by alkenes.

Optical isomerism: Measurement of Optical activity by Polarimeter , Specific rotation, Enantiomerism, Necessary conditions of optical activity, Optical isomerism of Lactic acid & Tartaric acid., Distereoisomerism , Baeyer's angle strain concept.

UNIT-III **No. of Lect. – 08, Marks: 16**

Chemistry of heterocyclic compounds:

Classification of heterocyclic compouds.
Furan: Structure , Preparation, Properties, Reactions & Uses.
Pyrrole: Preparation, Properties, Reactions & Uses.
Thiophene: Preparation, Properties, Reactions & Uses.
Pyridine: Structure, Preparation, Properties, Reactions & Uses.
Quinoline : Skraup synthesis, Properties, Reactions & Uses

Petroleum:

Origin and composition , Petroleum mining, refining, compositions and uses of main petroleum fractions., Cracking & its importance in chemical industries, Octane number , Improving octane number, Chemicals from petroleum.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Nitration

Nitration, Mechanism of nitration of benzene.

Typical Industrial Nitration Processes: Nitration of benzene with HNO_3-fortified spent acid, Prepation of p-Nitroacetanilide, Preparation of α-Nitronaphthalene

Sulphonation

Sulphonation , Mechanism of sulphonation of benzene

Technical indusrial sulphonation processes: Continuous partial pressure sulphonation of benzene, Sulfation of : Lauryl Alcohol, Dimethyl ether.

UNIT-V **No. of Lect. – 08, Marks: 16**

Halogenation

Halogenation, mechanism of halogenation.

Technical preparation of chloral, DDT, BHC and vinyl chloride from acetylene.

Principle of Polymer chemistry & practice:

Principle of polymer chemistry, Study of Industrially important polymers with respect to synthesis, properties & applications: Polyethylene, Polypropylene, Polyvinyl acetate, Urea Formaldehyde, Phenol Formaldehyde, Nylon

Textbooks:

1) Arun Bahl & B.S.Bahl, Textbook of organic chemistry: S.Chand & Co.Ltd. New Delhi.
2) P. H. Groggins, Unit Processes in Organic Synthesis- , Tata McGraw-Hill

References:

1) Stanley H. Pine, Organic Chemistry: McGraw Hill Int.Co.
2) Morrison & Boyd, Organic Chemistry: Allyn Bacon Inc.
3) V.R. Gowarikar, N.V.Vishwanathan, Jayadev Sreedhar, Polymer Science: Wiely Eastern Ltd., New Delhi
4) John McMurry, Organic Chemistry, 5th Edn., Brooks/Cole Thomas Learning
5) P.S.Kalsi, Stereochemistry: Conformation & Mechanism, 4th Edn., New Age International Publishers
6) G.S.Mishra, Introductory Polymer Chemistry, New Age International Publishers

Course Outline

Lab Chemical Engineering Materials **Lab CEM** **CHP 305**
Course Title Short Title Course Code

Course Description: This course intended to fulfill the need for comprehensive laboratory course in Chemical Engineering Materials

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**15**	**16**	**01**

Prerequisite Course(S): Engineering Mechanics, Engineering Chemistry-I & II

General Objectives:

1 To induce knowledge of properties of materials through experimentation.
2. To impart practical knowledge of study of metals and alloys.
2 To train the students for studying the strength of materials which are used in chemical Industries.

Learning Outcomes:

Students completing this laboratory course will be able to apply the knowledge of testing of materials for identification of materials for fabrication of different chemical process equipments and also linings of vessels.

Course Content:

(Any eight experiments from the following)

List of Experiments:

1.Microstructure observation and study of metals and alloys. (Minimum five) low carbon steel, medium carbon steel, high carbon Steel, tin, bronze, brass, phosphor bronze.
2. Study of properties of polymeric materials; impact test and polymeric Tests.
3. Different types of hardness test on metals. i.e. Rockwell hardness test, Brinell hardness test.
4. Izod and Charpy impact test on mild steel, copper, brass and aluminum.
5. Macrostructure observation: (flow lines observation in forging by macro etching sulphur printing of steel.)
6. Study experiments based on, i) Dye penetration ii) Rubber lining iii) Heat treatments. iv) Ultrasonic Test
7.Tension test on mild steel for studying stress, strain & Young's modulus
8. Bending test on steel sheets
9. Bending test on copper sheets
10.Chemical analysis of metals and alloys (Any one element to be analysed e.g.molybdenum from stainless steel, carbon from steel, copper from brass etc.)

References for Practicals:

1. Don W. Green, Perry's Chemical Engineers Handbook, 8th Edn., McGraw-Hill
2. V.D. Kodgire and S.V. Kodgire "Material Science & Metallurgy" Everest Publisher, Pune

Course Outline

Lab Fluid Flow Operation — Course Title
Lab FFO — Short Title
CHP 306 — Course Code

Course Description: This course intended to fulfill the need for comprehensive laboratory course in. Unit Operation-I

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	02	15	16	01

Prerequisite Course(S): Engineering Mechanics, Mathematics

General Objectives:

1. To induce knowledge of flow of fluids through experimentation.
2. To impart practical knowledge of study of measurement of flow of fluids.

Learning Outcomes:

Students completing this laboratory course will be able to apply the knowledge of fluid flow for controlling heat and mass transfer. They will also get knowledge about properties of fluids. They will also able to design piping , pumping systems .Also they will also know the measurement of the flow rate of fluids which is important in chemical industries.

Course Content:

(Any eight experiments from the following)

List of Experiments:

1. Study of Bernouillis theorem
2. Measurement of coefficient of discharge for venturimeter
3. Measurement of coefficient of discharge for orificemeter
4. Measurement of coefficient of discharge for notch
5. Study of Reynolds experiment
6. Study of characteristics of centrifugal pump
7. Study of characteristics of reciprocating pump
8. Study of characteristics of diaphragm pump
9. Study of Rotameter.
10. Study of manometers

References for Practicals :

R.K.Bansal "A textbook of fluid mechanics and hydraulic machines" Firewall Media, 2005

Course Outline

Lab Applied Inorganic Chemistry | **Lab AIOC** | **CHP 307**
Course Title | Short Title | Course Code

Course Description: This course dealing with the fundamentals of quantitative chemical analysis both on volumetric and gravimetric basis.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**15**	**16**	**01**

Prerequisite Course(S): Engineering Chemistry-I & II

General Objectives:

1. To expertise the students in proper techniques for making solutions of different concentrations.
2. To train the students in analyzing techniques used for presence of compounds in solutions.
3. To develop skills in students for gravimetric analysis.
4. To induce proficiency amongst students in finding strength of solutions.

Learning Outcomes:

Students completing this course will be capable of making solutions of desired concentrations required for analysis. They will also study the safety precautions for handling the chemical reagents in analysis, estimation and in preparation. After finishing the laboratory course they will also have proficiency in volumetric and in gravimetric analysis.

Course Content:

(Any eight experiments from the following)

List of Experiments:

1. To find strength of solution in g/l & in normal terms
2. Determination of the amount of Magnesium volumetrically by using disodium EDTA
3. Determination of amount of Manganese by Volhards Method
4 Estimation of Manganese dioxide in pyrolusite ore
5. Gravimetric determination of Fe as Fe_2O_3
6. Gravimetric determination Ni as Ni-DMG
7 Determination of amount of Copper(II) volumetrically from the given solution of $CuSO_4$
8. Preparation of tetramine copper (II) sulphate
9. Preparation of tris-ethylenediamine nickel(II) thiosulphate.
10.Preparation of potassium tri-oxalato aluminate tri-hydrate

References for Practicals:

Vogel's. , Text book of Quantitative Chemical Analysis : ELBS with Longman

Course Outline

Lab Applied Organic Chemistry **Lab AOC** **CHP 308**
Course Title Short Title Course Code

Course Description: This course intended to fulfill the need for comprehensive laboratory course in organic chemistry.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**15**	**16**	**01**

Prerequisite Course(S): Engineering Chemistry-I & II

General Objectives:

1. To introduce the basics of qualitative and quantitative analysis techniques for organic compounds and its importance in chemical process industry.
2. To induce knowledge of estimation of organic compounds through experimentation.
3. To impart practical knowledge of single stage preparation of chemical compounds and preparation of derivatives on laboratory scale.
4. To train the students for analysis of chemical compounds with due care and precautions.

Learning Outcomes:

Students completing this laboratory course will able to apply the knowledge of organic qualitative and quantitative analysis for identification of unknown chemical compounds. They would also study and can apply the laboratory techniques in preparation of organic compound and their derivatives along with estimation of physical constants of chemical compounds.

Course Content:

(Any eight experiments from the following)

List of Experiments:

1. Purification of organic compound by crystallization
2. Purification of organic compound by distillation
3. Estimation of Acetone
4. Estimation of Glucose
5. Preparation of p-nitro acetanilide by nitration.
6. Preparation of Quinone.
7. Preparation of Urea Formaldehyde resin
8. Preparation of acetyl derivative of $-NH_2$ / -OH group.
9. Preparation of benzoyl derivative of $-NH_2$ / -OH group.
10. Preparation of 2:4 dinitro-phenyl hydrazone (2,4 DNP) derivative of –CHO / -CO group.

References for Practicals:

1) Kulkarni , A laboratory handbook of organic quantitative analysis & separation, Dastane Ramchandra & Co., Pune
2) S.K.Bhasin, Laboratory manual on engg. Chemistry: Dhanpat Rai Pub.New Delhi
3) B.S.Furniss,A.J.Hannaford, P.W.G.Smith,A.R.Tatchell, Vogels textbook of practical organic chemistry, Pearson Edn.

S.E. Chemical Engineering

Semester-IV

Faculty of Engineering and Technology

North Maharashtra University, Jalgaon

Course Outline

Chemical Engineering Processes-I **CEP -I** **CHL 401**
Course Title Short Title Course Code

Course Description:

This course provide the students basic understanding of unit operations & unit processes involved in inorganic chemical process industries thus they can understand the value of chemicals, the type of problems met in their production and the effective measures for solving these problems.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	15	40	03

Prerequisite Course(S): Applied Inorganic Chemistry

General Objectives:

1. To know the basics of manufacturing of chemicals and work of chemical engineer in chemical process industries.
2. To learn the unit processes and unit operations with symbols involved in manufacturing of useful inorganic chemical products.
3. To study the techniques of drawing of flow diagram for conversion of reactants into products.
4. To identify the engineering problems encountered during production of chemicals with achievable best appropriate solutions.
5. To learn the proper techniques of storage, transportation and handling of raw materials as well as finished products.

Learning Outcomes:

Students finishing this course will learn the drawing techniques of symbols of unit operation and flow diagram and its importance in manufacturing procedures for various industrially important inorganic chemicals. They will also identify the major engineering problems involved in manufacturing operations and best possible solutions for the same.

SE Chemical Engineering **Semester – IV**

Chemical Engineering Processes-I
(Course Content)

Teaching Scheme
Theory : 3 hours/ week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Examination (ISE) : 20 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Fuel & Industrial Gases:
Chemical Processing and work of chemical engineer.
Industrial Gases: Hydrogen, Oxygen, Nitrogen, Carbon Dioxide, Acetylene.
Fuels and Fuel gases: Producer gas, Synthesis gas

UNIT-II **No. of Lect. – 08, Marks: 16**

Chlor-Alkali Industries:
Soda ash, Sodium bicarbonate ,caustic soda, Chlorine , Bleaching powder.
Electrochemical industries:
Fuel Cells: Principle& Efficiency of Fuel cells, Kinds of Fuel cells & advantages of Fuel cells.

UNIT-III **No. of Lect. – 08, Marks: 16**

Phosphorous Industries:
Phosphate industries: Elemental phosphorous, Wet process & electric furnace process for phosphoric acid production, Manufacturing of ammonium phosphate, Baking powder, Fire retardant chemicals. Manufacturing of Superphosphate & Triple Superphosphate

UNIT-IV **No. of Lect. – 08, Marks: 16**

Nitrogen industries & Inorganic Acids : Synthetic ammonia process for ammonia production , Nitric acid, Ammonium nitrate, Urea.,Hydrochloric acid manufacture.
Sulfur industries: Manufacture of elemental sulfur by Frasch & Finnisch process, sulfuric acid.

UNIT-V **No. of Lect. – 08, Marks: 16**

Sodium compounds: Sodium sulphate, Sodium sulfide, Sodium thiosulphate, Sodium silicate, Sodium peroxide.

Chemicals from Sea Water:
Production of common salt by solar evaporation of sea water, production of salt from brine, Bromine Manufacture from sea water & by steaming out process.

References:

1) George T. Austin, “Shreeve’s Chemical Process Industries”, 5th Edition , Mc Graw Hill Book Company
2) C.E. Dryden, Outlines of Chemical Technology, Affiliated East WestPress.1973
3) G.N.Pandey, A textbook of chemical technology, Vol.I, Vikas publishing house pvt.ltd.

Course Outline

Process Calculation **PCAL** **CHL 402**
Course Title Short Title Course Code

Course Description:

This course provide the students basic understanding of Industrial Process Calculations and to apply this in designing the various chemical process equipments.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**40**	**03**
Tutorial	**01**	**15**	**13**	**01**

Prerequisite Course(S): Engineering Chemistry-I & II

General Objectives:

1. To present fundamentals of chemical engineering in a simple manner.
2. To provide broad background for applying principles to industrial and theoretical problems.

Learning Outcomes:

Students completing this course will be able to analyze a particular process in whole or part. They will also in a position in evaluating the economics of the various processes. Using elemental & material balances & energy balances students will be able to design various equipments. Thus they will also study how to increase the efficiency of the chemical processes.

SE Chemical Engineering **Semester – IV**

Process Calculations
(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory	: 3 hours/ week	End Semester Examination (ESE)	: 80 Marks
Tutorial	: 1 hour/ week	Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Properties of Gases ,liquid and solids:

Units their dimensions and conversions , Mass and volume relations, Stoichiometric and composition relations, Excess reactants, Degree of completion, Conversion, selectivity and yield.
Ideal gas law, Dalton's Law, Amagat's Law, and Average molecular weight of gaseous mixtures.
Effect of temperature on vapour pressure, Vapour pressure plot (Cox chart), Vapour pressures of miscible and immiscible liquids and solutions, Raoult's Law and Henry's Law

UNIT-II **No. of Lect. – 08, Marks: 16**

Humidity
Humidity and saturation, Relative Humidity and percent saturation, Dew point, Dry and Wet bulb temperatures, Use of humidity charts for engineering calculations, problems on psychometric chart.

UNIT-III **No. of Lect. – 08, Marks: 16**

Stoichiometry & Material Balance

Material balances for systems with and without chemical reactions, species and elemental balance. Analysis of systems with by-pass, recycle and purge.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Energy balance
Energy capacity of gases, liquids and solutions, Heat of fusion and vaporization, Steady state energy balance for systems with and without chemical reactions. Calculations and application of heat of reaction, combustion, formation, neutralisation and solution. Enthalpy-concentration charts. Combustion of solids, liquids and gaseous fuels, Calculation of theoretical and actual flame temperatures.

UNIT-V: **No. of Lect. – 08, Marks: 16**

Fuels & Combustion

Heating value of fuels, calculations involving theoretical and excess air. Heat & material balances of combustion processes. Chemical ,metallurgical and petrochemical processes.

Textbook:

1) Bhatt., B.I. and Vora S.M. "Stoichiometry" IInd edition, Tata McGraw Hill (1984)
2) K.A.Gavhane "Introduction to process calculations" Nirali Publications
3) Felder, R.M. & Rousseau, R.W**.** "Elementary Principles of Chemical Processes ", 3rd edition. JohnWiley. (1999).
4) O.A.Hougen , K.M.Watson, Ragatz, Chemical Process Principles, Vol.I, Asia Publishing House, New Delhi.

References:

1. Don W. Green, Perry's Chemical Engineers Handbook, 8th Edn., McGraw-Hill
2. Shekhar Pandharipande and Samir Musharaf "Process Calculations" Pune Vidyarthi Griha Prakashan, Pune
3. R.W. Gaikwad "Chemical Process Calculations" Dennet & Co. Nagpur
4. Richard M. Felde,Ronald W. Rousseau, John Wiley & sons, New Delhi
5. S. N. Ghosh, Bidisha Khatua "A textbook of Chemical Calculations" Dhanpat Rai & Co., Delhi
6. Himmelblau, D.M**.** "Basic Principles and Calculations in Chemical Engineering", 6th edition. Prentice Hall .

Course Outline

Mechanical Operation **MO** **CHL 403**
Course Title Short Title Course Code

Course Description: This course provides the knowledge and concept of mechanical operations to undergraduate engineering students, and is designed to strengthen the preliminary operation so that it can provide the platform for the further operation of machines with industrial applications in the branch of chemical engineering.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**40**	**03**
Tutorial	**01**	**15**	**13**	**01**

Prerequisite Course(S): Fluid Flow Operation

General Objectives:

1. To study the importance of size reduction and its laws and significance in chemical process industry.
2. To recognize the factors influencing the size of the product, difference between crushing and grinding.
3. To study the size of the balls required for grinding.
4. To study sedimentation of suspended solids and design of continuous thickener.
5. The students should know the working of filter presses, its operation at constant rate filtration and constant pressure filtrations.
6. To familiar the students with typical industrial manufacturing processes through diagram and design procedures for cyclone separator.
7. To study the various mixing operations, and flow pattern of mixing. Baffles, impeller action during mixing.
8. To study characteristics of fluidized system and its types.
9. To study industrially importance of mechanical operations and its utilizations for handling bulk solids and its conveying system.
10. To study the power utilization of conveyors, mixing operations, and design of belt and screw conveyors.

Learning Outcomes:

Students shall be able to understand the importance of screening equipments in the industry point of view and will able to visualize, analyze and solve basic engineering problems for designing chemical engineering equipments. They shall understand scientific principles and apply them to the practice of engineering problems during maintenance. Students will predict the applications of filtration processes and its working principle to carry out the designs at constant rate of filtration and constant pressure filtrations. After completing the course students shall be able to design and fabricate the screw conveyor, chain and flight as per capacity of equipments.

SE Chemical Engineering **Semester-IV**

Mechanical Operation
(Course Content)

Teaching Scheme

Theory : 3 hours/ week
Practical : 4 hour/ week
Tutorial : 1 hour/week

Examination Scheme

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Examination (ISE) : 20 Marks
Internal Continuous Assessment (ICA) :50 Marks
End Semester Examination (ESE) (OR) :25 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Size Reduction: Properties of solids , Particle size, shape; mixed particle size & size analysis, specific surface of mixture, average particle size; energy utilization, Crushing efficiency, Laws of crushing, Types of equipments for coarse, intermediate & fine size reduction; energy & power requirement; open & closed loop circuit. Screening: Equipment, ideal screen. Screen analysis methods & std. screen series; capacity & effectiveness of screen Problem based on above.

UNIT-II **No. of Lect. – 08, Marks: 16**

Handling of transport of Solids- Bins, bunker, Silos. Introduction about conveyors, belt conveyors – checking/determining conveyor capacity, belt speed. Belt tension, belt sag, motor power. Screw conveyor, advantage and disadvantage of screw conveyor. Bucket elevators – types of bucket,Chain conveyor and its type's chain pull conveyor.
Mixing and Agitation:- Necessity of mixing and agitation in chemical industries. Impellers, flow pattern , Calculation of power requirement of mixing equipments, Mixing Index, Types of mixers, paste & plastic masses, rate of mixing. Mixing & Agitation of Liquids: Agitation equipment &; circulation velocities & power consumption in agitated vessel; blending & mixing. problem based on above.

UNIT-III **No. of Lect. – 08, Marks: 16**

Fluid Solid System: Drag force, drag coefficient, Stokes law, Cozeny- Carman equation. Motion of particles in a fluid. Drag force on spherical particle. free settling velocity, & hindered settling. Fluidization: Minimum fluidization velocity, types of fluidization, application of fluidization in catalytic cracking, pneumatic conveying system, spouted beds , etc. problem based on above.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Sedimentation: Clarification & thickening, separation ratio; equipment for centrifugal & gravity classification; cyclone separator & design; hydro cyclones; principle of magnetic & electrostatic separation. Kynch theory of sedimentation, Determination of thickener area Gravity; laboratory batch & continuous sedimentation, Continuous centrifuges, disc type centrifuge.

UNIT-V **No. of Lect. – 08, Marks: 16**

Filtration: Objectives of filtration, preparation stages of filtration Filter aids, classification of filters, selection of filter media. Basic equation of filtration, Relation between thickness of cake and volume of filtrate. Principle of batch filtration: constant pressure & constant rate filtration, factors affecting filtration. Flow of filtrate through the cloth and cake combined. Compressible filter cake, optimum time cycle, Continuous, centrifugal,vacuum, gravity filtration & related equipments. Washing of filter cake, and numerical based on above.

References:

1.Mc Cabe W. L. & Smith J. C. " Unit Operation for Chemical Engg." 5th Edt. McGraw Hill Kogakusha Ltd.

2. Coulson J. M. & Rechardson J. F. " Chemical Engg.- Vol. II" Butterworth Heinemann

3. Badger W. L. & Banchero J. T. " Introduction to Chemical Engg." McGraw Hill International Book Co. New Delhi

4.Narayan & Bhatacharya " Mechanical Operation In Chemical Engg." NCBA Calcutta

5.P. Chattopadhaya " Unit Operation In Chemical Engg. Vol. I " Khanna Publication Delhi

6.R.S.Hiremath and A.P.Kulkarni, Unit Operation of Chemical Engineering. Everest publishing House

7.Shrikant S.Barkade , Sunita S. Desai, “Mechanical Operations” , Denett and Co.

Course Outline

Applied Physical Chemistry **APC** **CHL 404**
Course Title Short Title Course Code

Course Description:

For undergraduate students this course provides the significant understanding of physical chemistry principles and thus they can relate the concepts for sustainable development in operations encountered in chemical process industries.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	15	40	03

Prerequisite Course(S): Engineering Chemistry-I & II

General Objectives:

1. To introduce the ideal and real gas concept and causes of deviation of gases from ideal behavior.
2. To study the role of critical constants in liquefaction of gases.
3. To study the rate expressions and order of reactions.
4. To understand the influence of various parameters on rate of reactions.
5. To study the basics of chemical thermodynamics and thermochemistry.
6. To learn the chemical equilibrium and applications of Le Chatelier's principle on reaction equilibrium.
7. To study the significance of change in vapor pressure of a solution and colligative properties of dilute solutions.
8. To study the changes in colligative properties of dilute solutions and their role in molecular weight determination.
9. To study the catalysis phenomenon and its influence on activation energy.

Learning Outcomes:

Students finishing this course will be capable to use fundamental physical chemistry principles to make predictions about ideal and real gases. Learners will apply chemical kinetics principles to investigate the order of reaction, effect of temperature and catalysts on reaction kinetics and time taken by reactants to change their initial concentration. They will also learn how the measurable changes in colligative properties of solutions used for determination of molecular mass of solute.

SE Chemical Engineering **Term – II**

Applied Physical Chemistry
(Course Content)

Teaching Scheme
Theory : 3 hours/ week
Practical : 2 hour/ week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Examination (ISE) : 20 Marks
Internal Continuous Assessment (ICA) :25 Marks
End Semester Examination (ESE) (PR) :25 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Kinetic theory of gases: Gas Laws, Kinetic gas equation, Equation of state of ideal & real gases, compressibility factor, critical constants, mol. velocities, probability distribution of velocities, mean free path, collision diameter, collision no., diffusion, Graham's law of diffusion, liquefaction of gases, Heat capacity of gases: C_p & C_v problems.

UNIT-II **No. of Lect. – 08, Marks: 16**

Chemical kinetics: Objective of chemical kinetics, rate of reaction, velocity constant of a reaction, elementary reaction steps & rate expressions, order & molecularity of reaction, factors influencing the reaction rates, integrated rate expressions for 1^{st}, 2^{nd} , 3^{rd} , & zero order reaction (with example), methods for determining order of reactions. Arrhenius equation. Problem based on above topics.
Photochemical reactions, Set up for study of photochemical reactions.

UNIT-III **No. of Lect. – 08, Marks: 16**

Classical chemical thermodynamics:
Objective & scope, definition of thermodynamic systems, state property etc.
Heat work reversibility, maximum work, isothermal & adiabatic process, first law of thermodynamics, thermo chemistry, thermo chemical law, standard heat of formation, second law of thermodynamics, entropy, entropy changes, enthalpy & free energy, Gibbs Helmholtz equation, Third law of thermodynamics. Problems based on above topics.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Chemical Equilibrium
Criteria of chemical equilibrium, Le Chatelier's theorem, its application to some systems likes ammonia, sulphuric acid, and nitric acid.
Catalysis:
Catalysis: Types of catalysis, characteristics of catalytic reactions, Promoters, Catalytic poisoning, Autocatalysis, Negative catalysis, Activation energy & catalysis, Theories of catalysis, Acid-base catalysis & mechanism, Enzyme catalysis: Mechanism & characteristics.

UNIT-V **No. of Lect. – 08, Marks: 16**

Colligative properties:

Colligative properties, lowering of vapour pressure, measurement of vapour pressure lowering determination of molecular weights from vapour pressure, lowering.

Osmosis, osmotic pressure, measurement of osmotic pressure, the law of osmotic pressure, determination of molecular weight from osmotic pressure, osmosis & semipermeability, reverse osmosis.

Elevation in boiling point, determination of molecular weight from boiling point elevation, measurement of boiling point elevation.

Depression in freezing point, determination of molecular weight from freezing point depression, determination of freezing point depression.

Textbook:

1) B. S.Bahl,, G.D.Tuli, Arun Behl, ,Essentials of physical Chemistry: S.Chand & Co.Ltd.Delhi.

References:

1) Maron-Prutton, Principles of Physical chemistry: Oxford & IBH publishing Co.Pvt.Ltd. New Delhi
2) S. Glasstone & Lewis, Elements of physical chemistry : McMillan India Ltd.
3) B.R.Puri & L.R.Sharma, A textbook of physical chemistry : S. Chand & Co. Delhi

Soft Skills – III

COURSE OUTLINE

Course Title	Short Title	Course Code
Soft Skills – III	**SK-III**	

Course Description: Through this course we have tried to prepare the students for the industry. Most companies test mathematical and logical ability through an aptitude test. This subject aims at working on these skills of a student through strategies formulae and practice exercises.

Lecture	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
	1	14	14	2

Prerequisite Course(s): Fundamental knowledge of High School Mathematics.

COURSE CONTENT

Soft Skills – III **Semester-III**

Teaching Scheme **Examination Scheme**

Lecture: 1 hour / week **Internal Continuous Assessment (ICA): 50 Marks**

Unit-I: Arithmetic-1 **No. of Lect. – 3, Marks: 10**

a. Basic Formulae

i. Divisibility Rules.
ii. Speed Maths.
iii. Remainder Theorem.
iv. Different Types of Numbers.
v. Applications.

b. HCF, LCM and Linear Equations

i. HCF – Successive Division and Prime Factorization Methods.
ii. LCM – Successive Division and Prime Factorization Methods.
iii. Applications.
iv. Linear Equations – Elimination Method.
v. Substitution Method.
vi. Applications.

c. Averages and Mixtures

i. Concept of Average.
ii. Faster Ways of Finding It.
iii. The Allegation Method.
iv. Applications.

Unit-II: Arithmetic–II **No of Lect. – 3, Marks: 10**

a. Percentages

i. Concept of Percentage.
ii. Working with Percentages.
iii. Applications.

b. Profit and Loss

i. Difference between Cost and Selling Price.
ii. Concept of Profit Percentage and Loss Percentage.
iii. Applications.

c. Time and Work

i. Basic Time and Work Formula.
ii. Relation between Time and Work.
iii. Applications.

Unit-III: Arithmetic–III **No of Lect. –3, Marks: 10**

a. Permutations and Combinations

i. Sum Rule of Disjoint Counting.

ii. Product Rule of Counting.
iii. Concept of Factorial.
iv. Permutations.
v. Linear Permutations.
vi. Combinations.
vii. Circular Permutations.
viii. Applications.

b. Probability

i. Definition and Laws of Probability.
ii. Mutually Exclusive Events.
iii. Independent Events.
iv. Equally Likely Events.
v. Exhaustive Events.
vi. Cards.
vii. Dice.
viii. Applications.

c. Time and Distance

i. Speed.
ii. Conversion Factors for Speed.
iii. Average Speed.
iv. Moving Bodies – Passing, Crossing and Overtaking.
v. Relative Speed.
vi. Boats and Streams.
vii. Applications.

Unit-IV: Non-Verbal Reasoning **No of Lect. 2, Marks: 10**

a. Analogies

i. Examples.
ii. Applications.

b. Classification

i. Examples.
ii. Applications.

c. Sequences

i. Examples.
ii. Applications.

Unit-V: Analytical Reasoning **No of Lect. – 3, Marks: 10**

a. Analytical Puzzles

i. Classification Puzzles.
ii. Ordering Puzzles.
iii. Assignment Puzzles.
iv. Applications.

b. Letter and Number Series

i. Different Types of Letter Series.
ii. Different Types of Number Series.
iii. Mixed Series.

c. Coding and Decoding

i. Letter Coding.
ii. Number Coding.
iii. Mixed Coding.
iv. Odd Man Out.
v. Applications.

Guide lines for ICA:

ICA will be based on credit tests and assignments submitted by the student in the form of journal.

Reference Books:

1. R. S. Aggarwal, "Quantitative Aptitude", S. Chand Publication, New Delhi, 2012.
2. R. S. Aggarwal, "A Modern Approach to Verbal Reasoning", S. Chand Publication, New Delhi, 2012.
3. R. S. Aggarwal, "A Modern Approach to Non-Verbal Reasoning", S. Chand Publication, New Delhi, 2012.

Course Outline

Chemical Engineering Processes-II **CEP -II** **CHL 405**
Course Title Short Title Course Code

Course Description:

This course provide the students basic understanding of unit operations & unit processes involved in organic chemical process industries thus they can understand the flowcharts which gives great deal of information to be collected and examined and which represents an overall viewpoint for industrial manufacturing processes.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**40**	**03**

Prerequisite Course(S): Applied Organic Chemistry

General Objectives:

1. To know the basics of manufacturing of organic chemicals.
2. To learn the unit processes and unit operations with symbols involved in manufacturing of industrially important organic chemical products.
3. To identify the major engineering problems encountered during production of organic chemicals with achievable best appropriate solutions.
4. To learn the proper techniques of storage, transportation and handling of raw materials as well as finished products.
5. To study the manufacturing steps involved in the production of important chemicals.

Learning Outcomes:

Students finishing this course will learn the drawing techniques of symbols of unit operation and flow diagram and its importance in manufacturing procedures along with major engineering problems & solutions for them involved in the manufacturing of industrially important organic chemicals. Apart from this they will gain knowledge and can apply the same in the manufacturing steps involved in the production of important chemicals.

SE Chemical Engineering **Semester – IV**

Chemical Engineering Processes-II
(Course Content)

Teaching Scheme
Theory : 3 hours/ week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Examination (ISE) : 20 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Oil and Waxes:
Vegetable oil extraction, hydrogenation of oils
Waxes: Introduction, types & their uses.
Soaps , Glycerin and Detergents: Introduction, Raw materials for production of soap & detergents, method of soap production, manufacture of detergents, glycerin production & its uses.

UNIT-II **No. of Lect. – 08, Marks: 16**

Sugar and Starch Industries: Extraction of sucrose from sugar cane, by-products of the sugar industry, properties & structure of starch, production of starch from maize, production of dextrin by starch hydrolysis.
Fermentation Industries:
Manufacture of ethyl alcohol by fermentation, production of beer, wines and liquors, vinegar, citric acid ,lactic acid.
Pulp and paper industries: Manufacturing of pulp, manufacturing of paper, and structural boards.

UNIT-III **No. of Lect. – 08, Marks: 16**

Agrochemical Industries: Insecticides, pesticides, herbicides, plant growth , nutrients and regulators, compound fertilizers, bio-fertilizers, complex fertilizers, various grades of N.P.K. fertilizer.
Pharmaceuticals Industries: Classification of pharmaceuticals products, manufacture of penicillin & tetracycline.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Petrochemicals : Manufacturing of Methanol , Formaldehyde , Ethylene and Acetylene , Ethylene dichloride, Ethylene oxide, Isopropanol, Acetone, Isopropyl benzene ,Butadiene.

UNIT-V **No. of Lect. – 08, Marks: 16**

Explosives: Types of Explosives, explosive characteristics, industrial explosives, propellants, rockets, missiles, pyrotechnics, matches, toxic chemical weapons.
Plastic industries: Raw Materials, manufacturing processes, general polymerization processes, compounding and moulding operation.

References:
1) George T. Austin, "Shreeve's Chemical Process Industries", 5th Edition , Mc Graw Hill Book Company
2) C.E. Dryden, Outline of Chemical Technology, Affiliated East WestPress.1973
3) G.N.Pandey, A textbook of chemical technology, Vol.II, Vikas publishing house pvt.ltd.
4) Casida, Jr. L.E., Industrial Microbiology, New Age International, New Delhi.
5) Reed G., Prescott & Dunn Industrial Microbiology, CBS Publisher, New Delhi.

Course Outline

Lab Computer Applications **Lab CA** **CHP 406**
Course Title Short Title Course Code

Course Description: This laboratory course is dealing with applications of computers for designing the various formulas required for chemical engineering programme with a comprehensive study of the C++ programming language.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**01**	**15**	**10**	**01**
Laboratory	**02**	**15**	**16**	**01**

Prerequisite Course(S): Computer Programming, Engineering Mathematics I and II.

General Objectives:

1. Students will learn to solve matrix equations using Matrix Inversion method.
2. Students will learn to solve Differential equation of first order by various methods like Taylor's series method, Modified Euler's method, Runge Kutta's 4^{th} order method.
3. Students will also learn to solve Numerical Integrations by various methods like, by Picards method, Trapezoidal Rule, by Simpson's $1/3^{rd}$ Rule, Simpson's $3/8^{th}$ rule.

Learning Outcomes:

Students completing this course will able to apply knowledge of Basic Science using knowledge of C and C++ language in Chemical Engineering Problems. Students will demonstrate their ability to solve Chemical Engineering Problems using computer interface. Students will be able to provide a definite solution to various designing problems in Chemical Engineering field.

SE Chemical Engineering **Semester – IV**

Lab Computer Applications
(Course Content)

Teaching Scheme
Theory : 1 hours/ week
Practical : 2 hours/ week

Examination Scheme
Internal Continuous Assessment (ICA): 50 Marks

Theory:

Introduction to object oriented programming

(a) Structure of C++ programming.
(b) Tokens, keywords, constant in C++.
(c) Derived data types, operators, expression in C++.
(d) Function in C++.
(e) Classes and objects in C++.

Introduction to Polymath and Chemical Engineering problems based softwares.
Fundamental concepts of Matrices, Numerical Differentiation & Numerical Integration.

Lab Work: (Any Eight from the following)

1. To solve Matrices using Matrix Inversion Method.
2. To solve Matrices using Gauss Elimination method.
3. To solve Differential equation of first order by Taylor's series method
4. To solve Differential equation of first order by Modified Euler's method
5. To solve Differential equation of first order by Picards method
6. To solve Differential equation of first order by Runge Kutta's 4^{th} order method
7. To solve Numerical Integration by Weddle's rule.
8. To solve Numerical Integration by Trapezoidal Rule
9. To solve Numerical Integration by Simpson's $1/3^{rd}$ Rule
10. To solve Numerical Integration by Simpson's $3/8^{th}$ rule

Reference Books:

1. E Balagurusamy "Object Oriented Programming with C++", Tata McGraw Hill, 4/E,2008.
2. Yashavant Kanetkar, "Let Us C" , BPB Publications ,10/E, 2010.
3. Steven C. Chapra, Raymond P. Canale, Numerical Methods for Engineers, 6^{th} Edition, Tata McGraw Hill.
4. David M. Himmelblau, Basic Principles & Calculations in Chemical Engineering, 6^{th} Edn., Pearson Education Pvt.Ltd., New Delhi.
5. S.S.Sastry, Introductory methods of Numerical Analysis, Prentice Hall

Course Outline

Lab Chemical Processes **Lab CP** **CHP 407**
Course Title Short Title Course Code

Course Description: This laboratory course is dealing with manufacturing procedures of industrially important organic and inorganic chemicals on laboratory scale and safe analysis of the same.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**15**	**16**	**01**

Prerequisite Course(S): Lab Engineering Chemistry-I & II

General Objectives:

1. To induce importance of unit operations & unit processes in chemical process industries through experimental work.
2. To make the students capable of handling chemicals with due care & precautions.
3. To create confidence amongst students for safe synthesis of industrially important chemicals on laboratory scale.
4. To induce proficiency in students for preparation, purification, analysis of chemical compounds on laboratory scale.

Learning Outcomes:

Students finishing this laboratory course will understand importance of unit operations & unit processes in manufacturing of chemicals through experimentation. They will also acquire necessary knowledge of safe handling, synthesis and analysis of industrially important chemicals with due care and precautions.

SE Chemical Engineering **Semester – IV**

Lab Chemical Processes

Teaching Scheme
Practical : 2 hours/ week

Examination Scheme
Internal Continuous Assessment (ICA): 50 Marks
End Semester Examination (ESE)(PR): 25 Marks

Course Content:

(Any Eight experiments from the following)

1. Determination of the Na_2CO_3 content of washing soda.
2. To determine the loss per gram and the percentage purity of the given sample of sodium bicarbonate by heating.
3. Estimation of available chlorine in bleaching powder.
4. Preparation of Sodium thiosulphate
5. Preparation of biuret from urea
6. Preparation of soap
7. Preparation of drug aspirin
8. Estimation of formaldehyde.
9. Determination of TFM in soap
10. Preparation of acetaldehyde by the oxidation of ethanol

References for Practicals:

1) Vogel's. , Text book of Quantitative Chemical Analysis : ELBS with Longman
2) F.G.Mann & B.C.Saunders, Practical Organic Chemistry, Orient Longman

Course Outline

Lab – Mechanical Operation **Lab MO** **CHP 408**
Course Title Short Title Course Code

Course Description: This course intended to fulfill the need for comprehensive laboratory course in unit operations.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**04**	**15**	**32**	**02**

Prerequisite Course(S): Fluid Flow Operation

General Objectives:

1. To understand and apply engineering experimentation techniques and safety procedures common to the chemical industry.
2. To apply principles developed in chemical engineering courses to the analysis of chemical engineering processes and unit operations.
3. To improve technical skills for particle size reduction and screening during process.
4. To study various Laws of crushing, Energy utilization, crushing Efficiency, Energy for size reduction.
5. To give the knowledge of various equipment for classification of particulate matter such as Gravity settling tank, Cyclone separator, Magnetic separators, Electrostatic separator, Equipment etc.

Learning Outcomes:

At the end of the laboratory course students will be able to apply the principles of unit operations through experimentation and will demonstrate the ability to design various equipments used in chemical and allied process industry.

Course Content:

(Any eight experiments from the following)

List of Experiments:

1.To study the separation of solids by sedimentation.
2.To study the differential and cumulative screen analysis of sand.(Sieve analysis)
3.To verify the laws of crushing and grinding by ball mill
4.To verify the laws of crushing and grinding by Jaw crusher
5.To determine the rate of filtration, cake resistance and filter medium resistance.
6.To determine the rate of filtration by vacuum filter.
7.To study the behavior of the bed during fluidization and to calculate minimum fluidization velocity.
8.To study the sigma Kneader Mixer.
9.To study the operating behavior of cyclone separator and to find out its efficiency.
10To study the Ribbon Blender and to find out the mixing index.

Course Outline

Lab Applied Physical Chemistry **Lab APC** **CHP 409**
Course Title Short Title Course Code

Course Description: This course is planned to induce proficiency in students for experimental planning, data analyzing and drawing logical conclusions based on the fundamentals principles of physical chemistry.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**15**	**16**	**01**

Prerequisite Course(S): Engineering Chemistry-I & II

General Objectives:

1. To teach basic manipulative skills. Skills, including the proper techniques for making solutions, weighing, and statistical data analysis.
2. To study the rate expressions and order of reactions through experimentation.
3. To induce knowledge of thermochemistry through experimental work.
4. To develop skills in students for determination of molecular weight by experimently measuring changes in colligative properties.
5. To develop skills for the determination of atomic weight , equivalent weight of metals.

Learning Outcomes:

Students completing the laboratory course will be capable of applying knowledge for investigations of order of simple chemical reactions, heat of neutralization. They would also in a position to estimate molecular weight through changes in colligative properties of dilute solution due to addition of non volatile solute in it.

Course Content:

(Any Eight experiments from the following)

1) Determination of equivalent weight of metal eudiometrically.
2) Detrmination of atomic weight of the metal using Dulong-Petit law.
3) Determination of surface tension of liquids by Stalagmometer.
4) Determination of rate constant of hydrolysis of methyl acetate by dilute HCl & to show that the reaction is of first order.
5) Determination of rate constant of hydrolysis of ethyl acetate by NaOH & to show that the reaction is of second order.
6) Determination of energy of activation for the reaction between potassium pursulphate and potassium iodide.
7) Determination of heat of solution of KNO_3.
8) Determination of water equivalent of copper calorimeter & heat of neutralization of strong acid & strong base by calorimeter.
9) To determine ΔH, ΔG, ΔS of a reaction.
10) Determination of molecular weight of substance by depression in freezing point method.

References for Practicals:

S.K.Bhasin, Laboratory manual on Engineering Chemistry: Dhanpat Rai Pub.New Delhi

Teaching Scheme

T.E. Chemical Engineering

(With effect from 2014-15)

Faculty of Engineering and Technology

North Maharashtra University, Jalgaon

NORTH MAHARASHTRA UNIVERSITY, JALGAON
STRUCTURE OF TEACHING & EVALUATION
T.E. (CHEMICAL ENGINEERING) W.E.F.2014-2015

SEMESTER V

COURSE CODE	NAME OF THE COURSE	GROUP	TEACHING SCHEME				EVALUATION SCHEME					CREDITS
							THEORY		PRACTICAL		TOTAL	
			THEORY HRS/week	TUTORIAL HRS/week	PRACTICAL HRS/week	TOTAL	ISE	ESE	ICA	ESE		
CHL 501	Process Equipment Design -I	D	3	--	--	3	20	80	--	--	100	3
CHL 502	Process Heat Transfer	D	3	--	--	3	20	80	--	--	100	3
CHL 503	Instrumentation & Instrumental Analysis	D	3	--	--	3	20	80	--	--	100	3
CHL 504	Mass Transfer-I	D	3	--	--	3	20	80	--	--	100	3
CHL 505	Industrial Economics and Management	C	3	--	--	3	20	80	--	--	100	3
CHP 506	LAB Process Heat Transfer	D	--	--	2	2	--	--	25	25(OR)	50	1
CHP 507	LAB Instrumentation & Instrumental Analysis	D	--	--	2	2	--	--	25	--	25	1
CHP 508	LAB Mass Transfer-I	D	--	--	4	4	--	--	50	50	100	2
CHP 509	LAB Data Analysis & Interpretation	B	1	--	2	3	--	--	50	--	50	2
CHP 510	Industrial Training/EDP/Special Study	D	--	--	--	--	--	--	25	--	25	2
	TOTAL		**16**	**--**	**10**	**26**	**100**	**400**	**175**	**75**	**750**	**23**

SEMESTER VI

COURSE CODE	NAME OF THE COURSE	GROUP	TEACHING SCHEME				EVALUATION SCHEME					CREDITS
							THEORY		PRACTICAL		TOTAL	
			THEORY HRS/week	TUTORIAL HRS/week	PRACTICAL HRS/week	TOTAL	ISE	ESE	ICA	ESE		
CHL 601	Process Equipment Design -II	D	3	--	--	3	20	80	--	--	100	3
CHL 602	Chemical Reaction Engineering-I	D	3	--	--	3	20	80	--	--	100	3
CHL 603	Chemical Engineering Thermodynamics	D	3	--	--	3	20	80	--	--	100	3
CHL 604	Mass Transfer-II	D	3	--	--	3	20	80	--	--	100	3
CHL 605	Process Engineering Economics & Costing	C	3	--	--	3	20	80	--	--	100	3
CHP 606	LAB Chemical Reaction Engineering-I	D	--	--	2	2	--	--	25	25(OR)	50	1
CHP 607	LAB Mass Transfer-II	D	--	--	4	4	--	--	50	50	100	2
CHP 608	LAB Entrepreneurship	B	--	--	2	2	--	--	25	--	25	1
CHP 609	Minor Project	D	--	--	2	2	--	--	50	--	50	2
CHP 610	Seminar-I	D	--	--	2	2	--	--	25	--	25	2
	TOTAL		**15**	**--**	**12**	**27**	**100**	**400**	**175**	**75**	**750**	**23**

NOTE: As Mass Transfer-II practical requires 4 hrs workload for performance of practical hence two laboratory hours are merged to form a four hours slot.

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

FINAL YEAR ENGINEERING (B.E.)

CHEMICAL ENGINEERING

TERM – I & II

W.E.F. 2008-2009

NORTH MAHARASHTRA UNIVERSITY, JALGAON

STRUCTURE OF TEACHING & EVALUATION

B.E. (CHEMICAL ENGINEERING) W.E.F.2008-2009

First Term

Sr. No.	Subject	Teaching Scheme Hours/Week		Examination Scheme				
		Lectures	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Process Dynamics & Control	04	02	03	100	25	--	25
2	Transport Phenomenon	04	--	03	100	--	--	--
3	Chemical Reaction Engineering-II	04	04	03	100	50	--	25
4	Elective –I	04	--	03	100	--	--	--
5	Energy Engineering	04	02	03	100	25	--	25
6	Project –I	--	02	--	--	25	--	25
7	Seminar	--	02	--	--	25	--	--
		20	12		500	150	--	100
	Grand Total	32			750			

Second Term

Sr. No.	Subject	Teaching Scheme Hours/Week		Examination Scheme				
		Lectures	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Computer Aided Process Equipment Design Modeling & Simulation	04	04	03	100	50	25	--
2	Process Engineering Economics & Costing	04	02	03	100	25	--	25
3	Chemical Plant Design & Project Engineering	04	04	03	100	25	--	25
4	Elective –II	04	--	03	100	--	--	--
6	Project –II	--	04	--	--	100	--	50
7	Industrial Visit / Case Study	--	--	--	--	25	--	--
		16	14		400	225	25	100
	Grand Total	30			750			

Subjects:

Elective-I
1. Biochemical Engineering
2. Polymer Engineering
3. Advance Catalysis

Elective-II
1. Industrial Pollution & Control
2. Advance Separation Techniques
3. Petrochemicals

1. PROCESS DYNAMICS & CONTROL

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Oral : 25 Marks
Term Work: 25 Marks

UNIT- I

Characteristics of Chemical Process Control, Mathematical Modeling of Chemical Processes, State Variables and State Equation for Chemical Processes.

Input –Output Model, Linearization of non linear systems, Solution of Linear differential equation using Laplace Transform.

First order system and their transfer functions.

(10 Hrs, 20 Marks)

UNIT- II

Dynamic behavior of first order system , Pure capacity process, First order system with variable time constant and gain, Response of first order system in series :Interacting and Non-interacting.

Second order system and their transfer function.

(10 Hrs, 20 Marks)

UNIT- III

Dynamic behavior of second order system: under damped and over damped and critically damped systems, Transportation lag.

Higher order systems.

Introduction to feedback control, Controllers and final control elements.

Control action block diagram of chemical reactant control systems.

(10 Hrs, 20 Marks)

UNIT- IV

Dynamic behavior of feedback control processes: P, PD, PI, and PID.

Design of feedback controller: Performance criteria, selection of type of controller, Tuning of feedback controller.

Stability analysis by Routh criteria, Root Locus Diagram

(10 Hrs, 20 Marks)

UNIT-V

Frequency response analysis of linear processes: Bode's diagram, Nyquist plots.

Design of feedback control system using frequency response technique: Bode's stability criteria, gain and phase margin.

Ziegler – Nichols tuning technique. Nyquist stability criteria,

Control Systems with Multiple Loops: Feed forward control, Cascade control, Ratio control, selective control, split range control, Adaptive and Inferential control. Multi Variable Control

(10 Hrs, 20 Marks)

PRACTICAL and TERM WORK:

Practical and Term work shall consist of minimum eight experiments from list given below.

Dynamic behavior of first order system

1. Mercury Thermometer
2. Single tank system.
3. C.S.T.R.

Dynamic behavior of first order system in series

4. Two tank non-interacting system.

5. Two tank interacting system.

Dynamic behavior of second order system

6. Mercury Manometer

Dynamic behavior of final control Element

7. Pneumatic control valve.

Study of Pneumatic controllers.

8. Proportional Controller
9. Proportional Derivative Controller
10. Proportional Integral Controller
11. Proportional Integral Derivative Controller

Control Systems

12. Study of closed loop control system.

REFERENCES

1. George Stephanpolous, Chemical Process Control, Prentice Hall of India.
2. D.R. Coughnour, Process System Analysis and Control, McGraw-Hill.
3. R.P.Vyas, Process Control & Instrumentation {2nd edition}. Central Techno publication, Nagpur.
4. K. Krishnaswamy, Process Control, New age International.

2. TRANSPORT PHENOMENON

Teaching Scheme:
Lectures: 4 Hrs./ Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)

UNIT-I

Introduction. Transport phenomenon and Unit Operation.

Equilibrium and Rate Processes. Fundamental variables and Unit The role of Intermolecular forces.

Simple Balance: Material and Energy.

Molecular transport Mechanism:

The Analogy. The Case of Heat Transfer. The Case of Mass Transfer. The Case of Momentum Transfer. The Analogues forms. Heat, Mass, Momentum Diffusivities. Thermal Conductivity. Diffusion Coefficient. Viscosity.

(10 Hrs, 20 Marks)

UNIT-II

Viscosity and Mechanism of Momentum Transport.

Velocity Distribution in Laminar Flow.

(10 Hrs, 20 Marks)

UNIT-III

Thermal Conductivity and The Mechanism of Energy Transport.

Temperature Distribution in Solids and in laminar Flow.

(10 Hrs, 20 Marks)

UNIT-IV

Diffusivity and Mechanism of mass Transport.

Concentration Distribution in Solids and in Laminar Flow.

(10 Hrs, 20 Marks)

UNIT-V

The Equation of Change for Isothermal System.

The Equation of Change for Non-Isothermal System.

(10 Hrs, 20 Marks)

REFERENCES

1. R.B.Bird; W.E.stewart; E.N.Lightfoot, Transport Phenomenon, John Wiley & Sons1994; Singapore
2. R.S.Brodsky & H.C.Hershey, Transport Phenomenon ,McGraw-Hill{International edition}
3. C.O.Bennett & J.E.yers; Momentum, Heat & Mass Transfer; McGraw-Hill1982.
4. James R. Welly, Charles E. Wicks & Robert E.Wilson; Fundamentals of Momentum, Heat & Mass Transfer{3rd edition}. John Wiley & Sons; Singapore

3. CHEMICAL REACTION ENGINEERING – II

Teaching Scheme:
Lectures: 4 Hrs. / Week
Practical: 4 Hrs. / Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Oral : 25 Marks
Term Work: 50 Marks

UNIT-I

Introduction – Rate equations for heterogeneous systems , Contacting patterns in Two –Phase system ,Introduction to fluid particle reaction non-catalytic reactions, unreacted core model for Spherical particle of unchanging size, Rate of reaction for shrinking spherical particles , Determination of rate controlling step , Various contacting patterns in fluid solid reactors for fluid-particle non-catalytic reactions

(10 Hrs, 20 Marks)

UNIT-II

Introduction to fluid-fluid system (without catalyst), Rate equation for Instantaneous, Fast, Intermediate and slow reaction, Slurry Reaction kinetics, Rate equation for infinitely slow reaction Film conversion parameter , Reactors for gas-liquid reactions and their comparative evaluations on the basis of holdups .

Gas liquid reaction modeling on the basis of simultaneous absorption reaction model.

Aerobic fermentation, Tower for fast and slow reaction, Mixer settler and semi-batch contacting pattern .

Reactive distillation and extractive reaction.

(10 Hrs, 20 Marks)

UNIT-III

Introduction , Classification , Characteristics , Preparation and Deactivation of catalyst , Promoters and inhibitors , Determination of surface area and Pore volume of catalyst , Adsorption process and its classification , Types of adsorption isotherm .

(10 Hrs, 20 Marks)

UNIT-IV

Introduction to solid catalyzed reactor , Rate equation for adsorption , desorption and surface reaction, Diffusion and reaction in spherical catalyst pellets , Internal effectiveness factor, Over all effectiveness factor, Estimation of diffusion and reaction limited regimes, Mass transfer and reaction in a packed bed, The determination of limiting situation from reaction data, chemical vapor deposition reactors.

(10 Hrs, 20 Marks)

UNIT-V

Introduction to heterogeneous catalytic reactors,

Design, Mechanical construction and applications of: Moving bed reactors, Fluidized bed Reactors, Slurry bed reactors, Trickle bed reactors, Isothermal and Adiabatic fixed bed reactor.

(10 Hrs, 20 Marks)

REFERENCES

1. Octave Levenspiel , Chemical Reaction Engg" 3rd edition (1999)
2. H Scott Fogler, Elements of Chemical Reaction Engineering, Prentice Hall of India , 2nd edition (1997)
3. J M Smith, Chemical Engg Kinetics 3rd edition , New York , McGraw Hill (1981)
4. Lanny D Schmidt , The Engineering of Chemical Reactions ,Oxford University Press (1998)
5. Froment and Bischoff , Chemical Reactor Analysis and Design, Wiley Publications , New York (1979)
6. Hiroo Tominaga and Masakazu Tamaki, Chemical reactions & reactor design Ed Wiley and Maruzene Publications(1997)

PRACTICAL and TERM WORK:

Practical and Term work shall consist of eight experiments from list given below.

1. To study the reaction of solid liquid system for an instantaneous reaction for benzoic acid NaOH and calculate the enhancement factor.
2. To study the isothermal decomposition of ethyl alcohol in tubular reactor packed with activated alumina catalyst.
3. To improve the % purity of commercially used ethanol using reactive distillation.
4. To improve the % purity of commercially used ethanol using extractive distillation.
5. To carry out the catalytic reaction to convert the nitrobenzene to aniline in presence of iron filling/HCl catalyst in the reactor.
6. To study the reaction of liquid liquid system for butyl acetate NaOH and to calculate the enhancement factor.
7. Absorption – to study the reaction of liquid gas system for NaOH – CO_2 to determine rate of absorption.
8. Adsorption- to study the adsorption of Acetic acid on charcoal
9. Preparation of Butyl Acetate by Reactive Esterification

4. ELECTIVE – I
1. BIOCHEMICAL ENGINEERING

Teaching Scheme: Examination Scheme:
Lectures: 4 Hrs./ Week Paper: 100 Marks (3 Hrs)

UNIT-I:

Characteristics of Biological material. Types of microorganisms; general physical properties of cells and chemical composition of cells; requirement for growth of cells and formulation of media; reproduction cycles in microorganisms; changes in composition of cells with age and with growth rate; effect of substrate limiting growth on the composition of cells; strain breeding; Maintenance of pure cultures.

Material Balances in bioprocesses, Application of material balances to bioprocesses; material balance with recycle, by-pass and purge streams. Stoichiometry of growth and product formation. Thermodynamics of microbial growth. Energy balances in bioprocesses, Heat of reaction for processes with biomass production. Unsteady state energy and material balances in bioprocesses.

(10 Hrs, 20 Marks)

UNIT-II:

Enzymes. History. Enzyme nomenclature and classification. Properties of enzymes. Applications of enzymes. Enzyme substrate complex and enzyme action. Effect of Temperature and pH on enzyme activity.

Kinetics of enzyme catalyzed reaction; simple enzyme kinetics with one and two substrates; Michaelis Menten kinetics. Evaluation of parameters of Michaelis Menten equation. Kinetics of reversible enzyme catalyzed reaction. Enzyme inhibition. Types of enzyme inhibition. Kinetics of competitive, uncompetitive and noncompetitive enzyme inhibition. Substrate activation and inhibition. Multiple substrates reacting on a single enzyme. Immobilization of enzymes and their applications. Kinetics of immobilized enzyme system.

(10 Hrs, 20 Marks)

UNIT-III:

Microbial Kinetics: Monod's growth kinetics. Environmental effects on growth kinetics. Balanced growth kinetics, Transient growth kinetics, Unstructured batch growth model, Growth of filamentous organisms, Structured kinetic model, Product formation kinetics. Unstructured model. Chemically structured kinetic model, Product formation kinetics by filamentous organisms.

Reactor Cofigurations: Enzyme reactors, Batch growth of microorganisms, Continuous culture of microorganisms, Stirred tank reactor with recycle of biomass, Continuous stirred tank fermenters in series, plug flow fermenter, fed batch fermenter, CSTR cell reactors with recycle and wall growth, multiphase reactors such as packed bed reactors, bubble column reactors, fluidized bed reactors and trickle bed reactors.

(10 Hrs, 20 Marks)

UNIT-IV:

Sterilization: Importance of Sterilization. Batch Sterilization of liquids, continuous sterilization of liquids, filter sterilization of liquids, sterilization of air, thermal death kinetics of cells and sports.

Aeration and Agitation: Mass transfer and Microbial respiration, bubble aeration and mechanical agitation, correlation between oxygen transfer coefficient and operating variables, effect of temperature, organic substances, surface active agents, mycelium and types of sparger on oxygen transfer coefficient. Measurement of oxygen transfer coefficient, Scale up.

(10 Hrs, 20 Marks)

UNIT-V:

Recovery of fermentation products, principle of mechanical separation; hindered settling in gravitation and centrifugal fields, filtration, pretreatment of cells to alleviated filtration resistance; Disruption of cells, mechanical methods, ultrasonic vibrations, grinding and mechanical shear, shearing by pressure, induction by lysis(physical methods, lytic agents, dessication, increasing the fragility of cells, Extraction preliminary fractionation procedures(removal of nucleic acids precipitation),high resolution techniques(ultra filtration, Chromatography, counter current distribution methods and other means).

Instrumentation and Control: Introduction, methods of measuring process variables; temperature measurement and control, pressure measurement and control ,foam sensing and control, weight of fermenter and estimation of microbial biomass, dissolved oxygen measurement and control, inlet and exit gas analysis, pH measurement and control, online analysis of other chemical factors and computer applications in fermentation technology, bioprocess economics.

(10 Hrs, 20 Marks)

REFERENCES

1. Shuichi Aiba, Arthur E.H. & Nancy F.M.,Biochemical Engineering; University of Tokyo Press.

2. James E.Bailey & David F.Ollis, Biochemical Engineering. Fundamentals; McGraw Hill Publication.
3. P.F.Stanbury, A.Whitaker & S,J.Hall, Principles of Fermentation Technology; Aditya Books Ltd; New Delhi.
4. Doran Pauline M. Bioprocess Engineering Principles, Academic Press. An Imprint of Elsevier.
5. Shular Michael L.and Kargi Fikret. Bioprocess Engineering Basic Concepts, Prentice Hall of India.
6. Editors: J.F. Richardson, D.G. Peacock, Coulson's & Richardson's Chemical Engineering, (Vol-III) Asian Books Pvt. Ltd. New Delhi
7. J.H. Backhurst& J.H.Harker, Coulson's & Richardson's Chemical Engineering(Vol-V) Asian Books Pvt. Ltd. New Delhi

4. ELECTIVE – I
2. POLYMER ENGINEERING

Teaching Scheme: Examination Scheme:
Lectures: 4 Hrs./ Week Paper: 100 Marks (3 Hrs)

UNIT-I:
Introduction to polymer and their classification. Types of polymerization. Addition Polymerization and Condensation Polymerization. Mechanism of polymerization.
Bulk, solution, suspension and emulsion polymerization techniques; merits, demerits and applications of these techniques.

(10 Hrs, 20 Marks)

UNIT-II:
Kinetics of polymerization: Kinetics of free-radical chain polymerization via initiation; propagation and Termination. Degree of polymerization and chain transfer reactions. Kinetics of catalyzed and uncatalyzed polycondensation reactions. Molecular Weight distribution; extent of reaction and degree of polymerization of polycondensation reactions.

(10 Hrs, 20 Marks)

UNIT-III:
Introduction to average molecular weight and Molecular Weight distribution in polymers, measurements of number, average by cryoscopy; Ebwiometry ; membrane osmometry ; vapor pressure osmometry and end group analysis. Measurement of viscosity, average molecular weight by viscometry.

(10 Hrs, 20 Marks)

UNIT-IV:
Thermal analysis of polymer by differential scattering calorimeter; TGA, TMA and HDT. Mechanical properties like tensile strength, Young's Modulus, hardness, etc.

(10 Hrs, 20 Marks)

UNIT-V:
Properties, applications and manufacturing techniques of polyethylene, PVC, Phenol formaldehyde, Urea formaldehyde resins, styrene-butadiene rubber (SBR), Nylon6, cellulose fiber (Rayon Yarn), PET.

(10 Hrs, 20 Marks)

REFERENCES
1. V. R. Gowarikar, N. V. Vishwanathan, Polymer science; Wiley Eastern Publication, Delhi
2. B. K. Sharma, Polymer Science, Goel Publishing House; Meerut
3. Fried W. Billmeyar, Text book of polymer science, John Willey and Sons
4. M. Gopalarao, Dryden's Outlines of Chemical Technology; 3rd edn; East West Press.

4. ELECTIVE – I
3. ADVANCE CATALYSIS

Teaching Scheme:
Lectures: 4 Hrs./ Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)

UNIT-I:
Catalysis: Introduction, History.
Homogeneous Catalysis: Introduction, Characterization of solution Processes, Examples of solution catalysis: Acid – base catalysis, Organometallic Catalysis.
Heterogeneous Catalysis: Introduction, Characterization of Surface Processes, Properties of Solid Catalysts, Influence of Mass Transport on Catalyst Performance.
Catalyst Components: Catalytically active species, Supports, Binders, Promoters.
Catalyst treatment: Activation, Deactivation, Regeneration, Redispersion, Reclamation, Disposal and Toxicity
Catalysis by Metals, Metal Oxides and zeolites, Metal Sulphides.

(10 Hrs, 20 Marks)

UNIT-II:
Supported Catalysts: Introduction, Definition of Supported Catalysts.
Advantages of Supported Catalysts: Separability, Cost, Catalyst activity, Catalyst Selectivity.
Support Materials for the Catalyst, Composition, Size and Shape, Surface Area., Porosity and Pore size. Attrition Loss, Density, Cost and quality.
Design and Development of Supported Catalysts: Preparation and Manufacture, Catalyst Preparation Methods, Catalysts from Physical Mixtures, Impregnated Catalysts, Ion exchange Catalysts. Testing and evaluation of Supported Catalysts, Application of Supported Catalysts.

(10 Hrs, 20 Marks)

UNIT-III:
Regeneration of Catalysts
Fluid Catalytic Cracking Unit: Process Description, Heat Balance, Coke formation, Coke burning, CO Combustion, Environmental aspects. Regenerator Operating Parameters. Influence of Regenerator design on Catalyst Fluidization, Equipment/Unit Operation in Cracking Units.
Noble and Base Metal Catalysis: Noble Metal Catalysis, Deactivation, Regeneration, Regeneration Processes such as continuous Catalyst Regeneration, Fixed Bed Semi Regenerative Process, Cyclic or swing, Reactor regeneration.
Base Metal Catalysis: Process and Catalyst Description.

(10 Hrs, 20 Marks)

UNIT-IV:
Catalysis in Petroleum and Petrochemical Industries:
Applications of zeolites in Petrochemical Refining. Improving quality of Petroleum fuels through Catalysis. O-xylene isomerization over Nickel containg SAPO-5 molecular sieves. Pd-sulfonated Polysiloxane catalyst for etherification of FCC light gasoline. Oxidation of Ethylbenzene catalyzed

by Soluble Cobalt (III) complexes. Comparative evaluation of various catalysts used for removal of NOx from air streams.

(10 Hrs, 20 Marks)

UNIT-V:

Biocatalysts: Introduction and importance of biocatalysts. Type of biocatalysts.

Enzymes: Definition, Sources of Enzymes, production of Enzymes. Formation of enzyme substrate complex. Applications.

Simple enzyme kinetics. Derivation of Michaelis Menten equation. Evaluation of parameters of Michaelis Menten equation. Effect of Temperature and pH on enzyme Kinetics.

Microbial Cell: Classification of cells. Requirement for the growth of cells and growth Media. Microbial Kinetics. Monods Equation. Parameters affecting the growth kinetics of cells. Immobilization of enzymes and cells. Methods and Techniques of immobilization. Application of immobilized enzymes and cells.

(10 Hrs, 20 Marks)

REFERENCES

1. Kirk Othmer, Encyclopedia of Chemical Technology, 4th edition, Volume-V. John wiley and sons New York.
2. Editors: Bhattacharya KG and Talukdar A K, Catalysis in Petroleum and Petrochemical Industries. Narosa Publishing House, New Delhi.
3. Editors: Richardson J.F. and Peacock D.G.Richardson and Coulson's , Chemical Engineering , Volume-III, Asian Books Pvt. Ltd., New Delhi.
4. James E. Bailey and David F.Ollis, Biochemical Engineering. Fundamentals; McGraw Hill Publication.

5. ENERGY ENGINEERING

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Oral : 25 Marks
Term Work: 25 Marks

UNIT-I:

Introduction to energy engineering. Energy resources and forms of energy. Energy demand. Changing energy consumption trends. National energy strategies. National energy plan. Energy power management and Energy planning in India. Energy Audit. Energy Conservation and recycling.

(10 Hrs, 20 Marks)

UNIT-II:

Conventional Energy Sources

Coal : Type of coal, classification of Indian coal. Important Properties of coal. Exploration, Storage and Transportation of coal. Coal gasification, coal liquefication. Carbonization of coal, Production of coke and coal gas, By-products.

Petroleum, Natural gas and Refinery Products: Introduction to Petroleum and Natural gas and Naphtha. Energy routs of petroleum. Exploration of petroleum. Production of crude oil and Natural gas. Transportation of crude oil and Natural gas. Refining of crude oil and Natural gas. Liquefaction of Natural gas. Petroleum and Natural gas in India.

(10 Hrs, 20 Marks)

UNIT-III:

Chemical Energy Sources:

Fuel cells: Introduction, Design and operation of a Fuel cell. Classification of fuel cells, Types of fuel cells, Advantages and disadvantages of fuel cells, Conversion efficiency of fuel cells, Work out put and EMF of fuel cell, Applications of fuel cells.

Hydrogen: Introduction, Applications of Hydrogen, Production of Hydrogen, Storage and transportation safety and management, Hydrogen technology development in India.

Methanol: Production of methanol, Applications of methanol as fuel.

Nuclear Energy: Nuclear energy and application compared with coal, Fuels for Nuclear Fission Reactor. Nuclear fuel cycle, Storage and Transportation. Energy from nuclear fission reaction. Uranium Enrichment Process. Nuclear Waste management.

(10 Hrs, 20 Marks)

UNIT-IV:

Solar Energy: Solar radiation and its measurement. Solar energy collectors, solar energy storage, Applications of Solar energy.

Wind energy: Basic Principles of wind energy conversion. Site Selection Considerations Classification of wind energy conversion system, Advantages and disadvantages of wind energy conversion systems, Storage and Applications of wind energy.

Geothermal Energy: Geothermal energy resources, utilization of geothermal energy, Applications of geothermal energy.

Tidal Energy: Tidal energy conversation, Tidal power, Tidal energy resources in India.

Bioenergy: Biomass energy resources, Biomass conversion processes, direct combustion of biomass, Thermo chemical conversion of biomass, Biochemical conversion, Ethanol from biomass, Applications.

(10 Hrs, 20 Marks)

UNIT-V:

Energy conversion technologies and Electrical power plants: Energy conversion processes and devices, Power plants with conventional energy sources, Coal fired steam thermal power plants, Hydro electric power plants, Nuclear fission reaction power plants, Gas-turbine power plants, Combined cycle power plants, Integrated coal gasification combined cycle power plants, Diesel electric power plants, Geothermal electrical power plants. Plant factors and reserves.

(10 Hrs, 20 Marks)

REFERENCES

1. S. Rao and Dr. B.B. Parulekar, “Energy Technology” Non Conventional, Renewable and Conventional, Khanna Publishers, Delhi.
2. G.D. Rai “Non conventional Energy Sources”, Khanna Publishers Delhi
3. S.B. Pandya, “Conventional Energy Technology” Fuels and Chemical Energy Tata McGraw-Hill Publishing Company Ltd, New Delhi
4. S.P. Sukhatme, “Solar Energy”, Principals of thermal collection and Storage. Tata McGraw-Hill Publishing Company Ltd, New Delhi

TERM WORK:

Term Work shall consist of any eight assignments given below.

1. Energy power management and Energy planning in India
2. Energy Audit, Energy Conservation and recycling.

3. Conventional Energy Sources: Coal
4. Petroleum, Natural gas and Refinery Products
5. Chemical Energy Sources
6. Nuclear Energy and Power plant
7. Solar Energy
8. Wind Energy, Geothermal Energy, Tidal Energy and Bioenergy
9. Energy conversion technologies and power plants

6. PROJECT-I

Teaching Scheme:
Practical: 2 Hrs./ Week

Examination Scheme:
Oral : 25 Marks
Term Work: 25 Marks

The project topic shall consists of either some investigation work or design problem or experimental set up of some development work or prototype equipment or dissertation related to field of chemical engineering.
Project shall be taken in the beginning of the seventh term in consultation with concerned guide and must be completed in eighth term. The project proposal must be submitted in the beginning of the seventh term by every student or a group of students (not more than five students in a group).
The students shall submit the report to the corresponding guide, present their work in due time based on following points,

- Introduction.
- Literature survey.
- Physical / chemical properties etc.
- Experimental setup and procedure.
- Extent of project completed.

Presentation can be performed with OHP slides / LCD.
The progress of the project shall be evaluated by a committee of internal teachers which shall include concerned guide also and shall award the term work marks.
The oral examination of the project shall be conducted by concerned guide and external examiner jointly.

7. SEMINAR

Teaching Scheme:
Practical: 2 Hrs./ Week

Examination Scheme:
Term Work: 25 Marks

During seventh term, every student individually will study a topic assigned to him and submit a report in a typed form and shall deliver a short lecture / seminar on the topic at the time of seminar oral examination .The topic assigned will be related to the field of chemical engineering.

The students shall deliver the seminar (10 to 15 minutes) and submit the seminar report to the staff member on different technical subjects during the semester. The assessment of the term-work shall be based on the: -

1. Attendance to the seminar
2. Performance of the seminar delivery
3. Seminar reports and
4. Viva voce during the seminar.

The staff member/members shall guide the students in:

1. Selecting the seminar topic.

2. Information retrieval (literature survey)
    a) Source of Information i.e. names of the journals, reports, books etc.
    b) Searching for the information i.e. referring to chemical abstracts etc.
3. Preparing the seminar report
4. Delivering the seminar

The oral examination shall be conducted by a committee of teachers internally which shall include the concerned guide also and shall award the oral marks (in the seventh term / at the end of seventh term).

1. COMPUTER AIDED PROCESS EQUIPMENT DESIGN MODELING & SIMULATION

Teaching Scheme:
Lectures: 4 Hrs. / Week
Practical: 4 Hrs. / Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Practical: 25 Marks
Term Work: 50 Marks

UNIT-I:
Computer Aided Design:
Shell and Tube Heat Exchanger.
Reactor

(10 Hrs, 20 Marks)

UNIT-II:
Computer Aided Design:
Single Effect Evaporator.
Distillation Column.

(10 Hrs, 20 Marks)

UNIT-III:
Computer Aided Design:
Absorption Column.
Rotary Dryer.

(10 Hrs, 20 Marks)

UNIT-IV:
Introduction to Lumped Parameter Model.
Comparison of Model with Real Situation.
Modeling of An Activated Sludge Process as a continuous Operation by Recycling Biological Sludge
Modeling Difficulties in C.S.T.R.
Modeling of Constant Hold up Three CSTR's in Series.
Modeling of Batch Reactor With First Order Consecutive Reaction Takes Place as Time Proceed for Study of Optimal Batch Time.
Modeling for Maximizing the Yield of the Intermediate (Desirable) Product.
Modeling for Evaluation of the Adiabatic Equilibrium Temperature.
Modeling for Catalyst Decay in a CSTR.
Modeling for Evaluation of Conversion with Catalyst Decay in Batch Reactor.

(10 Hrs, 20 Marks)

UNIT-V:
Introduction of the Chemical Engineering Simulation.
Simulation Language.
When to Use Simulation?
Steps of Simulation Process.
Chemical Engineering Application of Simulation Techniques.
Advantage and Limitation of Simulation Technique.
Simulation of Ammonia Production System.
Simulation of Catalyst Temperature by Newton-Raphson Method.
Simulation of CSTR By Euler's Method.

Simulation of CSTR with Second Order Irreversible Exothermic Reaction Using Runga-Kutta Method.

(10 Hrs, 20 Marks)

Practical and Term Work shall consist of following experiments.

1. Computer aided design of shell & tube heat exchanger.
2. Computer aided design of single effect evaporator.
3. Computer aided design of rotary dryer.
4. Simulation of ammonia production system.
5. Simulation of catalyst temperature by Newton Raphson method.
6. Simulation of Reactor Design.
7. Computer control heat exchanger.
8. Computer Aided Design of absorber.

REFERENCES

1. W. L. Luyben , Process Modeling Simulation and Control for Chemical Engineers; 1988 McGraw Hill.
2. B.C. Bhattacharya & C. M. Narayan, Computer Aided Design of Chemical Process Equipment : 1st Edition, 1992, NCBA, Calcutta

Note: Students Can Utilize FORTRAN -77 And / Or C And/Or C++ Programming Language for the Above Syllabus.

2. PROCESS ENGINEERING ECONOMICS & COSTING

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Oral : 25 Marks
Term Work : 25 Marks

UNIT-I:

Scales of Production, Selection of Plant Capacity, Plant Location. Availability of Raw Materials, Energy Gestation Period. Expansion, Diversification and Obsolescence. Scope for Standardization in Design and Production .Economics of Research and Development .Indian Chemical Industry , Current Status and Trends .

(10 Hrs, 20 Marks)

UNIT-II:

Cost Estimation: Factors Affecting Investment and Production Cost .Capital Investment , Fixed Investment and Working Capital .Estimating Equipment Cost By 6 /10 Factor Rule .Method of Estimating Capital Investment .Different Costs Involved in Total Product Cost .Computer Automization in Costing.

(10 Hrs, 20 Marks)

UNIT-III:

Interest and Investment Cost , Simple and Compound Interest , Nominal and Effective Rates of Interest , Continuous Interest , Ordinary Annuity ,Perpetuities and Capital Costs . Taxes and Insurances: Types of Taxes and Tax Returns. Types of Insurance and Legal Responsibility.

(10 Hrs, 20 Marks)

UNIT-IV:
Depreciation: Types of Depreciation, Service Life, Salvage Value, Present Value. Methods of Determining Depreciation, Single Unit and Group Depreciation .Causes of Obsolescence and Inadequacy.

(10 Hrs, 20 Marks)

UNIT-V:
Profitability, Alternative Investment and Replacement, Mathematical Methods of Profitability Evaluation, Cash Flow Diagram. Break Even Analyses, Balance Sheet, Pricing Issue Method and Income Statement.

(10 Hrs, 20 Marks)

TERM WORK:
Term Work shall be based on the following.
1. Location of a chemical plant
2. Indian Chemical industry
3. Cost Estimation
4. Interest and Investment costs
5. Taxes and Insurance
6. Depreciation
7. Profitability and Replacement
8. Break Even Analysis

REFERENCES

1. Peter M.S. Timmerhaus K.D. Plant Design and Economics for Chemical Engineers. McGraw Hill.
2. Vilbrandt F.C. and C.E. Dryden , Chemical Plant Design. McGraw Hill
3. T.R. Banga and S.C.Sharma, Industrial Organization & Engineering Economics, Khanna Publications, New Delhi.
4. O.P.Khanna Industrial Engineering & Management, Dhanpat Rai Publications Pvt. Ltd. New Delhi.
5. Dewett & Varma, Elementary Economic Theory : S Chand & Company Ltd New Delhi

3. CHEMICAL PLANT DESIGN & PROJECT ENGINEERING

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 4 Hrs./ Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Oral : 25 Marks
Term Work: 25 Marks

UNIT-I:
Introduction to Chemical Engineering Plant Design and Project Engineering.
The role of Chemical Engineer in Chemical Plant Design. Chemical Engineering Design, need for Plant Design, Process Design.
Development of the project: Evaluation of a process, process research, research evaluation, process development, preliminary engineering studies, pilot plant, semi-commercial plant, commercial plant and commercial plant design factors.
Technical factors, economic factor, safety considerations, legal phases, sources of information.

(10 Hrs, 20 Marks)

UNIT-II:

Process Design: Choice of process continuous Vs. Batch processing.

Process Equipments and Materials: Selection of Materials, Plan for Selection of Materials. Selection of Process Equipments, Equipment selection procedures, standard Vs. special equipment. Scale up method, types of flow sheet, development of process flow sheet from process information.

(10 Hrs, 20 Marks)

UNIT-III:

Plant Layout : Introduction planning-layout, factors in planning-layout methods of layout planning area concept, two dimensional layouts, scale models, principles of plant layout, safety, utilities & material handling equipments , railroads and roads, etc.Plant layout for Benzene Hexachloride process.

Locating the Chemical Plant: Introduction, summary of factors in plant location.

Economics location, plant location factors, raw material supply, market and transportation, power and fuel, water supply , temperature, plant measures for conservation of water, legal restriction, federal pollution act, climate, labour, community and site characteristics and waste disposal.

(10 Hrs, 20 Marks)

UNIT-IV:

Site preparations and Structures : Introduction, Site Preparation, Surface Evaluation, Foundation and Shape of Foundation, Machinery and Equipment Foundations, Supports, Outdoor Plants, Selection Building types, Building design principles, Flooring , walls, Roof, safety and higher protection conditioning , heating and ventilation. Cost Consideration for Plant Sites and Structures New Development in Management techniques. (PERT & CPM).

(10 Hrs, 20 Marks)

UNIT-V:

Process Auxiliaries : Introduction, Piping, Explanation of CODES, Selection of Piping, Pipe strength, Wall thickness, Nominal Pipe Size (NPS), Criteria for Selection of Materials, Pipe sizing by ID, Choosing the final pipe size, Process steam piping, piping layout, piping insulation, methods of providing flexibility for piping.

(10 Hrs, 20 Marks)

TERM WORK:

Term Work shall consist of minimum 5 (five) half imperial size sheets based on above syllabus.

1. Process flow diagram of Manufacturing of Benzene Hexa Chloride (BHC)
2. Process flow diagram of Manufacturing of Nitric Acid
3. Plant Layout for Manufacturing of Benzene Hexa Chloride (BHC)
4. Plant Layout for Manufacturing of Nitric Acid
5. Piping diagram for Manufacturing of Nitric Acid
6. Piping diagram for Manufacturing of Benzene Hexa Chloride (BHC)
7. Network Analysis Numerical : PERT & CPM

REFERENCES

1. F.C. Vilbrandt and C.E. Dryden, Chemical Engineering Plant Design McGraw Hill, New Delhi.
2. Peter M. S. and K.D. Timmerhaus, Plant Design and Economics for Chemical Engineers. McGraw Hill.
3. Modes J. and Philips, Rheinhold, Project Engineering with CPM and PERT :
4. Perry’s Chemical Engineer’s handbook.

4. ELECTIVE – II
1. INDUSTRIAL POLLUTION & CONTROL

Teaching Scheme: Examination Scheme:
Lectures: 4 Hrs./ Week Paper: 100 Marks (3 Hrs)

UNIT-I:
Introduction: Types of Pollution. Introduction: Pollution control aspects. Environmental Legislation: Water (Prevention and Control of Pollution) Act,197, Air (Prevention and control of Pollution) Act, 1981. Industrial Waste Water Analysis. Industrial Gaseous Effluent Analysis. General Instrument for Gaseous Pollutants.

(10 Hrs, 20 Marks)

UNIT-II:
Removal of BOD. Introduction to removal of BOD Biological oxidation units: Activated Sludge Process; Trickling /Biological Filters; Waste Stabilisation Ponds. Anaerobic Treatment. Numerical Examples based on removal of BOD.
Removal of Chromium. Introduction to removal of Chromium. Control Methods, Reduction precipitation, Ion Exchange, Reverse Osmosis, Lime coagulation and adsorption.

(10 Hrs, 20 Marks)

UNIT-III:
Removal of Mercury: Introduction of removal of mercury, Measurement of Mercury, Ventron mercury removal process.
Removal of ammonia/urea: Introduction to removal of ammonia/urea, Methods for removal of nitrogen, Physico-chemical processes, Biological methods.

(10 Hrs, 20 Marks)

UNIT-IV:
Treatment of Phenolic Effluents: Introduction to Treatments of Phenolic Effluents, Sources of phenols.
Treatments/Removal Methods: Steam Gas Stripping. Adsorption/Ion Exchange; Extraction of phenols using Phenosolvants Biological Methods of Treatment.
Removal of particulate matter: Introduction to removal of particulate matter, Gravity settling chamber, solid traps, cyclone separators, fibre filters, fabric filters, liquid scrubbers and ESP.
Numerical Examples based on settling chamber, cyclone separators, fiber filter, liquids scrubber and ESP.

(10 Hrs, 20 Marks)

UNIT-V:
Pollution control in process industries:
Introduction to pollution control,
Pollution control aspects of fertilizer industry: Introduction to pollution control in fertilizer industry.
Removal of carbon in ammonia plant effluents by scrubbing with liquids using vacuum filtration,
Removal of oil in ammonia plant effluents, Removal of hydrogen sulphide in ammonia plant effluents
Pollution control in petroleum and petrochemical units: Introduction
Refinery Liquid based treatment methods: Oxidation pond treatment, disposal of sludges.
Treatment of liquid effluents from petrochemical industries, Removal of hydrogen sulphide gas from sour gas by stripping, Removal of ammonia from gases.
Alcohol industry: Treatment method by recovery of potash from distillery spent-wash.

(10 Hrs, 20 Marks)

REFERENCES
1. S. P. Mahajan, Pollution control in process industries, Tata McGraw-Hill Publication
2. M. N. Rao & A K. Datta, Waste Water Treatment: IBH Pub., Delhi

4. ELECTIVE – II
2. ADVANCE SEPARATION TECHNIQUES

Teaching Scheme: Examination Scheme:
Lectures: 4 Hrs./ Week Paper: 100 Marks (3 Hrs)

UNIT-I:
Separation Processes: Industrial Chemical Processes, Mechanism of Separation
Separation by phase addition or creation. Separation by barrier. Separation by solid agent. Separation by external field or gradient. Component Recoveries and product purities. Separation power. Selection of feasible separation processes.
Crystallization from the melt: Introduction.
Progressive freezing: component Separation by progressive freezing, Pertient variables in progressive freezing. Applications.
Zone melting: component separation by zone melting, pertient variables in zone melting, Application.
Melt crystallization from the bulk: Investigations, commercial equipment and application.
Falling-film crystallization: Principles of operation, commercial equipment and applications.

(10 Hrs, 20 Marks)

UNIT-II:
Enhanced distillation: Introduction. Azeotropism.
Azeotropic distillation: Introduction, exploitation of homogeneous azeotropes, exploitation of pressure sensitivity, exploitation of boundary curvature, Exploitation of azeotropy and liquid Extractive distillation: Introduction, solevent effect in extractive distillation, extractive distillation design and optimization, solvent screening and selection extractive distillation by salt effects. Reactive distillation: Introduction, simulation, modeling and design feasibility, Mechanical design and implementation issues, process applications.

(10 Hrs, 20 Marks)

UNIT-III:
Supercritical fluid separation processes: Introduction. Physical properties of pure supercritical fluids; thermodynamic properties and transport properties. Process concept in super critical fluid extraction. Phase equilibria: Liquid- Fluid equilibria, Solid- Fluid equilibria, Polymer- Fluid equilibria and the Glass Transition, Cosolvents and surfactants, phase equilibria models. Mass Transfer.
Applications: Food and Pharmaceutical applications, Temperature controlled residuum Oil super critical extraction [ROSE], Extraction from aqueous solution, Adsorption and desorption, Polymer de volatilization and fractionation, Drying and Aerogel formation, Clearing, Crystallization, Reactive separations.

(10 Hrs, 20 Marks)

UNIT-IV:
Membrane separation processes: Introduction. Advantages of membrane separations, Basic equations, Basic concept, Membrane types, Economics.
Electro dialysis: Process description, examples, membranes, membrane efficiency, process description and configuration, Energy requirements, Equipment and economics.
Reverse osmosis and Nano filterization: Processes description, examples Basic principles of operations, RO and NF membranes, process limitations and configuration. Economics.
Ultra filtration: Process description, UF membranes, membrane characterization, process limitations, process configurations, Energy requirements, Design and economics.
Microfiltrations: process description, Examples, MF membranes, membrane characterization , process limitations, Equipments configurations, process Applications and Economics.
Gas- Separations membranes: Process descriptions, examples, Basic principles of operations, selectivity and permeability, Gas- Separation membranes, membrane system design features, energy requirements and economics.
Pervaporization: Process description, definition, operational factors, vapor feed, examples, pervaporation membranes, modules.

(10 Hrs, 20 Marks)

UNIT-V:
Biochemical separation processes: Introduction.
Initial product harvest and concentration: centrifugation, Filtration, Selection of cell separation Unit operation, Cell disruption, protein refolding.
Initial purification: Precipitation, Extraction, Adsorption, Membrane processes.
Final Purification and product formulation.: Chromatography, Lyophilization and drying. Integration of fermentation and downstream processing operations.

(10 Hrs, 20 Marks)

REFERENCES

1. Perry Robert H. and Green Don W. Perry's chemical Engineers Handbook 7th edition. McGraw Hill Publication, New York.
2. Seader J. D. and Henley Ernest J, Separation Process Principles. John Wiley and Sons, Inc, New York
3. Ladisch Michael R., Bioseparations Engineering, Principles, Practice and Economics, Wiley Interscience, John Wiley and Sons, Inc. Publications New York
4. Long Robert B. Separation Process in Waste Minimization .Marcel Dekker, Inc, New York

4. ELECTIVE – II
3. PETROCHEMICALS

Teaching Scheme:
Lectures: 4 Hrs./ Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)

UNIT-I
Petrochemical Industry in India. Feed stocks for petrochemicals, separation of aromatics
Chemicals from methane: Manufacture of methanol, formaldehyde, acetic acid, ethylene glycol, CS_2, liquid fuels from methanol, manufacture of ethanol.

(10 Hrs, 20 Marks)

UNIT-II
Chemicals from ethane- ethylene-Acetylene.
Ethane: Occurrence, halides of ethane, Nitroethane and oxidation of ethane.

Ethylene production, production of ethylene derivatives like vinyl acetate monomer, ethylene oxide, ethylene diamine, ethanol and acetaldehyde.
Chemicals from acetylene: acrylic acid, vinyl chloride, vinyl acetate and Acetonitrile.

(10 Hrs, 20 Marks)

UNIT-III

Chemicals from C_3, C_4 and higher carbon atoms:
Products from propane. Dehydrogenation of propane and higher paraffins.
Chemicals from propylene: Isopropyl alcohol, acetone, propylene glycol, acrylic acid and ester, Phenol.
Dehydrogenation of butanes. Production of Iso and n- butanol. Production of methyl –tert-butyl ether [MTBE], Adipic acid. Derivatives from hydrocarbons higher than butane.

(10 Hrs, 20 Marks)

UNIT-IV

Synthesis gas and chemicals:
Synthesis gas. Steam reforming of hydrocarbons. Production of synthesis gas. Chemicals from synthesis gas. Oxo synthesis, vinyl acetate, acetic acid.
Fischor- Tropsch synthesis: catalysts and the products.
LPG: sources, properties grades of LPG. Supply of LPG to consumers, the storage and use of LPG, LPG piping system, safety consideration and emerging action. Emergency controls and action.

(10 Hrs, 20 Marks)

UNIT-V

Petroleum aromatics: Production of BTX.
Benzene derivatives like Aniline, phenol, alkylation of benzene.
Products from toluene: Chloro toluenes, O- Cresols, Dinitro toluenes, Benzaldehyde, caprolactum, Terephthalic acid.
Chemicals from xylene: o-xylene, m-xylene, p-xylene, Naphthalene

(10 Hrs, 20 Marks)

REFERENCES

1. Bhaskararao B.K. “A Text on petrochemicals”, Khanna Publishers, New Delhi
2. Sarkar G.N. “Advanced Petrochemicals” Khanna Publishers, New Delhi
3. Maiti Sukumar [editor],”Introduction to Petrochemicals”, Oxford and IBH Publishing co. Pvt. Ltd. New Delhi

6. PROJECT-II

Teaching Scheme:
Practical: 4 Hrs./ Week

Examination Scheme:
Oral : 50 Marks
Term Work: 100 Marks

The students are required to carry out one of the following projects.
1. Process based Project: Manufacture of product.
2. Equipment based Project: Detailed design and fabrication of the equipment for a given capacity.
3. Experimental based Project: Experimental investigation of basic or applied research problem.
4. Industrial Problems: Any problem or project directly related to existing plants for modification of process or equipment or regarding pollution control and energy conservation under the guidance of a staff member and /or staff members and submit a typed report in duplicate.

The Project Work consists of collection of literature, study of the various processes selection of the process, computation of material and energy balances, process design of important equipments, detailed design of one of the main equipment, plant location and layout, cost Estimation,
economic analysis, details of experimental set up, analysis of data, pollution control, safety, marketing, conclusions and recommendations, bibliography, etc., as applicable to the individual problem.
The object of the project is to make use of the knowledge gained by the student at various stages of the degree course. This helps to judge the level of proficiency, originality and capacity for application of the knowledge attained by the student at the end of the course.
Each group should consist of maximum 5 students. For term-work (Internal) of 100 marks, the assessment should be by conducting frequent written tests, seminars during the year and an oral examination at the end of the year conducted by all the staff members of the department. The Head of the Department should see that the assessment procedure should be the same for all the students of the class. For external 50 marks, the project work shall be assessed by an oral examination by at least two examiners, one internal and one must by external at the end of the year.
The object of the VIVA VOCE examination (Internal and External Orals) is to determine whether the objectives of the project work have been met by the student as well as to assess the originality and initiative of the student as demonstrated in the project work.

7. INDUSTRIAL VISIT / CASE STUDY

Examination Scheme:
Term Work: 25 Marks

During seventh term, every student shall visit minimum three industries or organization pertaining to the Chemical Engineering arranged by College and accompanied by departmental teachers as per AICTE and University norms. The report of technical visit shall be submitted by every student at the end of eight term which shall be evaluated by the concerned teachers through internal Viva Voce.

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Second Year Engineering (Computer)

Faculty of Engineering and Technology

COURSE OUTLINE

Semester – III

W.E.F 2013 – 2014

Annexure - I

SE Semester - III

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory			Practical	Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Engineering Mathematics-III	A	3	1	---	4	20	80	---	---	100	4
Analog & Digital Electronics	B	3	---	---	3	20	80	---	---	100	3
Discrete Structure & Graph Theory	D	3	1	---	4	20	80	---	---	100	4
Microprocessor & Microcontroller	D	3	---	---	3	20	80	---	---	100	3
Object Oriented Technology	D	3	---	---	3	20	80	---	---	100	3
Soft Skills – III	C	1	---	2	3	---	---	50	---	50	2
Analog & Digital Electronics Lab	B	---	---	2	2	---	---	50	---	50	1
Discrete Structure & Graph Theory Lab	D	---	---	2	2	---	---	25	25 **(PR)**	50	1
Microprocessor & Microcontroller Lab	D	---	---	2	2	---	---	25	25 **(PR)**	50	1
Object Oriented Technology Lab	D	---	---	2	2	---	---	25	25 **(PR)**	50	1
Total		**16**	**2**	**10**	**28**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

SE Semester - IV

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Data Communication	D	3	---	---	3	20	80	---	---	100	3
Microprocessor & Microcontroller Interfacing	D	3	1	---	4	20	80	---	---	100	4
Data Structures	D	3	1	---	4	20	80	---	---	100	4
Computer Organization	D	3	---	---	3	20	80	---	---	100	3
Computer Graphics	D	3	---	---	3	20	80	---	---	100	3
Application Development Lab	B	1	---	2	3	---	---	50	---	50	2
Data Communication Lab	D	---	---	2	2	---	---	50	---	50	1
Microprocessor & Microcontroller Interfacing Lab	D	---	---	2	2	---	---	25	25 **(PR)**	50	1
Data Structures Lab	D	---	---	2	2	---	---	25	25 **(PR)**	50	1
Computer Graphics Lab	D	---	---	2	2	---	---	25	25 **(PR)**	50	1
Total		**16**	**2**	**10**	**28**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

Engineering Mathematics –III

COURSE OUTLINE

Course Title	Short Title	Course Code
Engineering Mathematics -III	**EM-III**	

Course Description:

This course is aimed at introducing the fundamentals of basic Mathematics to undergraduate students. The background expected includes a prior knowledge of Mathematics from first year engineering or diploma and familiarity with various laws, principles and theories. The goals of the course are to understand the basic principle of Mathematics and its application in different area.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**40**	**04**
Tutorial	**01**	**15**	**13**	

Prerequisite Course(s): Engineering Mathematics-I, Engineering Mathematics-I / Diploma Mathematics.

COURSE CONTENT

Engineering Mathematics -III **Semester- III**

Teaching Scheme	**Examination Scheme**	
Lecture: 3 hours / week	**End Semester Examination (ESE)**	**: 80 Marks**
Tutorial: 1 hour / week	**Paper Duration (ESE)**	**: 03 Hours**
	Internal Sessional Exam (ISE)	**: 20 Marks**

1. Laplace Transform (08 Hours, 16 marks)

- Definition and Existence of Laplace transforms.
- Laplace Transform of elementary/standard functions.
- Theorems and Properties of Laplace Transform (without proof).
- Inverse Laplace Transform.
- Laplace Transform of Unit step function.
- Solution of differential equations using LT.

2. Fourier Transform and Z-Transform (08 Hours, 16 marks)

A) Fourier Transform:

- Introduction to Fourier Integral theorem.
- Fourier Transforms, Fourier Cosine Transforms, Fourier Sine Transform and their inverse.

B) Z- Transform:

- Definition and standard properties (without proof)
- Region of Convergence.
- Z-Transform of standard / elementary sequences.
- Inverse Z-transform.

3. Statistics and Probability distributions (08 Hours, 16 marks)

- Introduction to Mean, Mode, Median standard deviation, Variance, Coefficient of Variation.
- Moments, Skewness and kurtosis.
- Correlation and Regression.
- Binominal Distribution.
- Poisson distribution.
- Normal distribution.

4. Testing of Hypothesis and Significance (08 Hours, 16 marks)

- Introduction to population parameters and statistics.
- Testing of Hypothesis, Null Hypothesis and Alternative Hypothesis.
- Level of Significance.
- Test of Significance of large sample.
- Chi-Square test.

5. Fuzzy Sets and System (08 Hours, 16 marks)

- Introduction to Fuzzy sets.
- Standard Fuzzy sets operations.
- Crisp sets, Crisp sets verses Fuzzy sets.
- Fuzzy arithmetic.
- Constructing Fuzzy sets and operations on Fuzzy sets and systems
- Applications of Fuzzy sets.

Text Book:

1. Debashis Dutta, “Textbook of Engineering Mathematics”, New Age International Publishers.
2. Witold Pedrycz and Fernando Gomide, “An Introduction to Fuzzy Sets: Analysis and Design”, Prentice Hall of India, New Delhi.

Reference Books:

1. H.K. Dass, “Advanced Engineering Mathematics”, S. Chand Publication, New Delhi.
2. Erwin Kreyszig, “ Advanced Engineering Mathematics”, Wiley Eastern Ltd.
3. B.S. Grewal, “Higher Engineering Mathematics” , Khanna Publication, Delhi.
4. Wylie C.R. & Barrett , “ Advanced Engineering Mathematics”, Mc Graw Hill
5. B.V. Raman, “Engineering Mathematics”, Tata Mc Graw Hill.
6. N. P. Bali , “A Text Book of Engineering Mathematics”, Laxmi Publication.
7. George J. Klir and Bo Yuan, ‘‘Fuzzy Sets and Fuzzy Logic: Theory and Applications”.

Analog and Digital Electronics

COURSE OUTLINE

Course Title	Short Title	Course Code
Analog & Digital Electronics	**ADE**	

Course Description:

This course provides an introduction to Operational Amplifier & its applications. Digital electronics & its applications covering: different types of codes, Boolean laws, sop and pos form, K map technique, Arithmetic circuits such as Adder, Substractor. Multiplexer, Demultiplxer and their application; different types of flip-flops.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	**15**	**45**	**03**

Prerequisite Course(s): Fundamental knowledge of EEEE (Elements of Electronics and Electrical Engineering).

COURSE CONTENT

Analog & Digital Electronics **Semester-III**

Teaching Scheme	**Examination Scheme**
Lecture: 3 hours / week	**End Semester Examination (ESE) : 80 Marks**
Tutorial: 1 hour / week	**Paper Duration (ESE) : 03 Hours**
	Internal Sessional Exam (ISE) : 20 Marks

1 Operational Amplifier Basics & applications (08 Hours, 16 marks)

a Advantages of ICs over discrete components
b Block diagram of op-amp ,op-amp symbol, op-amp IC 741- pin diagram
c Basic arithmetic operation circuits.
d Instrumentation amplifier
e V to I and I to V converter, its applications
f Sample and hold circuit

2 Comparators and Signal Generators (08 Hours, 16 marks)

a Inverting and non inverting comparator.

b Zero crossing detector, window detector
c Schmitt trigger, its advantages.
d Limitation of op-amp as comparator.
e Waveform generator circuits.
f Timer IC 555 & its operating modes.

3 Review of fundamental concepts (08 Hours, 16 marks)

a Basic gates, universal gates & Exclusive gates
b Digital Signal, Positive & Negative logic
c Boolean Algebra: Boolean postulate and Theorems
d Examples of realization of Boolean functions using Boolean algebra
e Introduction to digital logic families: DTL, TTL & CMOS

4 Combination logic design (08 Hours, 16 marks)

a Standard representation of logical function.
b K map representation of logical function.
c Simplification of logical function using K map for 2, 3 & 4 variables.
d K map with Don't care condition.
e Design of half adder, full adder half substractor, full substractor.

5 Combination logic design examples (08 Hours, 16 marks)

a Example of combinations logic circuit.
b Implementation with the help of Basic/Universal gates.
c Design of multiplexer & Demultiplexer.
d Design of comparator circuits using logic gates.
e Design of parity generator & checker circuit using logic gates.
f Introduction to sequential logic circuit.

Text Books:

1. D. Roy Chaudhary, Shail Jain "Linear Integrated Circuit", New Age International, Second edition.
2. R.P. Jain "Modern Digital Electronics", TMH, Third edition.

Reference Books:

1. Ramakant A. Gaikward "Op amp and Integrated circuit", PHI, Fourth edition, 2012.
2. Coughling, Driscoll "Op amps and Linear Integrated Circuits", Pearson education, Sixth edition.
3. M. Morris Mano "Digital Logic and Computer Design", Pearson.
4. A Anandkumar "Fundamentals of Digital Circuits", Pearson.

5. Sergio Franco “Design with Operational Amplifier and Analog Integrated Circuits”, TMH- Third edition.
6. Botkar “Integrated circuits”, Khanna Pub.

Discrete Structure and Graph Theory

COURSE OUTLINE

Course Title	Short Title	Course Code
Discrete Structure and Graph Theory	**DSGT**	

Course Description:

The objective of this course is to introduce the students to the fundamentals of Discrete Structures and also with Graph Theory with concepts of the C programming language and enable them to apply these concepts for solving real world problems.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	15	45	04
Tutorial	01	15	15	

Prerequisite Course(s): Fundamental knowledge of C

COURSE CONTENT

Discrete Structure and Graph Theory **Semester-III**

Teaching Scheme	Examination Scheme	
Lecture: 3 hours / week	**End Semester Examination (ESE)**	**: 80 Marks**
Tutorial: 1 hour / week	**Paper Duration (ESE)**	**: 03 Hours**
	Internal Sessional Exam (ISE)	**: 20 Marks**

1. Propositions, Sets, Probability (08 Hours, 16 marks)

a Propositions, compound proposition, basic logical operations, truth tables, tautology, contradiction.

b Quantifiers: universal and existential quantifiers.

c Theory: Set, Combinations of Sets, Mathematical Induction Principle.

d Cardinality of finite Sets, Rule of sum, Rule of product.

e Permutations, Combinations.

f Discrete Probability.

2. Relations and Functions: (08 Hours, 16 marks)

a Definitions, properties of Binary relations.

b Equivalence Relations and partitions, Partial ordering relations.

c Lattice, chains and antichains.

d Transitive Closure and Warshall's Algorithm.

e Functions Definitions, Composition of Functions, Types of Function.

f Recursive Functions, Pigeonhole principle.

3. Recurrence Relation and Analysis of Algorithms (08 Hours, 16 marks)

a Recurrence Relation, Linear Recurrence Relations with constant Coefficients.

b Homogeneous Solutions, Particular Solutions, total solutions, Solution by the method of generating functions.

c Introduction, Largest number algorithm, sorting algorithms: Bubble sort.

d Divide and conquer algorithms: binary search algorithm.

e strassens matrix multiplication, Time Complexity of Algorithms.

f Complexity of Problems, Tractable and Intractable Problems.

4. Graphs and Trees (08 Hours, 16 marks)

a Basic terminology, multigraphs and weighted graph , paths and circuits.

b Dijkstra's shortest path algorithms.

c Euler and Hamiltonian Paths and circuits .

d factors of a graph, Planner graph.

e Trees, rooted trees, path length in rooted trees.

f prefix code, binary search trees.

g spanning trees and cut set, minimum spanning trees.

h kruskal's and prim's algorithms for minimum spanning tree.

5. Algebraic system Boolean algebra (08 Hours, 16 marks)

a Semigroup, Subsemigroup, Monoid, Submonid.

b Abelian Group, Subgroups.

c Isomorphism, Automorphism,Homomorphism .

d Ring, Integral domain ,field .

e Lattice and Algebraic systems, Principle of duality.

f basic properties of lattice defined by lattices, distributive and complemented lattices.

g Boolean lattices and Boolean algebras, Boolean functions and Boolean Expressions.

h Number system and Interconversion of number systems.

Text Books:

1. C.L. Liu , " Elements of Discrete Mathematics", Second edition, TMH.
2. Seymour Lipschutz, Marc Lipson, " Discrete Mathematics", Second edition, TMH.

Reference Books:

1. Kenneth H. Rosen, Discrete Mathematics and its Application, Fifth edition, TMH.
2. V. K. Balakrishnan, " Graph Theory", TMH.
3. B. Kolman , R. Busby and S. Ross, "Discrete Mathematical Structures" Fourth edition, Pearson .
4. J. Treamblay , R. Manohar ," Discrete Mathematical structures with application to computer science" , TMH.
5. Sukhendu dey, "Graph theory and its applications", Shroff publications.
6. John Dossey,Otto,Spence,Eynden, "Discrete Mathematics", Pearson publications, Fifth edition.

Microprocessor and Microcontroller

COURSE OUTLINE

Course Title	Short Title	Course Code
Microprocessor and Microcontroller	**MPMC**	

Course Description:

The objective of this course is to introduce the students to the fundamentals of microprocessor, microcontroller and microprocessor programming and enable them to apply these concepts for solving real world problems.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	**15**	**45**	**03**

Prerequisite Course(s): Fundamental knowledge of microprocessor basics.

COURSE CONTENT

Microprocessor and Microcontroller **Semester-III**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. **8086/8088 Microprocessor (08 Hours, 16 marks)**
   a. 8086 Architecture
   b. 8086 Programming Model
   c. 8086 Memory Segmentation
   d. 8086 Instruction Set
   e. DOS & BIOS Interrupts
   f. Macro and Procedure

2. **8086 Configuration & Other Peripherals (08 Hours, 16 marks)**
   a. 8086 Minimum Mode

b. 8086 Maximum Mode
c. 8259A PIC block diagram
d. 8259A operating modes
e. DMA Basics
f. 8237 DMAC

3. Main Memory Design (08 Hours, 16 marks)

a. 8086 interfacing with RAM
b. 8086 interfacing with ROM
c. Address decoding
d. Address decoding techniques: Full, Block and Block
e. Troubleshooting the memory module

4. Multiprocessor Configuration (08 Hours, 16 marks)

a. Tightly & loosely coupled system
b. Bus arbitration schemes
c. NDP Basics
d. 8087 architecture and programming model
e. 8087 data types
f. 8087 instruction set and programming
g. Interconnection of 8087 with 8086

5. Microcontroller (08 Hours, 16 marks)

a. Introduction to Microcontroller
b. 8051 microcontroller Architecture
c. 8051 hardware Features
d. Input/output pins and Internal RAM organization
e. Ports and Circuits and External memory
f. Counters and Timers and Serial data I/O, Interrupts

Text Books:-

1. A. Ray, K. Bhurchandi, "Advanced Microprocessors and Peripherals: Architecture, Programming & Interfacing", Tata McGraw Hill, Third edition, 2004.
2. Kenneth Ayala, "The 8051 Microcontroller Architecture, Programming & Applications", Penram International, Second edition, 2006.

Reference Books:

1. Soumitra Kumar Mandal, “Microprocessor and Microcontroller: Architecture, Programming and Interfacing using 8085, 8086 and 8051”, Tata McGraw-Hill.
2. Douglas V Hall, “Microprocessor and Interfacing, Programming and Hardware”, Tata McGraw Hill, Second edition.
3. Peter Abel, “IBM PC Assembly Language and Programming”, Pearson, 5th edition.
4. Ramesh Gaonkar, “Microprocessor architecture, programming and applications”, Second edition.
5. K Uma Rao, “8051 Microcontroller: Internals, Instructions, Programming and Interfacing”, Pearson.
6. John E. Uffenbeck, “The 8086/ 8088 Family: Design, Programming and Interfacing”, Pearson, 1987.
7. Barry B Bray, “The Intel Microprocessors-Architecture, Programming and Interfacing”, Pearson LPE/PHI, Second edition.
8. M.T.Savaliya, “8086 Programming and Advanced Processor Architecture”, Wiley India.
9. V Udayashannkra, “8051 Microcontroller”, Mc-Graw-Hill.
10. I. Scott Mackenzie, “The 8051 Microcontroller”, Pearson.

Object Oriented Technology

COURSE OUTLINE

Course Title	Short Title	Course Code
Object Oriented Technology	**OOT**	

Course Description:

The objective of this course is to introduce the students to the concepts of C++ programming language and enable them to apply these concepts for solving real world problems.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	**15**	**45**	**03**

Prerequisite Course(s): C Programming.

COURSE CONTENT

Object Oriented Technology **Semester-III**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Introduction to Object Oriented Programming

(08 Hours, 16 marks)

a. Introduction to procedural, modular and object-oriented programming techniques.
b. Limitations of procedural programming.
c. Need of object-oriented programming. Advantages, disadvantages and applications of OOP.
d. Class, objects, abstraction, encapsulation, data hiding, inheritance, polymorphism and message passing.
e. The basics of C++
f. Expressions

2. Classes and Objects, Function and Operator Overloading
(08 Hours, 16 marks)

a. Class and objects
b. Constructors and destructors:
c. Functions in C++
d. Function Overloading
e. Operator overloading

3. Pointers and Arrays (08 Hours, 16 marks)

a. Introduction, pointer declaration, voids pointers.
b. Pointers to class objects, this pointer.
c. Pointers to members, accessing private members with pointers.
d. Characteristics of arrays, initialization of arrays.
e. Arrays within a class, arrays of objects.
f. Dynamic memory allocation using new and delete operators.
g. One dimensional and two dimensional arrays using pointers.

4. Inheritance, Virtual functions and Polymorphism
(08 Hours, 16 marks)

a. Introduction, base and derived classes. Inheritance types, access modifiers.
b. Single inheritance, multiple and multilevel inheritance, hybrid, hierarchical, multipath inheritance and virtual base classes.
c. Overriding base class members. Constructors and inheritance, calling base class constructor.
d. Static and dynamic binding. Pointers to base and derived classes.
e. Virtual functions, rules for virtual functions, working of virtual functions, pure virtual functions.
f. Virtual base classes.

5. Files and Streams, Managing Console I/O Operations and Templates
(08 Hours, 16 marks)

a. Concept of a file, file stream operations.
b. Opening a file using constructor and open function, closing a file, detecting end-of-file, file modes, file pointers.
c. Introduction to C++ streams, stream classes, unformatted and formatted I/O.
d. ios class functions and flags, manipulators.
e. Introduction to function template and class template.

f. Overloading of templates functions.
g. Member function templates and template arguments.

Text Books:

1. E. Balagurusamy, "Object Oriented Programming with C++", Fifth Edition, Tata McGraw Hill, 2011.
2. Robert Lafore, "Object Oriented Programming in C++", Fourth Edition, Pearson Education, 2002.

Reference Books:

1. Ashok N. Kamthane, "Object-Oriented Programming with ANSI and Turbo C++", Pearson Education, 2006.
2. Rajesh K. Shukla, "Object-Oriented Programming in C++", Wiley India, 2008.
3. Bjarne Stroustrup, "C++ Programming Language", Third Edition, Addison Wesley, 2002.
4. Yashavant P. Kanetkar, "Let Us C++", Second Edition, BPB Publications, 2003.
5. Venugopal K.R., "Mastering C++", First Edition, TMH, 1999.
6. Mahesh Bhave, Sunil Patekar, "Object Oriented Programming with C++", Second Edition, 2012.
7. Herbert Schildt, "The Complete Reference C++", Fourth Edition, TMH, 2003.

Soft Skills – III

COURSE OUTLINE

Course Title	Short Title	Course Code
Soft Skills – III	**SK-III**	

Course Description:

Through this course we have tried to prepare the students for the industry. Most companies test mathematical and logical ability through an aptitude test. This subject aims at working on these skills of a student through strategies formulae and practice exercises.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	1	**14**	**14**	**2**

Prerequisite Course(s): Fundamental knowledge of High School Mathematics.

COURSE CONTENT

Soft Skills – III **Semester-III**

Teaching Scheme **Examination Scheme**

Lecture: 1 hour / week **Internal Continuous Assessment (ICA): 50 Marks**

Unit-I: Arithmetic-1 **(03 Hours, 10 marks)**

a. Basic Formulae

i. Divisibility Rules
ii. Speed Maths
iii. Remainder Theorem
iv. Different Types of Numbers
v. Applications

b. HCF, LCM and Linear Equations

i. HCF – Successive Division and Prime Factorization Methods
ii. LCM – Successive Division and Prime Factorization Methods
iii. Applications

iv. Linear Equations – Elimination Method
v. Substitution Method
vi. Applications

c. Averages and Mixtures

i. Concept of Average
ii. Faster Ways of Finding It
iii. The Allegation Method
iv. Applications

Unit-II: Arithmetic–II **(03 Hours, 10 marks)**

a. Percentages

i. Concept of Percentage
ii. Working with Percentages
iii. Applications

b. Profit and Loss

i. Difference between Cost and Selling Price
ii. Concept of Profit Percentage and Loss Percentage
iii. Applications

c. Time and Work

i. Basic Time and Work Formula
ii. Relation between Time and Work
iii. Applications

Unit-III: Arithmetic–III **(03 Hours, 10 marks)**

a. Permutations and Combinations

i. Sum Rule of Disjoint Counting
ii. Product Rule of Counting
iii. Concept of Factorial
iv. Permutations
v. Linear Permutations
vi. Combinations
vii. Circular Permutations
viii. Applications

b. Probability

i. Definition and Laws of Probability
ii. Mutually Exclusive Events
iii. Independent Events
iv. Equally Likely Events
v. Exhaustive Events
vi. Cards
vii. Dice
viii. Applications

c. Time and Distance

i. Speed
ii. Conversion Factors for Speed
iii. Average Speed
iv. Moving Bodies – Passing, Crossing and Overtaking
v. Relative Speed
vi. Boats and Streams
vii. Applications

Unit-IV: Non-Verbal Reasoning (02 Hours, 10 marks)

a. Analogies

i. Examples
ii. Applications

b. Classification

i. Examples
ii. Applications

c. Sequences

i. Examples
ii. Applications

Unit-V: Analytical Reasoning (03 Hours, 10 marks)

a. Analytical Puzzles

i. Classification Puzzles
ii. Ordering Puzzles
iii. Assignment Puzzles
iv. Applications

b. Letter and Number Series

i. Different Types of Letter Series
ii. Different Types of Number Series
iii. Mixed Series

c. Coding and Decoding

i. Letter Coding
ii. Number Coding
iii. Mixed Coding
iv. Odd Man Out
v. Applications

Guide lines for ICA:
ICA will be based on credit tests and assignments submitted by the student in the form of journal.

Reference Books:

1. R. S. Aggarwal, "Quantitative Aptitude", S. Chand Publication, New Delhi, 2012.
2. R. S. Aggarwal, "A Modern Approach to Verbal Reasoning", S. Chand Publication, New Delhi, 2012.
3. R. S. Aggarwal, "A Modern Approach to Non-Verbal Reasoning", S. Chand Publication, New Delhi, 2012.

Analog & Digital Electronics Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Analog & Digital Electronics	**ADE**	

Course Description:

This laboratory provides students with a comprehensive study of operational amplifier, its various applications & digital circuits.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**15**	**30**	**01**

Total Semester Credits: 1

Prerequisite Course(s): Fundamental knowledge of Elements of Electrical and Electronics Engineering.

LAB COURSE CONTENT

Outline of Content:

(Note: Minimum FOUR Experiments from group A and FOUR from group B.)

Group A

1. **Design of Inverting & non –inverting summing amplifier**.
   Performing simple arithmetic operations of addition using op-amp in both configurations.

2. **Design of Instrumentation amplifier**.
   Find out the gain of instrumentation amplifier theoretically & practically.

3. **Design of active integrator and differentiator circuits.**
   Take the response of circuit for different waveforms.

4. **Find out the hysteresis voltage of Schmitt trigger circuit**
   Measure the hysteresis voltage.

5. **Generate square, triangular and saw tooth wave using op-amp.**

   Measure the output frequency.

6. **Timer using IC 555 in monostable and astable mode.**

   Calculate the delay provided by IC 555.

Group B

1. **Verification of the truth table of logic gates and verification of De Morgan's theorem.**

   Implement the circuit to verify the operation of logic gates & De-Morgan's theorem.

2. **Construction of basic gates using universal gate (NAND / NOR)**

   To verify the truth table of basic gates using universal gates.

3. **Construction of half adder & full adder circuit. Implementation of full adder with the help of two half adder circuit & one OR gate.**

   Construct the circuits & verify the truth table.

4. **Construction of Half substractor & full substractor Circuit.**

   Construct the circuits & verify the truth table.

5. **Conversion of Gray to Binary and Binary to gray code.**

   a. Prepare the truth table of Gray to binary code.
   b. All the 16 combinations of inputs are given at respective pins
   c. Verify the truth tables of Gray to binary code.

6. **Verification of truth table of multiplexes & flip flops.**

   a. Prepare the truth table of multiplexer & flip-flops.
   b. Based on the select line one of the input will be selected at the output.
   c. Observe the output of multiplexer and verify the truth table.
   d. Examine the output of flip-flops and validate the truth table.
   e. Check out the output for J-K flip-flops, when J and k both inputs are at logic .

Guide lines for ICA:

- ICA will be based on the practical assignments submitted by the students in the form of journal.
- Evaluation will be based on the circuit diagram, understanding of the operation of circuit, observations, type of input and output for circuit.

Reference Books:

1. Ramakant A. Gaikward – "Op amp and Integrated circuit", PHI, Fourth edition, 2012.
2. Coughling, Driscoll - Op amps and Linear Integrated Circuits, Pearson education, Fourth edition.
3. Digital Logic and Computer Design by M. Morris Mano, Pearson.
4. Fundamentals of Digital Circuits by A Anandkumar, Pearson.
5. Sergio Franco - Design with Operational Amplifier and Analog Integrated Circuits, TMH- Third edition.

Discrete Structure and Graph Theory Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Discrete Structure and Graph Theory	**DSGT**	

Course Description:

This laboratory provides students with a comprehensive study of the C programming language in discrete structures and graph theory. Classroom lectures stress the strengths of C which provide students with the means of writing efficient codes for discrete structures and graph theory.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**15**	**30**	**01**

Total Semester Credits: 1

Prerequisite Course(s): Fundamental knowledge of C.

LAB COURSE CONTENT

Outline of Content:

(Note: Minimum FIVE experiments from the group A and minimum FIVE experiments from the group B.)

(Group A)

1. **A program for logical operations using bitwise operators.**
   Perform logical operations like AND,OR,NOT,IF THEN,IF AND ONLY IF
2. **A program for set operations: Union, Intersection, Difference, Symmetric difference.**
   Perform set operations like union, intersection, difference, symmetric difference, complement
3. **A program for generation of Power set of a given set.**
   Producing power set for a given input set.
4. **A program for generation of permutations.**
   Producing permutations set for a given input set.
5. **A program for generation of combinations.**

Producing permutations set for a given input set.

6. **A Program for Bubble sort.**

   Sorting of given numbers by using Bubble sort.

(Group B)

1. **A Program for Matrix multiplication.**

   Performing Multiplication of two matrices.
2. **A Program for Binary search.**

   Searching of a given number using binary search.
3. **A Program for Shortest Path algorithm using Dijkstra's.**

   Finding shortest path in a graph using Dijkstra's algorithm.
4. **A program for implementation of Kruskal's algorithm.**

   To find minimum spanning tree using kruskals algorithm.
5. **A program for implementation of Prim's algorithm.**

   To find minimum spanning tree using kruskals algorithm.
6. **A program for Inter conversion of number system.**

   Interconverting numbers from one base to another base.

Text Books:

1. C.L. Liu , " Elements of Discrete Mathematics", Second edition, TMH
2. Seymour Lipschutz,Marc Lipson, " Discrete Mathematics", Second edition, TMH

Reference Books:

1. Kenneth H. Rosen, Discrete Mathematics and its Application, Fifth edition, TMH
2. V. K. Balakrishnan, " Graph Theory", TMH.
3. B. Kolman , R. Busby and S. Ross, "Discrete Mathematical Structures", Fourth edition, Pearson.

Microprocessor and Microcontroller Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Microprocessor and Microcontroller	**MPMC**	

Course Description:

This laboratory provides students with a comprehensive study of the basic concepts of microprocessor and microcontroller. Classroom lectures stress the strengths of microprocessor programming, which provide students with the means of writing efficient, maintainable, and portable code.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**15**	**30**	**01**

Total Semester Credits: 1

Prerequisite Course(s): Fundamental knowledge of assembly programming language.

LAB COURSE CONTENT

Outline of Content:

(Note: Concerned faculty should suitably frame at least 10 experiments related to 8086 and 8087 only. Program based on 8087 are compulsory.**)**

(Group A)

1. **Program using Macro**

   Display personal information using Macro

1. **Program using NEAR and FAR Procedure**
   Addition of two numbers using NEAR and FAR Procedure Perform

2. **Perform addition/subtraction/multiplication of two numbers**

Addition/subtraction/multiplication of two numbers using NEAR and FAR Procedure

3. **Find factorial of given number**
   Find factorial of given number using recursive instruction

4. **Program for Password Verification**
   Program for Password Verification

5. **Perform the BCD Addition**
   Add two 16 bit BCD numbers

6. **Program to Display System Time & Date**
   Display current Time & Date of system

7. **Program for addition of first 50 BCD Numbers**

   Add first 50 BCD Numbers, result is also BCD number

(Group B)

1. **Program for HEX to BCD Conversion and vice versa**

   Convert HEX no. to BCD no. and BCD no. to HEX no**.**

2. **Generate sine wave using 8087 instructions**
   Generate sine wave using 8087 instructions

3. **Generate sum of series using 8087 instructions**
   Generate sum of series such as 1+x/1!-x/2!

4. **Solve the Quadratic Equations using 8087 instructions**
   Simplify the Quadratic Equations using 8087 instructions

5. **Generate Fibonacci series**
   Generate Fibonacci series

Guide lines for ESE:

1. Emphasis should be given to assembly language programming based on 8086 and 8087.
2. In programming, emphasis should be given to algorithm, program with proper comments and input-output.
3. Simple assembly language program (for 8086 and 8087only) may be asked based on above syllabus.

Reference Books:

1. Soumitra Kumar Mandal, “Microprocessor and Microcontroller: Architecture, Programming and Interfacing using 8085, 8086 and 8051”, Tata McGraw-Hill.
2. Douglas V Hall, “Microprocessor and Interfacing, Programming and Hardware”, Tata McGraw Hill, Second edition.
3. Peter Abel, “IBM PC Assembly Language and Programming”, Pearson, Fifth edition.
4. Barry B Bray, “The Intel Microprocessors-Architecture, Programming and Interfacing”, Pearson LPE/PHI, Seventh edition.

Object Oriented Technology Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Object Oriented Technology	**OOT**	

Course Description:

This laboratory provides students with a comprehensive study of the C++ programming language. Classroom lectures stress the strengths of C++, which provide students with the means of writing efficient, maintainable, and portable code.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**15**	**30**	**01**

Total Semester Credits: 1

Prerequisite Course(s): Fundamental knowledge of Computers and C programming

LAB COURSE CONTENT

Outline of Content:

(Note: Minimum SIX Experiments from group A and FOUR from group B.)

Group A

1. **Write a program for a simple class and object.**
   Performing simple arithmetic operations using C++ class and object like,
   a. Addition,
   b. Subtraction,
   c. Multiplication,
   d. Division.
2. **Write a program for parameterized constructor.**

Demonstrate the use parameterized constructor by passing different types of parameters to the constructor.

3. **Write a program for overloading constructors.**
   Demonstrate the concept of overloading constructor functions using class and object.

4. **Write a program to find the area of rectangle, triangle and sphere using function overloading.**
   To calculate the area of rectangle, triangle and sphere using function overloading and class and object.
5. **Write a program to overload unary operator using member function.**
   Demonstrate the overloading of unary operators using the concept of member functions.
6. **Write a program to overload binary operator using member function.**
   Demonstrate the overloading of binary operators using the concept of member functions.
7. **Write a program for arrays of pointers to objects.**
   Declaring an array of pointers to objects using suitable example.
8. **Write a program using single inheritance, multiple inheritance and hierarchical inheritance.**
   Demonstrate the use of single inheritance, multiple inheritance and hierarchical inheritance by taking suitable example.
9. **Write a program using multilevel inheritance and hybrid inheritance.**
   Demonstrate the use of multilevel inheritance and hybrid inheritance by taking suitable example.
10. **Write a program for virtual base classes.**
    To calculate the total mark of a student using the concept of virtual base class.
11. **Write a program to read and write class objects from files.**
    Writing/reading class object to/from file.
12. **Write a program to format output using ios class functions and flags.**
    To format the output using different ios class functions and flags.
13. **Write a program to format output using manipulators.**
    To format the output using different manipulators.
14. **Write a program using class template.**
    To swap the numbers using the concept of function template.
15. **Write a program for overloading of template functions.**
    Overload templates functions with the number of parameters.

Group B

1. **Write a program for the copy constructor.**
   To calculate factorial of a given number using copy constructor.
2. **Write a program to overload unary operator using friend function.**
   Demonstrate the overloading of unary operators using the concept of friend function.

3. **Write a program to overload binary + operator using member function for concatenation of two strings.**
   Demonstrate the overloading of binary + operator using the concept of member function for concatenation of two strings.
4. **Write a program for matrix multiplication using new and delete dynamic memory allocation operators.**
   Perform the matrix multiplication using new and delete dynamic memory allocation operators.
5. **Write a program to convert class type data to basic type data.**
   Perform the class type data conversion to any basic type data.
6. **Write a program for run time polymorphism using virtual functions.**
   Perform the run time polymorphism using virtual functions.
7. **Write a program for bubble sort using template functions.**
   Perform the bubble sort using the concept of template functions.

Reference Books:

1. E. Balagurusamy, "Object Oriented Programming with C++", Fifth Edition, Tata McGraw Hill, 2011.
2. Robert Lafore, "Object Oriented Programming in C++", Fourth Edition, Pearson Education, 2002.
3. Ashok N. Kamthane, "Object-Oriented Programming with ANSI and Turbo C++", Pearson Education, 2006.
4. Rajesh K. Shukla, "Object-Oriented Programming in C++", Wiley India, 2008.
5. Bjarne Stroustrup, "C++ Programming Language", Third Edition, Addison Wesley, 2002.
6. Yashavant P. Kanetkar, "Let Us C++", Second Edition, BPB Publications, 2003.
7. Venugopal K.R., "Mastering C++", First Edition, TMH, 1999.
8. Mahesh Bhave, Sunil Patekar, "Object Oriented Programming with C++", Second Edition, 2012.
9. Herbert Schildt, "The Complete Reference C++", Fourth Edition, TMH, 2003.

Guide lines for ESE:-

- ESE will be based on the practical assignments submitted by the students in the form of journal.
- In the ESE, the students may be asked to perform the practical assignment with minor modification.
- Evaluation will be based on the paper work of algorithm, understanding of the logic and the syntax, quality of the program, execution of the program, type of input and output for the program.

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Second Year Engineering

(Computer)

Faculty of Engineering and Technology

COURSE OUTLINE

Semester – IV

W.E.F 2013 – 2014

Data Communication

COURSE OUTLINE

Course Title	Short Title	Course Code
Data Communication	**DC**	

Course Description:

This course is aimed at introducing the fundamentals of data communications to undergraduate students. The goals of the course are to understand the basics and knowledge about the Data Communications using components and protocols of data communications.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	**15**	**45**	**03**

Prerequisite Course(s): Fundamentals of Data Communication.

COURSE CONTENT

Data Communication **Semester- IV**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week **End Semester Examination (ESE) : 80 Marks**
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1 Introduction to Data Communication and Signals

(08 Hours, 16 marks)

a Basics of Data Communication: Characteristics and Components
b Data Representation and Data Flow
c Networks, Introduction to ISO-OSI Reference model
d Introduction to Signals and Transmission Impairments: Analog and Digital
e Periodic Analog Signals, Digital Signals
f Transmission impairment, data rate limits, Performance

2 Digital transmission and Analog transmission

No of Lect – 8, Marks:16

a Digital to Digital Conversion
b Analog to Digital Conversion
c Transmission Modes
d Digital-to-analog Conversion

3 Multiplexing and Transmission Media (08 Hours, 16 marks)

a Multiplexing
b Guided Media
c Unguided Media

4 Switching and Multiple Access (08 Hours, 16 marks)

a Circuit-switched Networks
b Datagram networks
c Virtual-circuit networks
d Multiple Access

5 Error Control and Data Link Control (08 Hours, 16 marks)

a Types of errors
b Block coding
c Linear block codes
d Cyclic codes
e Checksum
f Flow and error control

Text Books:

1. Behrouz A Forouzan, "Data Communications and Networking", Fourth edition: Tata McGraw Hill.
2. P. C. Gupta, "Data Communications", PHI Publications.

Reference Books:

1. William Stallings, "Data & Computer Communications", Seventh edition: PHI Publication.
2. Leon - Garcia, Indra Widijaja, "Communication Networks Fundamental Concepts and Key Architectures", Second edition: McGraw Hill Education.
3. Achyut Godbole, "Data Communication Networks", Tata McGraw Hill.
4. Bruce Hartpence, "Packet Guide to Routing and Switching", O'Reilly.
5. Bruce Hartpence, "Packet Guide to Core Network Protocol" , O'Reilly.
6. James Irvine & David Harle, "Data Communication and Networks: An Engineering Approach", Wiley Edition.

Microprocessor & Microcontroller Interfacing

COURSE OUTLINE

Course Title	Short Title	Course Code
Microprocessor & Microcontroller Interfacing	**MPMCI**	

Course Description:

The objective of this course is to introduce the students to the fundamentals of microprocessor & microcontroller interfacing with assembly programming language and enable them to apply these concepts for real world applications.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	15	45	04
Tutorial	01	15	15	

Prerequisite Course(s): Fundamental knowledge of Microprocessors & Microcontrollers.

COURSE CONTENT

Microprocessor & Microcontroller Interfacing **Semester- IV**

Teaching Scheme	Examination Scheme	
Lecture: 3 hours / week	**End Semester Examination (ESE)**	**: 80 Marks**
Tutorial: 1 hour / week	**Paper Duration (ESE)**	**: 03 Hours**
	Internal Sessional Exam (ISE)	**: 20 Marks**

1. Basic I/O Interface

(08 Hours, 16 marks)

a. MSDOS FAT
b. MS DOS Device Drivers Types, Structure of device drivers.
c. 8255 PPI : Internal block diagram, control word and status word, modes of operation, numericals on control word design.

2.

(08 Hours, 16 marks)

a. 8254(PIT) : Internal block diagram, control word format, operating modes, numericals on control word design.

b. 8251(USART) : Architecture and signal description, operating modes, interfacing with 8086 and numericals.
c. TSR programs : concept and implementation.

3. Overall Motherboard Component Logic (08 Hours, 16 marks)

a. Functional block diagram of PC.
b. Motherboard (8086/8088 based) : Motherboard components.
c. Motherboard logic : Reset logic, Interrupt logic, RAM parity logic, NMI logic, Wait state logic, Bus Arbitration logic, RAM & ROM logic, CPU logic, DMA logic, keyboard interface block diagram.
d. Microcomputer Display : Raster scan basics, Overview of character display control system.
e. PC display adapters : CGA,EGA,VGA.
f. Introduction to LCD and Plasma display.

4. 8086 Microprocessor interface (08 Hours, 16 marks)

a. Parallel Printer Interface
b. 7 segment display interface.
c. Disk reading methods: FM , MFM.
d. Internal structure of Floppy disk and hard disk.
e. Floppy Disk Controller : Overview, FDC system interface, Overall operation of floppy disk subsystem, 8272 FDC : internal block diagram and commands.
f. Hard disk controller : HDC commands and device control block.

5. Microcontrollers and Interfacing (08 Hours, 16 marks)

a. Interfacing LEDs and of 7-segment displays.
b. Interfacing keys and keyboard interfacing .
c. Interfacing 0808/0809 ADC.
d. Interfacing DAC 0808.
e. Interfacing stepper motor.

Reference Books:

1. Douglas V. Hall, " Microprocessors and Interfacing : Programming and Hardware", Second edition , Tata McGraw Hill.
2. A. K. Ray & K. M. Bhurchandi, "Advanced Microprocessor and Peripherals – Architecture, Programming and Interfacing", Third edition, Tata Mc Graw Hill.
3. Ray Duncan, "Advanced MS-DOS Programming", Second edition, Microsoft Press.
4. Peter Abel, " IBM PC Assembly language and programming" , Fifth edition, Pearson education/ Prentice Hall of India Pvt. Ltd.
5. B. Govindarajalu, "IBM PC and Clones", Second edition, Tata McGraw Hill.

Data Structures

COURSE OUTLINE

Course Title	Short Title	Course Code
Data Structures	**DS**	

Course Description:

The objective of this course is to introduce the students to the fundamentals of Data Structure with concepts of the C programming language and enable them to apply these concepts for solving real world problems.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**45**	**04**
Tutorial	**01**	**15**	**15**	

Prerequisite Course(s): Fundamental knowledge of C

COURSE CONTENT

Data Structures **Semester - IV**

Teaching Scheme	**Examination Scheme**	
Lecture: 3 hours / week	**End Semester Examination (ESE)**	**: 80 Marks**
Tutorial: 1 hour / week	**Paper Duration (ESE)**	**: 03 Hours**
	Internal Sessional Exam (ISE)	**: 20 Marks**

1. Introduction to Data Structures (08 Hours, 16 marks)

a Introduction of data and data object.
b Data structure and Abstract Data Type(ADT).
c Implementation of different data structures.
d Basic terminologies with data structures, types of data structures.
e Data structure operations.
f Concept of arrays,pointer and structures.

2. Stack and Queue (08 Hours, 16 marks)

a Detailed knowledge of data structure like stack, queue & circular queue.
b Polish notations & interconversions by using stack.

c Use of stack in function call,recursion,tower of Hanoi.

3. Linked Lists (08 Hours, 16 marks)

a Understand the concept of linked list data structure.

b Pros & Cons of array compared with linked list.

c Creation,traversing,searching,insertion,deletion opertions w.r.t. single linked list.

d Pros & cons of single linked list, double linked list

e Polynomial addition using single linked list as well as storing multivariable polynomials using generalised list.

4. Trees (08 Hours, 16 marks)

a Creation,traversing,searching,insertion,deletion opertions w.r.t. binary search tree.

b Concept of threaded binary tree,tree traversals(recursive & non-necursive).

c Concept of Huffman Algorithm.

e Height Balanced Tree(AVL Search Tree).

5. Searching and Sorting (08 Hours, 16 marks)

a Basics of searching techniques.

b Basics of sorting techniques.

c Different sorting algorithms including Bubble, Insertion, Selection,Quick,Merge,Heap,Radix.

d Time and Space complexity of an algorithm with big 'O', '' , 'Ω' notations.

e Best, Worst, and Avgerage case time complexity of each of these algorithms.

Text Books:

1. Seymour Lipschutz, "Data Structures", Schaums Outlines Tata McGraw Hill, 2006.
2. Ellis Horowitz and Sartaj Sahani, "Fundamentals of Data Structures", Galgotia Publication.

Reference Books:

1. G.S.Baluja, "Data Structures through C", Dhanpatrai Publications.
2. Ashok N. Kamthane, "Introduction to Data structures in C", Person Publications, 2007.
3. Aarom Tanenbaum, Yedidyah Langsam, Moshe Augenstein, "Data structures using c", Pearson Publication.
4. Alfred Aho, John Hopcroft, Jeffrey Ullman, "Data Structures and Algorithms",Pearson Publications.
5. E.Balagurusamy,"Data Structures using C",Tata MacGraw Hill Publications.
6. P.S.Deshpande,O.G.Kakde,"C and Data Structures",dreamtech press Publications.
7. Rajesh K.Shukla, "Data Structures using C and C++" ,Willy India Publication.
8. Larry Nyhoff, "ADTs' Data Structures and prolems with C++",Pearson Publications.

Computer Organization

COURSE OUTLINE

Course Title	Short Title	Course Code
Computer Organization	**CO**	

Course Description:

This course introduces the students about the computer. It includes the terms, concepts, architectures, formats and addressing. This course also describes the Memory organization etc.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	**15**	**45**	**03**

Prerequisite Course(s): Introduction to Computer.

COURSE CONTENT

Computer Organization **Semester- IV**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Introduction to system concepts (08 Hours, 16 marks)

a. To introduce students to System Concept.
b. To learn about Instruction format.
c. To learn General addressing Modes.
d. To learn about Expanding op-codes.
e. To learn about Bus Structures.

2. Arithmetic (08 Hours, 16 marks)

a To know how Numbers are represented.
b To learn Multiplication using Booths and Bit-pairing Algorithms.
c To learn Division using Restoring and Non-Restoring Methods.
d To learn addition and Subtraction of signed numbers.
e To learn Floating point System.

3. Processing Unit (08 Hours, 16 marks)

a To design control unit.

b Designing Control unit using hardwired and Micro programmed methods.

c Learning Wilkes Design method.

d To learn Bus organization.

e To learn execution of complete instruction.

4. Memory (08 Hours, 16 marks)

a Memory organization techniques.

b To know cache memory organization.

c To know Virtual memory.

d To learn basic concepts of memory.

e Introduction to SDRAM, RDRAM, DDRSDRAM, Flash memory.

5. System Organization (08 Hours, 16 marks)

a To know concepts system buses.

b To know Daisy chaining, polling.

c Concepts of PCI bus, SCSI bus, Universal Serial Bus.

d RISC and CISC .

Text Book:

1. Hamacher, Vransic, Zaky, "Computer Organization", Fifth edition, McGraw Hill international.

Reference Books:

1. J.P. Hayes, "Computer Architecture and Organization", Third edition, McGraw Hill international.
2. Sajjan Shiva, "Computer Organization Design & Architecture", CRC Press Publication.
3. Tanenbaum, "Structured Computer Organization", Pearson.
4. William Stallings, "Computer Organization and Architecture", Sixth edition, Pearson.
5. Swati Saxena,"Computer Organization" Dhanpat Rai.
6. Murdocca, Heuring, "Computer Architecture & Organization", Second edition, Wiley.
7. Nicholas Carter, "Computer Architecture", Schaum's Outline.

Computer Graphics

COURSE OUTLINE

Course Title	Short Title	Course Code
Computer Graphics	**CG**	

Course Description:

This course introduces the students about the concepts of user interface with graphics system. It includes the graphics standards, transformations, filling & clipping objects, 2D&3D. This course also describes about graphics applications corresponds with scientific work as well as animation, simulation, etc.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	**15**	**45**	**03**

Prerequisite Course(s): Engineering Graphics.

COURSE CONTENT

Computer Graphics **Semester- IV**

Teaching Scheme	**Examination Scheme**	
Lecture: 3 hours / week	**End Semester Examination (ESE)**	**: 80 Marks**
Tutorial: 1 hour / week	**Paper Duration (ESE)**	**: 03 Hours**
	Internal Sessional Exam (ISE)	**: 20 Marks**

1. Basic Concepts (08 Hours, 16 marks)

a. Introduction to computer graphics
b. Graphics Standards
c. Interactive Computer Graphics
d. Linear and Circle Generation

2. Polygons (08 Hours, 16 marks)

a. Polygons
b. Types of Polygons
c. Polygon filling
d. Scan conversion algorithm
e. Segments

3. 2D & 3D Geometry (08 Hours, 16 marks)

a. 2D transformation primitives and concepts

b. 3 D transformations
c. 3D viewing transformation
d. Concept of parallel perspective projections
e. Viewing parameters

4. Windowing & Clipping (08 Hours, 16 marks)

a. 2 D clipping and 3D clipping
b. Generalized clipping
c. Polygon Clipping
d. Hidden Surfaces and Lines

5. Light, Color & shading (08 Hours, 16 marks)

a. Shading algorithm
b. Color Models – RGB, HVS, CYM
c. Graphical User Interface
d. Graphics Standard
e. Graphics Applications

Text Books:

1. "Computer graphics", ISRD group, THM publications, eleventh reprint 2012.

Reference Books:

1. David F. Rogers, "Procedural Elements for Computer Graphics, Tata McGraw Hill, Second edition.
2. Shirley, Marshner, "Fundamentals of Computer Graphics", Third edition, CRC Publication/ A.K. Peters.
3. Steven Harringtom, "Computer graphics A Programming Approach", MGH.
4. Maurya, "Computer Graphics: with virtual reality system", Wiley India.
5. Foley, Vandam, Feiner, Hughes, "Computer Graphics Principals & Practice", Pearson,
6. Second edition.
7. Donald Hearn and Pauline Baker," Computer Graphics", Pearson LPE, Second edition.
8. Rao and Prasad," Graphics user interface with X windows and MOTIF", New Age.
9. Mukherjee, "Fundamentals of Computer Graphics and Multimedia", PHI.

Application Development Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Application Development Lab	**ADL**	

Course Description:

The objective of this course is to introduce the students to the fundamentals of web development. It includes the technologies like HTML, XML, CSS and Scripting Languages.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	01	**15**	**15**	**02**

Prerequisite Course(s): Fundamental knowledge of Computers.

LAB COURSE CONTENT

This course will use advanced techniques in creating documents for the World Wide Web. Emphasis will be placed on HTML, JavaScript, XML and Java.

1 Introduction to HTML (03 Hours)

a. Tags and Elements
b. Separating Heads from Bodies
c. Attributes
d. Basic Text Formatting
e. Presentational and Phrase Elements
f. List
g. Links and Navigation

2 CSS Style Sheet and Scripting Languages (03 Hours)

a. URLs
b. Images, Audio, and Video
c. Tables, Forms and Frames
d. Cascading Style Sheets
e. Page Layout
f. Scripting Language (Java, VB)

3 Introduction to XML (03 Hours)

a. XML Basics

b. XML Elements
c. Working with DTD

4 DTD and Style Sheet (03 Hours)

a. Adding Style, Using Schemas

5 Introduction to Java (03 Hours)

a. Basic Input/output
b. Applet Class
c. Event handling
d. Introduction to AWT: working with windows, Graphics and Text

Reference Books:

1. Jon Duckett, "Beginning HTML, XHTML, CSS, and JavaScript", John Wiley & Sons publication, 2010.
2. Heather Williamson, "XML: The Complete Reference", First edition, Tata McGraw-Hill Education, 2001.
3. Herbert Schildt, "Java: The Complete Reference", Seventh edition, Tata McGraw-Hill Education, 2006.
4. Thomas A. Powell, "HTML & CSS: The Complete reference", Fifth edition, TMH 2010.
5. Elliotte Rusty Harold, "XML 1.1 Bible", Third edition, Willey Publication, 2004.
6. Steven Holzner, "XML: A Beginner's Guide", First edition, TMH, 2009.
7. Herbert Schildt, "Java: A Beginners Guide", Fifth edition, TMH, 2011.
8. Yashavant Kanetkar, "Let Us Java", BPB Publication, 2011.

Data Communication Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Data Communication Lab	**DC**	

Course Description:

This laboratory provides students with a comprehensive study of the Data Communication concepts and practical implementation of Data Communication concepts.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	02	15	30	01

Total Semester Credits: 1

Prerequisite Course(s): Fundamental knowledge of Data Communication.

LAB COURSE CONTENT

Outline of Content:

Group A

1. Comparative analysis of different types of network cables with Specifications
   - Study of different types of Network cables – CAT-5, CAT – 6.
   - Study of different cable specifications comparisons.
2. Implementation of Network performance calculator.
   - Simple Program for Calculating Network Performance.
3. Network related commands such as ARP, IPCONFIG, PING, TRACERT, NSLOOKUP, GETMAC, NETSTAT etc.
   - Practical use of Network commands ARP
   - Study of IPCONFIG for IP configurations
   - Study of PING command for finding destination reachable or not.
   - Study of TRACERT command
   - Study of NSLOOKUP command
   - Study of GETMAC to get MAC address.

- Study of NETSTAT to get the network status.

4. I.T Infrastructure planning using Network Connecting Devices.
   - Consider our own college as a case & prepare a planning for I.T. infrastructure.
5. Network Connecting Devices Specifications and configurations.
   - Practical study of Network Connecting device – Repeater.
   - Practical study of Network Connecting device – Switch /HUB.
   - Practical study of Network Connecting device – Router

Group B

1. Implementation of Stop and Wait Protocol
   - Study the working of stop and wait protocol
   - Implementation of simple client and server should be simple
   - Modular approach should be followed.
2. Implementation of Internet checksum
   - Consider a simple example
   - Study it theoretically.
   - Implementation of same .
3. Crimping of cross-wire and straight-through UTP cable to inter-connect two computers.
   - Study of crimping tool.
   - Study of color coding of Network cables.
   - Crimping the cable using Crimping Tool
   - Test the crimping by interconnecting two computers
4. Interconnections of computers in Local Area Network to share resources.
   - Study of concept of LAN & Shared resources.
   - Interconnect computers in LAN
   - Share and make the use of shared resources.
5. Implementation of cyclic redundancy check
   - Study the concept of CRC.
   - Consider Suitable example.
   - Implement same using modular approach.

Note:

- Concerned faculty should suitably frame 08 practical assignments (FOUR from PART – A and FOUR from PART – B) from above list.
- Every student is required to submit the assignments in the form of journal.

Reference Books:

1. Behrouz A Forouzan, “Data Communications and Networking”, Fourth edition: Tata McGraw Hill.
2. P. C. Gupta, “Data Communications”, PHI Publications.
3. William Stallings, “Data & Computer Communications”, Seventh edition: PHI Publication.
4. Leon - Garcia, Indra Widijaja, “Communication Networks Fundamental Concepts and Key Architectures” Second edition: McGraw Hill Education.
5. Achyut Godbole, “Data Communication Networks”, Tata McGraw Hill.
6. Bruce Hartpence, “Packet Guide to Routing and Switching”, O’Reilly.
7. Bruce Hartpence, “Packet Guide to Core Network Protocol” , O’Reilly.
8. James Irvine & David Harle, “Data Communication and Networks: An Engineering Approach”, Wiley Edition.

Microprocessor & Microcontroller Interfacing Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Microprocessor & Microcontroller Interfacing Lab	**MPMCI**	

Course Description:

This laboratory provides students with a comprehensive study of the 8086 and 8051 assembly programming language.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**15**	**30**	**1**

Total Semester Credits: 1

Prerequisite Course(s): Fundamental knowledge of microprocessors & microcontroller along with instruction set and addressing modes.

LAB COURSE CONTENT

Outline of Content:

(**Note:** Any 6 experiments from Group A and any 4 experiments from Group B. Total 10 experiments should be conducted.)

Group A

Assembly language programming for 8086.

1. Program for mouse interfacing.
2. Program for graphics editor.
3. Program for PC to PC communication using serial port.
4. Program for parallel printer interfacing.
5. Program for ADC interfacing with 8086.
6. Program for DAC interfacing with 8086.
7. Program for stepper motor interfacing.
8. Program for printer device driver.

Group B

Assembly language programming for 8051.

1. Program for interfacing LEDs.
2. Program for interfacing 7-segment displays.
3. Program for keyboard interfacing.
4. Program for ADC interfacing.
5. Program for DAC interfacing.

6. Program for stepper motor interfacing.

Guide lines for ESE:-

- ESE will be based on the practical assignments submitted by the students in the form of journal.
- In the ESE, the students may be asked to perform the practical assignment with minor modification.
- Evaluation will be based on the paper work of algorithm, understanding of the logic and the syntax, quality of program, execution of the program, type of input and output for the program.

Reference Books:

1. Douglas V. Hall, " Microprocessors and Interfacing : Programming and Hardware", Second edition , Tata McGraw Hill.
2. A. K. Ray & K. M. Bhurchandi, "Advanced Microprocessor and Peripherals – Architecture, Programming and Interfacing", Third edition, Tata Mc Graw Hill.
3. Ray Duncan, "Advanced MS-DOS Programming", Second edition, Microsoft Press.
4. Peter Abel, " IBM PC Assembly language and programming" , Fifth edition, Pearson education/ Prentice Hall of India Pvt. Ltd.
5. B. Govindarajalu, "IBM PC and Clones", Second edition, Tata McGraw Hill.

Data Structures Lab

LAB COURSE OUTLINE

Course Title	Short Title Course Code
Data Structures Lab	**DS**

Course Description:

This laboratory provides students with a comprehensive study of the C programming language in data structures. Classroom lectures stress the strengths of C which provide students with the means of writing efficient codes for different data types and data structures.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**15**	**30**	**1**

Total Semester Credits: 1

Prerequisite Course(s): Fundamental knowledge of C.

LAB COURSE CONTENT

Outline of Content:

(Note: Minimum FIVE experiments from the Group A and FIVE experiments from the Group B .)

(Group A)

1. **Implementation of stack using array or linked list.**
   Performing simple operations like push, pop and display with respect to stack.

2. **Implementation of queue using array or linked list.**
   Performing simple operations like insertion and deletion of an element into the queue.

3. **Implementation of circular queue using array or linked list.**
   Performing simple operations like insertion and deletion of an element into the circular queue.

4. **Conversion of infix expression to postfix expression.**
   Performing simple conversions of given infix expression into postfix expression.

5. **Conversion of postfix expression to infix expression**.

Performing simple conversions of given postfix expression into infix expression.

6. **Program for addition of two single variable polynomials using Linked List.**

Performing the addition of two polynomials using Linked List.

(Group B)

1. **Implementation of double linked list & perform insertion, deletion and searching.**

Performing the operations on double linked list like insertion, deletion and searching.

2. **Creation of binary tree & perform all non-recursive traversals**.

Create the binary tree and perform the Inorder,Preorder and Postorder traversal.

3. **Creation of binary search tree & perform insertion, deletion and printing in tree shape.**

Create the Binary Search tree performing the operations on BST like insertion, deletion and printing in tree shape.

4. **Create a hash table and handle the collision using linear probing with or without replacement**

Creation of hash Table and handle the collision using linear probing with or without replacement.

5. **Implementation of Quick Sort.**

Sort the given set of numbers using Quick sort.

6. **Implementation of Radix Sort.**

Sort the given set of numbers using Radix sort.

7. **Implementation of Merge Sort.**

Sort the given set of numbers using Merge sort.

8. **Conversion of Infix Expression to Prefix Expression.**

Performing Simple conversions of given Infix Expression into prefix Expression.

Text Books:

1. Seymour Lipschutz, "Data Structures", Schaums Outlines Tata McGraw Hill, 2006.
2. Ellis Horowitz and Sartaj Sahani, "Fundamentals of Data Structures", Galgotia Publication.

Reference Books:

1. G.S.Baluja, "Data Structures through C", Dhanpatrai Publications.

2. Ashok N. Kamthane, “Introduction to Data structures in C”,Person Publications,2007.
3. Aarom Tanenbaum,Yedidyah Langsam,Moshe Augenstein, “ Data structures using C”,Pearson Publications.
4. Alfred Aho,John Hopcroft,Jeffrey Ullman, “Data Structures and Algorithms”,Pearson Publications.
5. E.Balagurusamy, “Data structures using C”,Tata McGraw Hill publications.
6. P.S.Deshpande,O.G.Kakde,”C and Data Structures”,dreamtech press publications.
7. Rajesh K.Shukla, “Data Structures using C and C++” ,Willy India Publication.
8. Larry Nyhoff, “ADTs’ Data Structures and prolems with C++”, Pearson Publications.

Guide lines for ESE:-

- ESE will be based on the practical assignments submitted by the students in the form of journal.
- In the ESE, the students may be asked to perform the practical assignment with minor modification.
- Evaluation will be based on the paper work of concept understanding of topic and algorithm, understanding of the logic and the syntax, quality of program, execution of the program, type of input and output for the program.

Computer Graphics Lab

Lab COURSE OUTLINE

Course Title	Short Title	Course Code
Computer Graphics	**CG**	

Course Description:

This laboratory provides students with a comprehensive study of graphics commands. The practical's make students able for draw different line styles, polygon, circle as well as clipping of polygons & filling of polygons. It also implements 2D & 3D transformations. Because of it students with the means of writing efficient, maintainable, and portable code.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**15**	**30**	**1**

Total Semester Credits: 1

Prerequisite Course(s): Fundamental knowledge of C, C++ & Graphics.

LAB COURSE CONTENT

(Note: Minimum FIVE experiments from group A and FIVE from group B.)

(Group A)

1. **Line generation using DDA**

   Draw straight line using DDA algorithm.

2. **Different Line Style using Bresenhams Algorithm**

   Draw different styles of line like – Dotted Line , Dashed Line,etc.

3. **Circle Generation using Bresenhams Algorithm**

   Draw 8 way symmetry circle by using Bresenhams algorithm.

4. **Program for Polygon Filling**

   Draw polygon & then filled it by using any filling method like seed fill, flood fill or scan line algorithm.

5. **Program for 2D Transformations (Translation, Rotation and Scaling)**

   Perform 2D transformation on any polygon like- Translation, Rotation & Scaling.

6. **Program for Segmentation**

   Crete segment, Close segment, Delete segment & Open segment.

7. **Program for line clipping**

   Clip line by using any one at least- Sutherland Cohen line clipping algorithm, Mid-point subdivision algorithm, Generalized clipping with Cyrus-Beck Algorithm.

8. **Program for Polygon clipping**

   Clip line by using - Sutherland-Hodgeman algorithm

(Group B)

1. **Program for 3D rotation**

   Perform 3D transformation on any polygon like- Translation, Rotation & Scaling.

2. **Program for Parallel Projections**

   To draw polygon & show Parallel projection on it.

3. **Program for Perspective Projection**

   To draw polygon & show Perspective projection on it.

4. **Program for Animation**

   Show movement of any objects.

5. **Program for Bezier Curve**

   Consider four control points, by finding & joining mid points draw curve.

6. **Mini Project: Developing some Graphics application**

   Create any graphics application.

7. **Study assignment on any latest GUI application or mini-project.**

   Make study of any latest GUI application or develop any mini-project on it.

Guide lines for ESE:

- ESE will be based on the practical assignments submitted by the students in the form of journal.
- In the ESE, the students may be asked to perform the practical assignment with minor modification.
- Evaluation will be based on the paper work of algorithm, understanding of the logic and the syntax, quality of program, execution of the program, type of input and output for the program.

Reference Books:

1. David F. Rogers, "Procedural Elements for Computer Graphics, Tata McGraw Hill, Second edition.
2. Shirley, Marshner, "Fundamentals of Computer Graphics", Third edition, CRC Publication/ A.K. Peters.
3. Steven Harringtom, "Computer graphics A Programming Approach", MGH.
4. Maurya, "Computer Graphics: with virtual reality system", Wiley India.
5. Foley, Vandam, Feiner, Hughes, "Computer Graphics Principals & Practice", Pearson, Second edition.
6. Donald Hearn and Pauline Baker," Computer Graphics", Pearson LPE, Second edition.
7. Rao and Prasad," Graphics user interface with X windows and MOTIF", New Age.
8. Mukherjee, "Fundamentals of Computer Graphics and Multimedia", PHI.

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Third Year Engineering

(Computer)

Faculty of Engineering and Technology

COURSE OUTLINE

Semester – V

W.E.F. 2014 – 2015

Annexure - I

TE Semester – V

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Software Engineering*	D	3	---	---	3	20	80	---	---	100	3
Formal Language & Automata Theory*	D	3	---	---	3	20	80	---	---	100	3
Computer Network*	D	3	---	---	3	20	80	---	---	100	3
System Programming*	D	3	---	---	3	20	80	---	---	100	3
Principles of Management*	C	3	---	---	3	20	80	---	---	100	3
Software Engineering Lab*	D	---	---	2	2	---	---	25	25 **(OR)**	50	1
Linux Lab*	D	---	---	2	2	---	---	25	---	25	1
Computer Network Lab*	D	---	---	2	2	---	---	25	25 **(PR)**	50	1
System Programming Lab*	D	---	---	2	2	---	---	25	25 **(OR)**	50	1
Java Programming Lab*	B	1	---	2	3	---	---	50	---	50	2
Industrial Training / EDP / Special Study*	D	---	---	---	---	---	---	25	---	25	2
Total		**16**	**---**	**10**	**26**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA : Internal Continuous Assessment**

*** Common Subjects with TE I.T.**

TE Semester – VI

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Operating System*	D	3	--	---	3	20	80	---	---	100	3
Object Oriented Modeling & Design*	D	3	---	---	3	20	80	---	---	100	3
Database Management System*	D	3	---	---	3	20	80	---	---	100	3
Analysis & Design of Algorithms	D	3	---	---	3	20	80	---	---	100	3
Management Information System*	C	3	---	---	3	20	80	---	---	100	3
Operating System Lab*	D	---	---	2	2	---	---	25	25 **(OR)**	50	1
Object Oriented Modeling & Design Lab*	D	---	---	2	2	---	---	25	25 **(OR)**	50	1
Database Management System Lab*	D	---	---	2	2	---	---	25	25 **(PR)**	50	1
Web Programming Lab*	B	---	---	2	2	---	---	25	---	25	1
Minor Project*	D	---	---	2	2	---	---	50	---	50	2
Seminar – I*	D	---	---	2	2	---	---	25	---	25	2
Total		**15**	**---**	**12**	**27**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

*** Common Subjects with TE I.T.**

Software Engineering

COURSE OUTLINE

Course Title	Short Title	Course Code
Software Engineering	**SE**	

Course Description:
The objective of this course is to introduce students the knowledge of Software Development Life Cycle, application of analysis, design, testing principles and project planning & management concepts to develop quality software economically.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Knowledge of programming languages and data structures.

COURSE CONTENT

Software Engineering **Semester-V**

Teaching Scheme

Lecture: 3 Hours/Week

Examination Scheme

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Introduction to Software Engineering (08Hrs, 16 Marks)

a. Nature of Software
b. Software Process
c. Software Engineering Practice
d. Software Myths
e. Generic Process model
f. Process Assessment and Improvement
g. Perspective Process Models
h. Specialized Process Models
i. Personal and Team Process Models
Agile Process models:
j. Agile process
k. Extreme programming

2. Requirements Engineering (08Hrs, 16 Marks)

Requirements Engineering:
a. Eliciting Requirements
b. Building the Requirements Model
c. Negotiating requirements
d. Validating requirements
e. Requirements Analysis

f. Scenario-Based Modeling
g. Requirements modeling strategies
h. Flow-Oriented Modeling
i. Data modeling Concepts
j. Class based modeling
k. SRS.

3. Design Engineering (08Hrs, 16 Marks)

a. Design Process
b. Design Concepts
c. The Design Model

Architectural Design:

d. Software Architecture
e. Architectural Styles
f. Architectural Design

User Interface Design:

a. Rules
b. User Interface Analysis and Design
c. Interface Analysis
d. Interface Design Steps
e. Pattern Based Design
f. Design Patterns
g. Pattern Based software Design
h. Component Level Design patterns
i. User Interface Design patterns
j. WebApp Design patterns

Introduction to UML Diagrams.

4. Software Testing (08Hrs, 16 Marks)

Testing Strategies:

a. A Strategic approach to Software Testing
b. Strategic Issues
c. Testing Strategy for Conventional Software
d. Testing Strategy for Object-Oriented Software
e. Testing strategies for Web App
f. Validation Testing
g. System Testing

Testing Tactics:

h. Testing Fundamentals
i. White Box Testing
j. Basis Path Testing
k. Control Structure Testing
l. Black Box Testing

5. Software Project Planning & Management Concepts (08Hrs, 16 Marks)

a. Management Spectrum
b. People
c. Product

d. Process
e. Project
f. Critical Practices

Estimation for software project:

g. Project Planning Process
h. Software scope and feasibility
i. Resources
j. Decomposition Techniques
k. Empirical Estimation Models
l. Make/Buy Decision

Project Scheduling:

a. Task set for Software project
b. Defining a task network
c. Scheduling
d. Earned Value Analysis

Product Metrics:

e. A framework for product metrics
f. Software Quality
g. Software Quality Factors

Text Books:

1. Pressman R., "Software Engineering, A Practitioners Approach", 7th Edition, Tata McGraw Hill.

Reference Books:

1. Rajib Mall, "Software Engineering", 3rd Edition, PHI.
2. Pankaj Jalote, "An Integrated Approach to Software Engineering", 3rd Edition, Springer.
3. Sommerville, "Software Engineering", 8th Edition, Pearson.
4. Fairly R. , "Software Engineering", Tata McGraw Hill.
5. Davis A. , "Principles of Software Development", Tata McGraw Hill.
6. Shooman, M.L., "Software Engineering", Tata McGraw-Hill.

Formal Language and Automata Theory

COURSE OUTLINE

Course Title | Short Title Course Code
Formal Language and Automata Theory | **FLAT**

Course Description:
The objective of this course is to introduce the students the knowledge of automata Theory, principles of Grammars, Push down Automata, Turing Machines and enable them to apply these concepts for solving real world problems.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Knowledge of Discrete Structure & Graph Theory and Data Structures.

COURSE CONTENT

Formal Language and Automata Theory **Semester-V**

Teaching Scheme
Lecture: 3 hours / week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Finite State Machines: (08 Hrs, 16 Marks)

Mathematical Preliminaries:

a. Sets , Relations and Functions
b. Alphabets, Words / Strings, their Properties and operations
c. Graphs and trees
d. Basic machine

Finite State Machines:

e. State tables, Transition graph
f. Adjacency matrix
g. Description of a Finite automaton
h. Transition Systems
i. Properties of Transition functions
j. Acceptability of a string by a FA
k. Deterministic and Non-deterministic FSM's
l. Equivalence of DFA and NFA
m. Moore and Mealy Models
n. Minimization of Finite Automata
o. FSM with Epsilon moves

2. Regular Expressions: (08 Hrs, 16 Marks)

a. Definition, Identities for Regular Expressions

b. Finite Automata and Regular Expressions

   Transition System Containing ∧-moves, NDFAs with ∧-moves and Regular Expressions, Conversion of Nondeterministic Systems to Deterministic Systems

c. Building RE
d. Construction of Finite Automata Equivalent to a Regular Expression
e. Conversion of RE to FA
f. Converting FA to RE
g. Equivalence of two FA
h. Pumping lemma for regular sets
i. Applications of Pumping lemma
j. Closure properties of Regular sets

(08 Hrs, 16 Marks)

3. Grammars:

a. Definition
b. Derivation trees
c. Leftmost and Rightmost Derivations
d. Ambiguous grammar
e. Removal of ambiguity
f. Chomsky hierarchy
g. Construction of Reduced Grammar
h. Eliminating Useless symbols
i. Eliminating Epsilon productions
j. Eliminating Unit productions

Normal Forms for Context – free Grammars

k. Chomsky Normal Form
l. Greibach Normal Form
m. Reduced Forms – CNF and GNF
n. Reduction to CNF and GNF
o. Pumping Lemma for Context – free Languages
p. Decision Algorithms for Context- free Languages

4. Pushdown Stack Memory Machines & Production Systems (08 Hrs, 16 Marks)

Pushdown Stack Memory Machines:

a. Definition, PDM examples
b. Acceptance by PDA
c. Power of PDM
d. Deterministic and Non-deterministic PDM
e. Construction of PDA from CFG
f. Construction of CFG from PDA

Production Systems:

a. Definition, Post canonical system
b. PMT systems
c. Markov algorithm

5. Turing Machine: (08 Hrs, 16 Marks)

a. Turing Machine Model
b. Representation of Turing Machines

c. Language Acceptability By Turing Machines
d. Design of Turing Machines
e. Techniques for TM Construction
f. Variants of Turing Machines
g. Composite and Iterated TM
h. Universal TM
i. TM limitations
j. The Halting problem

Text Books -

1. E V Krishnamurthy, S.K.Sen, “Introductory Theory of Computer Science”, Second Edition, EWP.
2. John E. Hopcroft, Rajeev Motwani, Jeffery D. Ullman, “Introduction to Automata Theory, Languages and Computation”, Third Edition, Pearson.
3. K.L.P.Mishra, N. Chandrasekaran, “Theory of Computer Science Automaton, Languages and Computation”, Third Edition, PHI.

Reference Books -

1. Daniel Cohen, “Introduction to computer Theory”, Wiley India.
2. John Martin, “Introduction to Languages and the Theory of Computation”, TMH.
3. Lewis H., Papadimitriou C., "Elements of Theory of Computation", Second Edition, Pearson.
4. Moret B., “The Theory of Computation", Pearson Education.

Computer Network

COURSE OUTLINE

Course Title	Short Title	Course Code
Computer Network	**CN**	

Course Description:

This course is aimed at introducing the fundamentals of Computer Networking to undergraduate students. The objective of the course is to understand the basics and knowledge about the Computer Network concepts and different protocols.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**3**	**14**	**42**	**03**

Prerequisite Course(s): Data Communications.

COURSE CONTENT

Computer Network **Semester-V**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. TCP/IP Protocol Suit, Data Link Layer and Ethernet

(08 Hours, 16 marks)

TCP/IP Protocol Suit: Physical and Data Link Layers, Network Layer, Transport Layer, Application Layer. Addressing: Physical Addresses, Logical Addresses, Port Addresses, Specific Addresses.

Data Link Layer: Framing: Fixed size and variable size framing.

Ethernet: IEEE Standards: Data Link Layer, Physical Layer. Standard ETHERNET: MAC Sublayer, Physical Layer. Changes in the standard: Bridged Ethernet, Switched Ethernet, Full-Duplex Ethernet. Fast Ethernet: MAC Sublayer, Physical Layer. Gigabit Ethernet: MAC Sublayer, Physical Layer, Ten-Gigabit Ethernet.

2. Network Layer: Logical Addressing, Internet Protocol and Address Mapping

(08 Hours, 16 marks)

Logical Addressing: IPv4 Addresses: Address Space, Notations, Classful Addressing, Classless Addressing, Network Address Translation (NAT).

Internet Protocol: IPv4: Datagram, Fragmentation, Checksum, Options. IPv6: Structure, Address Space, Advantages, Packet Format, Extension Headers, Transition from IPv4 to IPv6: Dual Stack, Tunneling, Header Translation.

Address Mapping: Mapping Logical to Physical Address: ARP, Mapping Physical to Logical Address: RARP, BOOTP and DHCP.

3. Network Layer: Error Reporting, Delivery, Forwarding and Unicast 7 Mulicast Routing Protocols (08 Hours, 16 marks)

Error Reporting: ICMP: Types of Messages, Message Format, Error Reporting, Query, Debugging Tools.
Delivery: Direct Versus Indirect Delivery.
Forwarding: Forwarding Techniques, Routing Table.
Unicast Routing Protocols: Optimization, Intra and Interdomain Routing, Distance Vector Routing, Link State Routing, Path Vector Routing.
Multicast Routing Protocols: Source-Based Tree and Group-Shared Tree, MOSPF, Core-Based Tree (CBT).

4. Transport Layer: UDP and TCP

(08 Hours, 16 marks)

Transport Layer: Transport-layer services: Process-to-Process Communication, Addressing: Port Numbers, Encapsulation and Decapsulation, Multiplexing and Demultiplexing, Flow Control and Error Control.
User Datagram Protocol (UDP): User Datagram, UDP Services: Process-to-Process Communication, Connectionless Services, Flow Control and Error Control.
Transmission Control Protocol (TCP): Services, Features, Segment, Connection, Flow Control, Error Control and Congestion Control: open-loop congestion control and closed-loop congestion control.

5. Wireless Networks: 802.11 and Network Security

(08 Hours, 16 marks)

Introduction to Wireless Network: Why Wireless? A Network by Any Other Name.
Overview of 802.11 Networks: IEEE 802 Network Technology Family Tree, 802.11 Nomenclature and Design, 802.11 Network Operations, Mobility Support.
Network Security: Introduction to cryptography, symmetric-key and asymmetric-key cryptography. Symmetric-Key cryptography: Introduction, traditional ciphers, simple modern ciphers: XOR Cipher, Rotation Cipher, Substitution Cipher: S-box, Transposition Cipher: P-box. Asymmetric-Key cryptography: RSA, Diffie-Hellman algorithms.

Text Books:

1. B. A. Forouzan, "Data Communications and Networking", TMH, Fourth Edition.
2. A. S. Tanenbaum, "Computer Networks", Pearson Education, Fourth Edition.
3. Matthew S. Gast, "802.11 Wireless Networks: The Definitive Guide", O'Reilly, Second Edition.

Reference Books:

1. B. A. Forouzan, “TCP/IP Protocol Suite", TMH, Fourth Edition.
2. W.R. Stevens, “Unix Network Programming”, Vol.1, Pearson Education.
3. S. Keshav, “An Engineering Approach to Computer Networking”, Addison Wesley.
4. Comer, “Internetworking with TCP/IP", Vol. 1, Pearson Education, Fourth Edition.
5. W. Stallings, “Data and Computer Communications", Pearson Education, Fifth Edition.

System Programming

COURSE OUTLINE

Course Title	Short Title	Course Code
System Programming	**SP**	

Course Description:
The objective of this course is to introduce the students to the fundamentals of System Programming. In this basic system programs are studied in order to understand the working of system software.

	Hours per week	No. of Weeks	Total Hours	Semester Credits
Lectures	**03**	**14**	**42**	**03**

Prerequisite Course(s): Discrete Structure and Graph Theory, Data Structures.

COURSE CONTENT

System Programming **Semester-V**

Teaching Scheme
Lecture: 3 hours / week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Introduction to System Programs and Assembler: (08 Hours, 16 marks)

a. Introduction to system programming, Types of software and application software, System programming and system programs, Need of system software. Assemblers, Loaders, Compilers, Interpreters, Macros, Operating system and formal system, Translators and its types.
b. Assemblers: Structure of assembler, basic function, Machine dependent and machine independent features of assembler, Types of assemblers – single pass, multi-pass, cross assembler.
c. General design procedure of assembler, Design of Pass-I and Pass-II assembler (with reference to 8086 assembler).
d. Operating System:- concept, services, types (brief introduction only).

2. Macro processor & Loader: (08 Hours, 16 marks)

a. Macros and Macro Processors: Definition and function of Macro Processor, Macro expansion, Features of macro facility.
b. Design of macro processor – single pass and two pass macro processor, detailed design of two pass macro processor.
c. Loaders and Linkage Editors: Basic loader functions, Relocation and linking concepts, various loader schemes (Compile and go loader, Absolute loader, Relocating loader, general loading scheme) with their advantages and disadvantages.

3. Loader, Linker & Grammar: (08 Hours, 16 marks)

a. Design of direct linking loaders, specification of problem, specification of data structures, format of databases.
b. Design of a linker, A linker for MS DOS, Linking for overlays.
c. Other loader schemes – Binders, Linking loaders, Overlays, Dynamic binders.
d. Grammar and scanner, Programming language grammar, Derivation, Reduction and Syntax tree, Ambiguity, Regular grammar and Regular expression.

4. Parser and Parsing Techniques (08 Hours, 16 marks)

a. Parsing Techniques: - Concept, Top Down and Bottom up Parsing.
b. Top Down Parsing :- limitations of Top Down Parsing -Recursive descent and Predictive Parsing
c. Bottom Up Parsing:- Concept, Shift Reduce Parser, LR Parser, LALR, SLR Parser
d. Operator Precedence Parser, Syntax directed translation (Concept and introduction only).
e. Introduction to software development tools LEX & YACC.

5. Compiler & Inter Process Communication (08 Hours, 16 marks)

a. Overview of compilation process, Basic functions of complier, Machine dependent and machine independent features of compiler.
b. Types of compilers – single pass, multi-pass, cross compiler and pseudo code compiler,
c. Phase structure of compiler.
d. Introduction to inter process communication in windows(DLL, DDE, OLE, Clipboard:- concept and introduction only).

Reference Books:

1. John J. Donovan, “System Programming”, 2nd Edition, TATA Mc GRAW HILL.
2. D. M. Dhamdhere, “System Programming and Operating Systems”, Second Revised Edition, TATA Mc GRAW HILL.
3. Aho Alfred V, Sethi Rav and Ullman D, “Compiler Principles Techniques and Tools”, 2nd Edition, Pearson Education.

Principles of Management

COURSE OUTLINE

Course Title	Short Title	Course Code
Principles of Management	**POM**	

Course Description:
The objective of this course is to introduce the students to the Knowledge of Functions of Management and Project management, life-cycle of project, its scheduling and total quality management enable them to Understood and gain for further study.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

COURSE CONTENT

Principles of Management **Semester- V**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Basic Concepts of Management (08 Hours, 16 marks)

a. Management :Definition, classification, Characteristics and Importance of management, Principles of Management
b. Management objectives, Types of objectives
c. Functions of managers, Managerial accounting
d. Development of management thoughts : Functional approach to management by Henry Foyal
e. Scientific Management Approach by Taylor, Gilbreth, Gantt
f. Human Relation Approach by Elton Mayo,Follet
g. Schools of management Thoughts
h. Tools of Management science, Managerial economics

2. Functions of Management and Organisations

(08 Hours, 16 marks)

a. Functions of Management: Planning, Organising
b. Staffing - Concept, Nature, Importance, Steps, Concept of Knowledge worker
c. Directing– Concept, Nature, Importance
d. Controlling-Concept, Nature, Importance, Process of controlling Leadership theories, characteristic and styles of leaderships
e. Management by objectives: steps in setting up M.B.O, Problem in the approach of M.B.O., Management of participation, management by exception, quantitative and qualitative objectives

f. Organisation and its Concept: Nature, Importance, Principles, Centralization, Decentralization
g. Organization Structures- Line and Staff, Functional, Organizations.

3. Human Resource Management

(08 Hours, 16 marks)

a. Function and objective Personnel Management
b. Manpower Planning, Selection and Recruitment of Employees
c. Needs & Types of Training, Objective and Benefits of training, Training for Craftsman, supervisor and Executive
d. Motivation and motivators: motivations, perspective: self-motivation
e. Motivation: the carrot and the sticks, kinds of Motivation, Herzberg's motivation, Hygien Theory
f. Personal management: concept, principles of good personal policy
g. Communication in industry, suggestion system, discipline in industry, promotion, transfer, layout and discharge

4. Project and Quality Management

(08ours, 16 marks)

a. Introduction, Project Management Terminology, Concept of project Management
b. Role and Responsibilities of Project Manager
c. Types of project, Project Life Cycle Phase
d. Project Planning, Project Scheduling, Project Monitoring and Control
e. Basic tools and Techniques for Project Scheduling
f. Total quality management: Introduction, factors affecting quality,
g. product quality analysis, product quality analysis, causes of quality failure
h. elements of T.Q.M , requirements of T.Q.M, Aims of T.Q.M., quality circles, ISO 9000

5. Industrial Psychology, Ethics and MIS

(08 Hours, 16 marks)

a. Industrial Psychology: Definition and Concepts, Industrial psychology Vs Personal Management
b. Aims and Objectives of Industrial Psychology, Scope
c. Individual difference in behavior, Group Dynamics
d. Theory X and Y, Working Environmental Conditions, Industrial Fatigue
e. Professional and Business Ethics: Concepts, Ethics and Morals, Business Ethics, Professional Ethics
f. Need and Importance of ethics, Ethical problems and business, Ethical Issues, How to make business ethical
g. Definition, Evolution of MIS, Need/Objective/Functions of an MIS, Need for Information, Qualities of Good information
h. Information as an Organizational Resource, Management Information Categories, Application of MIS

Text Books:

1. T.R.Banga & S.C.Sharma , "Industrial Organization and Management Economics" Twenty-Third Edition, Hanna Publishers.
2. O.P.Khanna, "Industrial Organization and Management Economics", Dhanpat Rai Publications, 2006.

Reference Books:

1. Koontz and Weihrich, "Management –A Global Perspective", Tenth Edition, Mc Graw-Hill International Editions.
2. Tritaphy and Reddy, "Principles of Management", Second edition, TMH.
3. Hill and Steven, "Principles of Management", McGraw Hill, Special Indian Edition, 2007.
4. M.S.Mahajan," Industrial Engineering and Production Management" Dhanpat Rai and Co.
5. W.S.Jawadekar, "Management Information System", TMH.

Software Engineering Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Software Engineering	**SE**	

Course Description:
This laboratory provides students an ability to apply analysis & design concepts to develop quality software economically.

Laboratory	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	02	14	28	01

Prerequisite Course(s) : Knowledge of Object Oriented Concepts and any system programming language.

LAB COURSE CONTENT

The Software Engineering Lab must include any five of following software Mini-Projects covering Problem Definition, Analysis & Design using a CASE Tool and Documentation for each.

1. ATM System
2. Library Management System
3. Inventory Control System
4. Railway Reservation System
5. College Admission System
6. University Result Management System
7. Vehicle Navigation System
8. Hospital Management System
9. Banking System
10. Web based/Online Auction System

Guidelines for ICA:
Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:
The oral examination will be based on the assignments performed by the candidates as part of ICA. Questions will be asked during the oral examination to judge the understanding of the student. It is expected that student knows theoretical (Software Engineering) aspect of the problem.

Reference Books:

1. Timonthy C. Lethbridge and Robert Laganiere, “Object Oriented Software Engineering – A Practical Software Development using UML and JAVA”, 2nd Edition, Tata McGraw-Hill.
2. Mike O’Docherty, “Object-Oriented Analysis & Design – Understanding System Development with UML 2.0”, Wiley.

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Linux Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Linux	**Linux**	

Course Description:

This laboratory provides students with a basic knowledge of the linux programming environment. So that students able to use basic commands of linux as well as they will able to perform basic operations.

Laboratory	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	02	14	28	01

Total Semester Credits: 01

Prerequisite Course(s): Fundamental knowledge of Operating system.

LAB COURSE CONTENT

Outline of Content:

Teacher should facilitate learning following lab experiments:

Group A

1. **Installation of Linux OS.**
   Installing latest version of Linux. Observing each step of installation and notice the differences.
2. **Study and execution of various Linux Commands.**
   Studying various basic commands of Linux. Use of commands.
3. **Study of vi editor.**
   Studying basic working and use of vi editor.
4. **Configuration of Linux Server (any two)**
   It shows step by step Configuration of various types of servers
   1) Web Server
   2) Mail Server
   3) Proxy Server
   4) Telnet Server
   5) FTP Server
5. **Shell script for finding out factorial of a number.**
   To calculate the Factorial of number.
6. **Shell script for finding out file type and displaying list of a directory.**
   To find out file type and displaying list of directory.
7. **Shell Script for File Handling.**
   Demonstrates the various file operations such as :
   1) Create a File.
   2) Read a File.
   3) Add a record into a File.

4) Delete a record from File.
5) Delete a file.
6) Update a File.

Group B

1 **Write shell script for displaying user process and system related information using environment variables.**
Displays a user process and system related information using environment variables.

2 **Write a shell script to find the largest among the 3 given numbers.**
To find out largest number among 3 given numbers.

3 **Write a shell script to reverse the contents of a String.**
To print contents of string in reverse order.

4 **Write a shell script to print date and time.**
To print date and time along with greetings depend on time.

5 **Shell script to perform arithmetic operations.**
To perform arithmetic operations such as – Addition, Subtraction, Multiplication, Division**.**

Guidelines for ICA:
Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Reference Books:

1. Stevens Richard W, Rago Stephen A "Advanced Programming in the Unix Environment", Pearson 2008.
2. Gopalan N P,Sivaselvan B "Beginners guide to unix", PHI Learning: New Delhi, 2009.
3. Richard Blum, Christine Bresnahan, "Linux Command Line and Shell Scripting Bible, 2nd Ed", Wiley India, 2011.
4. Dayanand Ambawade, Deven N. Shah, "Linux Lab: Hands on Linux", Dreamtech Press
5. "Linux Administration", Kogent Learning Solutions Inc.
6. Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, "Unix and Linux System Administration Handbook" 4th Edition, Pearson.
7. Neil Matthew, Richard Stones, "Beginning Linux Programming", 4th Edition, Wiley.
8. K. L. JAMES, "Linux -Learning the Essentials", PHI, 2011.

Note:

- Concerned faculty should suitably frame at least **10 practical** assignments **(SIX from PART – A and FOUR from PART – B)** out of the above list.
- Every assignment should include syntax, use of commands/functions used for coding & print out of code with proper comments and output.
- Every student is required to submit the assignments in the form of journal.
- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Computer Network Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Computer Network	**CN**	

Course Description:

This laboratory provides students with a comprehensive study of the Computer Networking and protocols. Classroom lectures stress the strengths of Computer Networks, which provide students with the means of writing efficient, maintainable, and portable code and simulating protocols and networks.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**14**	**28**	**01**

Total Semester Credits: 01

Prerequisite Course(s): Fundamental knowledge of Computers and Data Communication, C, C++ and Java Programming.

LAB COURSE CONTENT
Outline of Content:

(Note: Minimum SIX Experiments from PART A and TWO from PART B.)

PART - A

1. Implementation of Character count/Bit-Stuffing/Byte stuffing framing methods.
2. Implementation of Dijkastra's Shortest Path Network routing algorithm.
3. Implementation of TCP checksum.
4. Socket programming for TCP.
5. Socket programming for UDP.
6. Encryption/Decryption using XOR symmetric-key cryptography algorithm.
7. Encryption/Decryption using RSA asymmetric-key cryptography algorithm.
8. Implementation of RLE data compression algorithm.

PART – B

1. Simulate the Ethernet LAN for wired networks.
2. Simulate the point-to-point wired network.
3. Simulate any Wireless network.

Guidelines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:

ESE will be based on the practical assignments submitted by the students in the form of journal. In the ESE, the students may be asked to perform the practical assignment with minor modification.

Evaluation will be based on the paper work of algorithm, understanding of the logic and the syntax, quality of the program, execution of the program, type of input and output for the program.

NOTE: -

- Concerned faculty should use any network simulator software like NS-2/NS-3/ OPNET/ NetSim/ OMNeT++ to perform **PART-B** assignments.
- Concerned faculty should suitably frame at least **08 practical** assignments **(SIX from PART – A and TWO from PART – B)** out of the above list.
- Every assignment should include, theory, algorithm, print out of code with proper comments and output. Every student is required to submit the assignments in the form of journal.
- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

System Programming Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
System Programming	**SP**	

Course Description:

The objective of this course is to introduce the students to the fundamentals of System Programming. In this basic system programs are studied in order to understand the working of system software.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**14**	**28**	**01**

Total Semester Credits: 01

Prerequisite Course(s): Fundamental knowledge of Discrete Structures and Graph Theory, Data Structures.

LAB COURSE CONTENT
Outline of Content:

1. **Develop an application to simulate pass-I of Two Pass Assembler.**
   To analyse the source program for finding Pseudo–opcode, Machine opcode, Literals and symbols.
2. **Develop an application simulate pass- II of Two pass Assembler.**
   To analyse the output of pass-I to generate the machine operation code.
3. **Develop an application to create simple text editor.**
   Develop a text editor for creation, opening, editing and saving the content into a file.
4. **Develop an application for simulating Lexical Phase of compiler.**
   Develop a Lexical Analyser for generating keywords, symbols, operators and identifires within the source code.
5. **Develop an application for simulating Syntax Analysis Phase of compiler.**
   Develop a Syntax Analyser for generating a Parse tree from source code.
6. **Develop an application for simulating Pass-I of Macro Processor.**
   Develop Pass-I of Macro processor for recognizing macro definition specified within a program.
7. **Develop an application for simulating Pass-II of Macro Processor.**
   Develop Pass-II of an Macro processor for expanding a macro definition specified within a program
8. **Develop an application for simulation of any one of parsing techniques.**
   Develop a parser from the grammar specified within a source code.

Guidelines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:

- ESE will be based on the practical assignments submitted by the students in the form of journal.
- In the ESE, the students may be asked to perform the practical assignment with minor modification.

Note:

- Concerned faculty should suitably frame at least **06 practical** assignments out of the above list.
- Every assignment should include theoretical concept, algorithm, print out of code with proper comments and output.
- Every student is required to submit the assignments in the form of journal.
- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Java Programming Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Java Programming	**JPL**	

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**14**	**28**	**01**

Group-A

1 **Write a program that demonstrates string operations.**

2 **Write a program that demonstrate package creation and use in program.**

3 **Write a program to demonstrate the abstract class and abstract method**.

4 **Write a Java program that illustrates the concepts of Java class that includes**

(a) constructor with and without parameters.
(b) Overloading methods.
(c) Overriding methods

5 **Write a Java program to demonstrate inheritance by creating suitable classes.**

6 **Create a Java package, interface and implement in Java program.**

7 **Write a program to demonstrate**

- Use of implementing interfaces.
- Use of extending interfaces.

Group- B

1 **Write a program to implement the concept of threading.**

2 **Write a program to demonstrate the predefined and User defined exception handling.**

3 **Write a program using Applet**

- to display a message in the Applet.
- for configuring Applets by passing parameters.

4 **Write programs for using Graphics class**

- to display basic shapes and fill them.
- draw different items using basic shapes

- set background and foreground colors.

5 **Write a program in Java that demonstrates JDBC**

6 **Write a program that demonstrates JDBC on applet/application**

Guidelines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Reference Books:

1. Herbert Schildt, "Java2: The Complete Reference", Tata Mc GrawHill, 5th edition.
2. E. Balagurusamy,"Programming with Java A primer", 3rd Edition.
3. Horstman Cay and Cornell Gary, "Core JavaTM2", Vol.1, Pearson education.
4. Kathey Sierra and Bert Bates, "Head First Java", SPD Publication.
5. Steven Holzner, "JAVA 2 Programming Black Book", Wiley India.

Note:

- Concerned faculty should suitably frame at least **08 practical** assignments **(FIVE from PART – A and THREE from PART – B)** out of the above list.
- Every assignment should include algorithm, print out of code with proper comments and output.
- Every student is required to submit the assignments in the form of journal.
- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Industrial Training / EDP / Special Study
COURSE CONTENT

Industrial Training / EDP / Special Study	**IT/EDP/SS**	
Course Title	Short Title	Course Code

Semester-V **Examination Scheme**
Total Semester Credits: 02 **Internal Continuous Assessment (ICA): 25 Marks**

Industrial Training

- Student shall undergo industrial training for a minimum period of **two weeks** during summer vacations between fourth semester and fifth semester.
- The industry in which industrial training is taken should be a medium or large scale industry
- The paper bound report on training must be submitted by the student in the beginning of Fifth semester along with a certificate from the company where the student took training.
- Every student should write the report separately.
- Institute / Department/T&P Cell have to assist the students for finding Industries for the training.
- Students must take prior permission from Department before joining for Industrial Training.

OR

EDP (Entrepreneurship Development Program)

- Student has to participate in Entrepreneurship Development Program for a minimum period of **One week** during summer vacations between fourth semester and fifth semester.
- Every student must submit the paper bound report based on the program in the beginning of Fifth semester along with a certificate (Course / Program completion) from the program organizers.
- Every student should write the report separately.
- Institute / Department may arrange Entrepreneurship Development Program at their campus.
- Students must take prior permission from Department before attending any Entrepreneurship Development Program.

OR

Special Study

- Student has to submit name of three topics of his interest to the department.
- Special study in a group shall not be allowed.
- The three-member committee appointed by Head of Department shall allot one topic out of the three topics submitted by the student.
- Every student must submit the paper bound report based on special study at the end of Firth semester.
- Department should allot guide to all such students, for monitoring their progress and

guide them for literature survey / report writing etc.

- Evaluation of special study shall be done based on presentation made by student, followed by brief question answer session.

Evaluation of Industrial Training / EDP / Special Study

ICA: The Internal Continuous Assessment shall be based on the active participation of the students in the training / EDP / Special study and based on knowledge / skill acquired by the student. The three-member committee appointed by Head of Department shall assess the reports and award marks based on following:

(a) Report	10 marks.
(b) Presentation	10 marks.
(c) Viva-voce at the time of presentation	05 marks.
Total:	**25 marks.**

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Third Year Engineering

(Computer)

Faculty of Engineering and Technology

COURSE OUTLINE

Semester – VI

W.E.F. 2014 – 2015

Operating System

COURSE OUTLINE

Course Title	Short Title	Course Code
Operating System	**OS**	

Course Description:
The objective of this course is to introduce the students to the concepts of Operating Systems functions, types and their working details.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Computer Organization, System Programming.

COURSE CONTENT

Operating System **Semester-VI**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Operating System Overview

(08 Hours, 16 marks)

a. Introduction: Computer system organization, Architecture, Evolution of OS, Need of OS, User view and System view of OS.
b. Types of Operating System: Batch, Timesharing, Multiprogramming, Multitasking, RTOS, Distributed.
c. Operating System Services and Components: Different OS services and OS components, System calls and its types.
d. Operating System Structures: Monolithic, Layered, Kernel, Microkernel, Virtual Machine.
e. Threads: Overview, Benefits, Models (Introduction Only).

2. Process and Process Management

(08 Hours, 16 marks)

a. Process Concept: The process, Process states, Process Control Block, Context Switching, SPOOLING, CPU & I/O burst.
b. Scheduling: Concept, Objectives, Queuing diagram.
c. Types of Schedulers: Long term Scheduler, Middle term Scheduler, Short term Scheduler.

d. Scheduling Algorithm (For Uniprocessor System): FCFS, SJF (preemptive & non preemptive), Priority (preemptive & non preemptive), Round Robin, MLQ with and without feedback.

e. IPC: Concept and Types.

f. Critical Section: Critical section problem, Solution to critical section problem, Mutual exclusion with busy waiting, TSL, Peterson's solution for two processes, Dijkstra's semaphore.

g. Problem in Concurrent Programming: Producer-Consumer problem, Readers–Writers problem, Dinning Philosopher problem, Monitors.

3. Deadlocks

(08 Hours, 16 marks)

a. Deadlock: System Model, Deadlock Characterization, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

b. Memory Management: Memory Management Requirements.

c. Memory Partitioning: Fixed and Dynamic Partitioning.

d. Memory Allocation: Allocation strategies (First Fit, Best Fit and Worst Fit), Fragmentation, Swapping, Paging and Segmentation.

e. Virtual Memory Management: Background, Demand Paging, Page Replacement (FIFO, LRU, Optimal LRU), Thrashing.

4. Storage Management

(08 Hours, 16 marks)

a. File concept: File Organization, Access Methods and Directory Structure.

b. Allocation of Disk Space: Contiguous allocation, Non-contiguous allocation (chaining and indexing).

c. Disk Scheduling: FCFS, SSTF, SCAN, C-SCAN, LOOK.

5. Secondary Storage Structure, Protection and Security, Introduction to UNIX.

(08 Hours, 16 marks)

a. Disk Management: Disk formatting, Boot block, Bad blocks.

b. Swap Space Management: Swap Space Use, Swap Space.

c. System Protection: Goals of protection, Domain of protection, Threats, Security attacks.

d. Introduction to UNIX: History, System architecture.

e. Internal Representation of File: Inode, Structure of regular file, Super block, Pipes (No Algorithms).

f. Process Control: Process creation, Process States and Transitions, Process system calls (exec, fork).

Text Books:

1. A. Silberschatz, P. B. Galvin, G. Gagne, “Operating Systems Concepts”, 7th/ 8th edition, John Wiley Publications, 2008.
2. William Stalling, “Operating System Internals and Design Principles”, 6th edition, Pearson Publication, 2013.

Reference Books:

1. Maurice J. Bach, “The Design of the Unix Operating System”, 1st edition, PHI.
2. Dhananjay M. Dhamdhere, “Operating Systems-A Concept-Based Approach”, 3rd edition, TMH, 2012.
3. A. S. Tanenbaum, “Modern Operating System”, 2nd edition, Pearson publication”, 2001.
4. H. M. Deitel, P. J. Deitel, D. R. Choffnes, “Operating System”, 3rd edition, Pearson publication, 2013.
5. Rajiv Chopra, “Operating Systems-A Practical Approach”, 1st edition, S. Chand Publication, 2009.
6. Sibsankar Haldar, Alex A. Arvind, “Operating Systems”, 1st edition, Pearson Publication, 2009.

Object Oriented Modeling & Design

Course Title Short Title Course Code

Object Oriented Modeling and Design **OOMD**

Course Description:
The objective of this course is to introduce students the knowledge about Modeling and Design of Software firmware and business processes. It introduces UML 2.0 and its diagrams as a modeling tool for large and complex systems. It also gives understanding of the concepts being modeled in UML.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Knowledge of software engineering and object oriented concepts.

COURSE CONTENT

Object Oriented Modeling and Design **Semester-VI**

Teaching Scheme

Lecture: 3 hours / week

Examination Scheme

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Introduction of Object Oriented Modeling (08 Hrs, 16 Marks)

Introduction:

a. What is object-oriented?
b. What is Object oriented development? : Modeling Concept , Not Implementation , Object- Oriented Methodology , Three Models
c. Object oriented themes

Why We Model:

d. The Importance of Modeling
e. Principles of Modeling
f. Object-Oriented Modeling

4+1 View architecture,

Architectural approaches: Use case driven, Architecture-centric, Iterative and Incremental,

Rational Unified Process:

g. Characteristics of the process

Phases and Iterations:

h. Inception Phase
i. Elaboration Phase
j. Construction Phase
k. Transition Phase
l. Iterations
m. Process Workflows
n. Artifacts
o. Other Artifacts

2. Introduction to UML (08 Hrs, 16 Marks)

a. An Overview of the UML: Visualizing, Specifying, Constructing, Documenting
b. Background , UML Basics

c. Introducing UML 2.0

A Conceptual Model of the UML:

d. Building Blocks of the UML
e. Rules of the UML
f. Common Mechanisms in the UML: Specifications, Adornments, Common divisions
g. Extensibility Mechanisms: stereotypes, tagged values, constraints

Object Constraint Language:

h. OCL Basics, OCL Syntax, Advanced OCL Modeling

3. Class Diagram and Composite Structure Diagram (08 Hrs, 16 Marks)

Object Diagram:

a. **Terms and Concepts:**
Common Properties, Contents, Common Uses
b. **Common Modeling Techniques:** Modeling Object Structures

Class Diagram:

c. Classes, Attributes, Operations, Abstract Classes
d. **Relationships:** Dependency, Association, Aggregation, Composition, Generalization, Association Classes, Association Qualifiers
e. **Advanced Relationships:**
Stereotypes on Dependency, Stereotypes and Constraints on Generalization, Constraints on Association, Realization
f. Interfaces
g. Templates
h. Class Diagram: Common Properties, Contents, Common Uses
i. Common Modeling Techniques : Modeling Simple Collaborations, Modeling a Logical Database Schema
j. Forward and Reverse Engineering

Composite Structures Diagram:

k. Connectors, Ports, Structured classes and Properties

4. Behavioral Diagrams (08 Hrs, 16 Marks)

a. **Use case Diagram**
Names, Use Cases and Actors, Use Cases and Flow of Events, Use Cases and Scenarios, Use Cases and Collaborations, Organizing Use Cases, Common Properties, Contents, Common Uses
b. **Sequence Diagram**
c. **Communication Diagram**
d. **Timing Diagram**
e. **State chart Diagram:**
Behavioral State Machines, States, Composite States, Submachine States, Transitions, Activities, Protocol State Machines ,Pseudo States , Event Processing
f. **Activity Diagram:**
Common Properties, Contents, Action States and Activity States, Transitions, Branching, Forking and Joining, Swimlanes, Object Flow, Common Uses

5. Package Diagram, Component Diagram, Deployment Diagram (08 Hrs, 16 Marks)

Package Diagram:

a. **Terms and Concepts**
Names, Owned Elements, Visibility, Importing and Exporting
b. **Common Modeling Techniques:** Modeling Groups of Elements, Modeling Architectural Views

Component:

c. **Terms and Concepts**
Names, Components and Classes, Components and Interfaces, Kinds of Components

Component Diagram:

d. Common Properties, Contents, Common Uses
e. **Common Modeling Techniques:** Modeling Source Code, Modeling an Executable Release, Modeling a Physical Database, Modeling Adaptable Systems
f. Forward and Reverse Engineering

Deployment:

g. **Terms and Concepts**
Names, Nodes and Components, Connections

Deployment Diagram:

h. Common Properties, Contents, Common Uses
i. **Common Modeling Techniques:** Modeling an Embedded System, Modeling a Client/Server System, Modeling a Fully Distributed System
j. Forward and Reverse Engineering

Text Books:

1. James Rumbaugh , Michael Blaha , William Premerlani, Frederick Eddy, William Lorensen ,"Object- Oriented Modeling and Design", Pearson Education.
2. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Pearson Education.
3. Dan Pilone, Neil Pitman, "UML 2.0 in a Nutshell", SPD ,O'Reilly.

Reference Books:

1. Martin Fowler, "UML Distilled: A Brief Guide to the Standard Object Modeling Language", Third Edition ,Addisioh Wesley.
2. Tom Pender, "UML 2 Bible", Wiley.
3. Meilir Page-Jones, "Fundamentals of Object Oriented Design in UML", Pearson Education.
4. Pascal Roques, "Modeling Software Systems Using UML2", Wiley.
5. Atul Kahate, "Object Oriented Analysis & Design", The McGraw-Hill Companies.
6. Mark Priestley, "Practical Object-Oriented Design with UML", TATA McGraw-Hill.
7. Craig Larman, "Appling UML and Patterns: An introduction to Object–Oriented Analysis and Design and Iterative Development", Pearson Education.
8. Mike O'Docherty, "Object-Oriented Analysis & design understanding system development with UML 2.0", John Wiley and Sons.

Database Management System

COURSE OUTLINE

Course Title	Short Title	Course Code
Database Management System	**DBMS**	

Course Description:
The objective of this course is to introduce the students to Learn and practice data modeling using the entity-relationship and developing database designs, apply normalization techniques to normalize the database, learn techniques for controlling the consequences of concurrent data access also understand the needs of Object based Database and Database System Architecture.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Knowledge of data structures.

COURSE CONTENT

Database Management System **Semester-VI**

Teaching Scheme	Examination Scheme	
Lecture: 3 hours / week	End Semester Examination (ESE)	: 80 Marks
	Paper Duration (ESE)	: 03 Hours
	Internal Sessional Exam (ISE)	: 20 Marks

1) Introduction to DBMS (08 Hrs, 16 Marks)

a. Database-System Applications
b. Purpose of Database Systems
c. View of Data: Data Abstraction ,Instances and Schemas, data independence
d. Data Models: Relational Model , Entity-Relationship Model ,Object-Based data model, Semistructured Data Model
e. Database Languages
f. Data Storage and Querying
g. Transaction Management
h. Database Architecture
i. Database Users and Administrators

Database Design and E-R Model

j. Overview of the Design Process
k. The Entity Relationship Model: Entity Sets , Relationship Sets, Attributes, Constraints
l. Entity-Relationship Diagram: Basic Structure , Mapping Cardinality, Roles, Weak Entity sets
m. Extended E-R Features: Specialization, Generalization, Attribute Inheritance, Constraints on Generalizations, Aggregation

2) Structured Query Language (08 Hrs, 16 Marks)

a. Introduction to relational Model: structure of relational Databases, Database Schema, Keys, Schema Diagrams
b. Overview of the SQL Query Language
c. SQL Data Definition

d. Basic Structure of SQL Queries
e. Additional Basic Operations
f. Set Operations
g. Null Values
h. Aggregate Functions
i. Nested Subqueries
j. Modification of the Database

Intermediate SQL:

k. Joined Expressions: Join Conditions , Outer Joins
l. Views
m. Integrity Constraints

3) Formal Relational Query Languages (08 Hrs, 16 Marks)

The Relational Algebra:

a. Fundamental Operations:
The select Operation, The Project Operation, The Union Operation, The Set-Difference Operation, The Cartesian-Product Operation, The Rename Operation, Formal definition of Relational Algebra
b. Additional Algebra Operations:
The Set-Intersection Operation, The Natural-Join Operation, The Assignment Operation, Outer Join Operations
c. Extended Relational-Algebra Operations:
Generalized Projection, Aggregation

The Tuple Relational Calculus:

d. Formal Definition
e. Example Queries

The Domain Relational Calculus:

f. Formal Definition
g. Example Queries

Functions and Procedures

Triggers

4) Relational Database Design and Transaction Management (08 Hrs, 16 Marks)

Relational Database Design:

a. Features of Good Relational Designs
b. Atomic Domains and First Normal Form
c. Decomposition Using Functional Dependencies:
Keys and Functional Dependencies, Boyce-Codd Normal Form, BCNF and Dependency Preservation, Third Normal Form
d. Decomposition Using Multivalued Dependencies: Multivalued Dependencies, Fourth Normal Form

Transaction Management:

e. Transaction Concept
f. A simple Transaction Model
g. Transaction Atomicity and Durability

Concurrency Control:

h. Lock-Based Protocols: Locks, Granting of Locks, The Two Phase Locking protocol
i. Timestamp–Based Protocols: Timestamps , The Timestamps-Ordering Protocol

Recovery System:

j. Failure Classification
k. Storage
l. Recovery and Atomicity: Log records, Database Modification, Concurrency Control and Recovery ,Transaction Commit , Using the Log to Redo and Undo Transactions

5) Object–Based Databases and Database- System Architectures (08 Hrs, 16 Marks)

Object–Based Databases

a. Overview,
b. Complex Data Types
c. Structure Types and Inheritance in SQL
d. Table Inheritance
e. Array and Multiset Types in SQL: Creating and Accessing Collection Values, Querying Collection-Valued Attributes
f. Object–Identity and Reference Types in SQL
g. Persistent Programming Languages: Persistence of Objects, Object Identity and Pointers

Database-System Architectures

h. Centralized and Client–Server Architectures
i. Server System Architectures
j. Parallel Systems
k. Distributed Systems

Text Book:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, “Database System Concepts”, 6th Edition, McGraw-Hill.

Reference Books:

1. R. Ramkrishnan , J. Gehrke, "Database Management Systems", 3rd Edition, McGraw-Hill.
2. C. J. Date, “Introduction to Database Management Systems”, 8th Edition, Pearson.
3. V.K.Jain, “ Database Management System”, Dreamtech Press (Wiley India).
4. Atul Kahate, “Introduction to Database Management System”, 3rd Edition, Pearson.
5. G. K. Gupta, “Database Management Systems”, McGraw–Hill.
6. S. K. Singh, “Database Systems Concepts, Design and Applications”, Pearson.
7. Bipin Desai, “Introduction to database management systems”, Galgotia.

Analysis & Design of Algorithms

COURSE OUTLINE

Course Title	Short Title	Course Code
Analysis and Design of Algorithms	**ADA**	

The objective of this course is to introduce the students to the fundamentals of Algorithm and their analysis. In this basic system program are studied in order to understand the working of system program.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Fundamental knowledge of Algorithm and their analysis.

COURSE CONTENT

Analysis and Design of Algorithms **Semester-VI**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week **End Semester Examination (ESE) : 80 Marks**
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Course Description:

1. Introduction to Algorithm

(08 Hours, 16 marks)

a. Defination
b. Role of Algorithm in computing
c. Performance analysis: space and time complexity
d. Asymptotic notation and complexity issues
e. Analysis of Algorithm: Insertion sort and bubble sort
f. Recurrence: The Master Method

2. Divide and Conquer

(08 Hours, 16 marks)

a. General strategy, analysis
b. Merge sort, Quick Sort, Binary Search- Analysis of algorithm
c. Hiring Problem
d. Indicator Random variable Problem
e. Randomized algorithms

3. Backtracking

(08 Hours, 16 marks)

a. Backtracking: Introduction and Analysis
b. N Queens Problem, graph coloring Problem
c. Branch and Bound: General Strategy and analysis
d. Traveling salesman's problem, knapsack problem
e. Single Source Shortest Path in directed acyclic Graph

4. Advanced Design and Analysis Techniques

(08 Hours, 16 marks)

a. Greedy Algorithms: General strategy, analysis
b. Huffman Code
c. Job sequencing, optimal merge patterns
d. Dynamic Programming: Elements of dynamic programming.
e. Multistage graph, Traveling salesman problem, 0/1 Knapsack Problem, Optimal Binary Search Tree

5. Classification of problems

(08 Hours, 16 marks)

a. Non- deterministic algorithm
b. Satisfiability Problem
c. P, NP-Hard and NP- complete class with example
d. NP-Hard problems: code generation Problems
e. Approximation algorithm for NP-hard problems
f. Parallel Sorting Networks: The zero-one Principle, Parallel Merging Networks, Improved Sorting Networks

Text Books:

1. E. Thomas H. Cormen and Charles E.L. Leiserson, "Introduction to Algorithm", Third Edition, PHI.
2. Horowitz/Sahani, "Fundamentals of Computer Algorithm", Second Edition,Galgotia.
3. Gilles,Brassard and Paul Bratley, " Fundamentals of Algorithmics", PHI.

Reference Books:

1. Aho, "Design & Analysis of Computer Algorithms", Pearson LPE.
2. Russ Miller, "Algorithms: Sequential and Parallel", Dreamtech Press.
3. Goodrich, "Algorithm Design: Foundation and Analysis", Wiley India.
4. Grama , "An Intro to Parallel Computing : Design & Analysis of Algorithms", Second Edition, Pearson LPE.
5. Baase , "Computer Algorithms: Intro to Design & Analysis", Third Edition, Pearson LPE.
6. A. V. Aho and J.D. Ullman, "Design and Analysis of Algorithms", Pearson LPE.
7. Bressard, Bratly, "Fundamentals of Algorithm", Pearson LPE/PHI.
8. Simon Harris, "Beginning Algorithms" Wrox Press (Wiley India).

Management Information System

COURSE OUTLINE

Course Title	Short Title	Course Code
Management Information System	**MIS**	

Course Description:

This course provides an introduction to information systems for business and management. It is designed to familiarize students with organizational and managerial foundations of systems, the technical foundation for understanding information systems, the role of information systems in enhancing business processes and management decision making across the enterprise, and the process of building and managing systems in organizations. The course will focus on topics such as Management of the Digital Firm, Internet and Internet technology, the Electronic Business and Electronic Commerce, the Information Technology (IT) Infrastructure, the Ethical and Security Issues related to Information Systems, and the Enterprise Applications. The course will provide students with information systems knowledge that is essential for creating successful and competitive firms.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Principles of Management.

COURSE CONTENT

Management Information Systems **Semester-VI**

Teaching Scheme
Lecture: 3 hours / week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Information Systems

(08 Hours, 16 marks)

i. Introduction

a) Data Vs Information
b) Functions of Management
c) Managerial Roles
d) Levels of Management
e) Classification of Information System
f) Framework for Information System

ii. Systems

a) System concepts
b) System and their Environments
c) How system works
d) System approach for problem solving

2. E Business Enterprise:

(08 Hours, 16 marks)

i. E Business Technology

a) Introduction to E Business
b) Models of E Business
c) Internet and WWW
d) Security in E Business
e) Electronic Payment System
f) Web Enabled Business Management
g) Enterprise Portal
h) MIS in Web Environment

ii. Organization of Business in Digital Firm

a) E Business
b) E Commerce
c) E Communication
d) E Collaboration
e) Real Time Enterprise

3. Applications To Functional Business Areas

(08 Hours, 16 marks)

i. Operational Information System

a) Accounting / Finance
b) Marketing
c) Production
d) Human Resource

ii. Tactical Information System

a) Accounting / Finance
b) Marketing
c) Production
d) Human Resource

iii. Strategic Information System

a) Accounting / finance
b) Marketing
c) Production
d) Human Resource

4. DSS, EMS And ES:

(08 Hours, 16 marks)

i. Decision Support System

a) Characteristics of Decision Making Process
b) Features of DSS
c) Development of DSS
d) Benefits and Risks of DSS
e) GDSS

ii. Enterprise Management System

a) ERP System
b) ERP Model and Modules
c) Benefits of ERP
d) Supply Chain Management
e) Customer Relationship Management

iii. Expert Systems

a) Characteristics
b) How an Expert System Works
c) Advantages
d) Expert System and DSS
e) Expert Systems and AI.

5. Information Security and Information Technology

(08 Hours, 16 marks)

i. Information Security Challenges in E Enterprise

a) Risks
b) Common Threats
c) Common Controls
d) Protection of information system

ii. IT: Impact on Society

a) Impact of IT on Privacy
b) Ethics
c) Technical Solution for Privacy Protection
d) Intellectual Property
e) Copyright and Patents
f) Impact of IT on the Workplace
g) Impact of quality on Life

Text Books:

1. Robert Schultheis and Mary Sumner, "Management Information Systems The Managers View", 4th Edition Tata McGraw Hill
2. Waman S. Jawadekar, "Management Information Systems", 4th Edition Tata McGraw Hill.

Reference Books:

1. Sahil Raj "Managament Information Systems" PearsonEducation
2. Kenneth C Laudon and Jane Laudon, "Management Information System", Pearson Education
3. James A. O'Brien, "Management Information Systems", Tata McGraw Hill
4. S. Sadagopan, "Management Information System", PHI.

Operating System Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Operating System	**OS**	

Course Description:

This laboratory provides students with a comprehensive study of the operating system functions, its working details and implementation of various algorithms used in the operating systems.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**14**	**28**	**03**

Total Semester Credits: 03

Prerequisite Course(s): C Programming, Basic Knowledge of Linux Operating System.

LAB COURSE CONTENT

Outline of Content:

(Note: Minimum FOUR Experiments each from group A and B)

Group A

1. **Study of Commercial and Open Source Operating Systems (01 each) and Design structure of these of Operating Systems.**
   a. Study the basic structures.
   b. Study the File systems.
   c. Study the Security aspects of Operating Systems.
   d. e. g. Windows OS, Linux OS.
2. **Write a program to implement Command Interpreter using system calls.**
   Implementation of Command Interpreter using various system calls showing working of Command Line Interpreter.
3. **Write a program to implement concept of Threading.**
   Demonstrate the concept of Threading in process. (Without using System Call/ Kernel Functions).
4. **Write a program to implement CPU Scheduling algorithms**
   Demonstrate the working of CPU Scheduling algorithms (any two).
   a. FCFS
   b. SJF(Preemptive & non-preemptive)
   c. Round Robin
   d. Priority(Preemptive & non-preemptive)
5. **Write a program to implement algorithmic solution for Critical Section Problem**

Demonstrate solution to overcome the critical section problem.

Group B

1. **Write a program to implement Memory Management algorithms – best fit, first fit, worst fit**
   Demonstrate the working of Memory Management algorithms (any two).
   a. First Fit
   b. Best Fit
   c. Worst Fit
2. **Write a program to implement Page Replacement algorithms**
   Demonstrate the working of Page Replacement algorithms (any two).
   a. FIFO(First In First Out)
   b. LRU(Least Recently Used)
   c. Optimal
3. **Write a program to implement Inter process communication**
   Demonstrate the working of Inter Process Communication (any one).
   a. Full Duplex pipes
   b. Half Duplex pipes
4. **Write a program for Banker's algorithm**
   Demonstrate the working of Banker's algorithm.
5. **Write a program to demonstrate disk scheduling algorithms**
   Demonstrate the working of the Disk Scheduling algorithms (any two).
   a. FCFS
   b. SSTF
   c. SCAN
   d. C-SCAN

Guidelines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guide lines for ESE:-

- ESE will be based on the practical assignments submitted by the students in the form of journal.
- In the ESE, the students may be asked to perform the practical assignment with minor modification.
- Evaluation will be based on the paper work of algorithm, understanding of the logic and the syntax, quality of the program, execution of the program, type of input and output for the program.

Reference Books:

1. A. Silberschatz, P. B. Galvin, G. Gagne, "Operating Systems Concepts", 7th/ 8th edition, John Wiley Publications, 2008.
2. William Stalling, "Operating System Internals and Design Principles", 6th edition, Pearson Publication, 2013.

3. Maurice J. Bach, “The Design of the Unix Operating System”, 1st edition, PHI.
4. Dhananjay M. Dhamdhere, “Operating Systems-A Concept-Based Approach”, 3rd edition, TMH, 2012.
5. A. S. Tanenbaum, “Modern Operating System”, 2nd edition Pearson publication, 2001.
6. H. M. Deitel, P. J. Deitel, D. R. Choffnes, “Operating System” 3rd edition, Pearson publication, 2013.
7. Rajiv Chopra, “Operating Systems-A Practical Approach”, 1st edition, S. Chand Publication, 2009.
8. Sibsankar Haldar, Alex A. Arvind, “Operating Systems”, 1st edition, Pearson Publication, 2009.

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Object Oriented Modeling & Design Lab

LAB COURSE OUTLINE

Course Title | Short Title Course Code

Object Oriented Modeling and Design | **OOMD**

Course Description:

The objective of this course is to introduce the students to learn how to understand the requirements of a system, its analysis, its scope, good design and good modeling practices and to document them. Students are being able to discuss the pros and cons of system design and issues in modeling large and complex systems. It explores UML 2.0 Basic and advanced concepts and notation for the same & diagrams for modeling different aspects of a system throughout the SDLC lifecycle.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	02	14	28	01

Total Semester Credits: 01

Prerequisite Course(s): Knowledge of software engineering.

LAB COURSE CONTENT

Outline of Content:

(Note: Minimum Six Experiments out of eight)

To meet above objectives teachers will help students choose a following system for modeling. The students will try and identify scope of such a system as realistically as possible. Students will learn to draw, discuss different UML 2.0 diagrams, concepts, notation, advanced notation, forward and reverse engineering aspects. As far as possible draw as many diagrams for one single system, unless they are not applicable for the chosen system in which case other systems may be chosen for specific diagrams.

1. Design ATM system using Structural and Behavioral UML diagram.
2. Design Coffee vending machine using Structural and Behavioral UML diagram.
3. Design College Admission Process using Structural and Behavioral UML diagram.
4. Design Library Management system using Structural and Behavioral UML diagram.
5. Design Hospital Management system using Structural and Behavioral UML diagram.
6. Design Railway Reservation system using Structural and Behavioral UML diagram.
7. Design Online Shopping system using Structural and Behavioral UML diagram.
8. Design Hotel Management system using Structural and Behavioral UML diagram.

Guidelines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guide lines for ESE:-

- ESE will be based on the practical assignments submitted by the students in the form of journal.

Reference Books:

1. Pascal Roques, “Modeling Software Systems Using UML 2”, Wiley.
2. Russ Miles and Kim Hamilton, “Learning UML 2.0, SPD”, O’Reilly.
3. Craig Larman, “Applying UML and patterns: An introduction to Object-Oriented Analysis and Design and Iterative Development”, Pearson Education.
4. Mike O’Docherty “Object-Oriented Analysis & design understanding system development with UML 2.0”, John Wiley and Sons.
5. Jim Arlow, Ila Neustadt, “UML 2 and the Unified Process: Practical Object-Oriented Analysis and Design”, 2nd Edition, Addison-Wesley Professional.
6. Mark Priestley, “Practical Object-Oriented Design with UML”, TATA McGraw-Hill.

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Database Management System Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Database Management System	**DBMS**	

Course Description:

The objective of this course is to introduce the students to learn and practice Structure Query Language for creation, Manipulation, controlling database, apply normalization techniques to normalize the database also learn different types of Join, view, PL/SQL, Trigger, Stored Procedure, Stored function and enable them to apply these concepts for solving real world problems.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	02	14	28	01

Total Semester Credits: 01

Prerequisite Course(s): knowledge of Data Structures

LAB COURSE CONTENT

Outline of Content:

(Note: Group A is Mandatory and Minimum Three experiments from Group B.)

GROUP A

1. Creating a sample database using any client server RDBMS (Oracle/ Open Source Database) package using SQL DDL queries. This will include constraints (Primary key, Foreign key, Unique, Not Null, and Check) to be used while creating tables.
2. SQL DML queries: Use of SQL DML queries to retrieve, insert, delete and update the database created in experiment No. 1.
3. SQL Queries: The queries should involve SQL feature such as aggregate functions, group by, having, order by the database created in experiment No. 1.
4. SQL Queries: The queries should involve Set Operations and Set Comparisons the database created in experiment No. 1.
5. Screen design and Report generation: Sample forms and reports should be generated using any front end tools.

GROUP B

1. Write a program to demonstrate different types of JOIN.
2. Write a program to demonstrate use of Trigger.
3. Write a program to demonstrate view.
4. Write a program to demonstrate PL/SQL block.
5. Write a program to demonstrate stored function.
6. Write a program to demonstrate stored procedure.

Guidelines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guide lines for ESE:-

- ESE will be based on the practical assignments submitted by the students in the form of journal.
- In the ESE, the students may be asked to perform the practical assignment with minor modification.
- Evaluation will be based on the paper work understanding of the logic and the syntax, quality of the program, execution of the program, type of input and output for the program.

Reference Books:

1. Rick F. Van der Lans, "Introduction to SQL", Pearson education.
2. B. Rosenzweig, E. Silvestrova, "Oracle PL/SQL by Example", Pearson education.
3. Steven Feuerstein, "Oracle PL/SQL Programming", SPD, O'Reilly.
4. Dr. P. S. Deshpande, "SQL& PL/SQL for Oracle 10g Black Book", Dreamtech Press
5. M. McLaughlin, "Oracle Database 11g PL/SQL Programming", TMH.
6. J. J. Patrick, "SQL Fundamentals", Pearson Education.

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Web Programming Lab

LAB COURSE OUTLINE

Course Title Short Title Course Code

LAB COURSE CONTENT

Teacher should facilitate learning following lab experiments:

(Note: 07 practical assignments from Group A and 03 from Group B)

GROUP A

1. **Develop a complete web page using HTML basic tags, CSS, Table and Layout**
   - A simple web page that includes basic tags such as head, body, text formatting tags, lists, paragraph, image tags, css, table and layout etc.
2. **Design a page web using JavaScript to demonstrate, if statement, if...else statement and Switch statement**
   - A simple web page that include JavaScript statements such as if, if...else and switch.
3. **Design a page web using JavaScript to demonstrate, Alert box Alert box with line breaks, Confirm box and Prompt box**
   - A simple web page that include JavaScript alert box, alert box with line breaks, confirm box and prompt box.
4. **Design a page web using JavaScript to demonstrate, Call a function ,Function with an argument, Function that returns a value**
   - A simple web page that include JavaScript call a function, function with arguments, function that return a value.
5. **Design a page web using JavaScript to demonstrate, For loop, While loop, Do While loop, Break a loop, Break and continue a loop**
   - A simple web page that include JavaScript for loop, while loop , do while loop, break a loop, break and continue a loop.
6. **Design a page web using JavaScript to demonstrate, Acting to the onclick event, Acting to the onmouseover event, onblur , onchange, ondblclick, onkeydown, onkeypress, onkeyup, onresize, onunload**
   - A simple web page that include JavaScript events like onclick, onmouseover, onblur, onchange, ondblclick, onkeydown, onkeypress, onkeyup, onresize, onunload etc.
7. **Design a page web using JavaScript to demonstrate, Sort an array (alphabetically and ascending), Sort numbers (numerically and ascending), Sort numbers (numerically and descending)**
   - A simple web page that include JavaScript to sort an array alphabetically and ascending, sort numbers numerically and ascending and sort numbers numerically and descending.
8. **Design a page web using PHP to demonstrate, variables, echo/print, data types, string functions and operators**
   - A simple web page that include PHP variables, echo/print, data types, string functions and operators.
9. **Design a page web using PHP to demonstrate, if-else-elseif, switch, for loop, while loop, functions and arrays**
   - A simple web page that include PHP if-else-elseif, switch, for loop, while loop, functions and arrays.
10. **Design a page web using PHP to demonstrate, form handling, form validation and form URL/E-mail**

- A simple web page that include PHP form handling, form validation and form URL/E-mail.

GROUP B

1 **Web server installation and configuration**
   - Installation and configuration of any web server like IIS, Apache, WAMP, XAMP etc.

2 **Design a page web using PHP to demonstrate, date, file, file upload, cookies and sessions**
   - A simple web page that include PHP date, file, file upload, cookies and sessions.

3 **Design a page web using PHP to demonstrate, MySQL connect, create DB/Table, insert into, select, where, order by, update and delete**
   - A simple web page that include PHP MySQL connect, create DB/Table, insert into, select, where, order by, update and delete.

4 **Design a Website with the help of HTML and JavaScript with not less than 15 full size pages for a selected topic (Commercial, Institute, Portal or decided jointly by the student and teacher)**
   - Design a website on the above listed topics with the help of HTML and JavaScript.

5 **Design a Website with the help of HTML and PHP for a selected topic (Banking, Commercial, Institute, Portal or decided jointly by the student and teacher)**
   - Design a website on the above listed topics with the help of HTML and PHP.

Guidelines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Reference Books:

1. "Web Technologies HTML, JavaScript, PHP, Java, JSP, XML and AJAX", Black Book, Kogent Learning Solutions Inc., dreamtech press, 2014.
2. Chris Bates, "Web Programming: Building Internet Applications", Third Edition, Wiley India, 2012.
3. Jon Duckett, "Beginning HTML, XHTML, CSS, and JavaScript", John Wiley & Sons publication, 2010.
4. Thomas A. Powell, "HTML & CSS: The Complete reference", Fifth edition, TMH 2010.

Note:

- Concerned faculty should conduct at least 07 practical assignments from group A and 03 from group B out of the above list.
- Every assignment should include print out of program with proper comments and output.

- Every student is required to submit the assignments in the form of journal.
- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Minor Project

COURSE CONTENT

Minor Project	**MIP**	
Course Title	Short Title	Course Code

Semester-VI

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	10	20	02

Examination Scheme
Internal Continuous Assessment (ICA): 50 Marks

- Every student shall undertake the Minor Project in semester VI.
- Each student shall work on an approved project, a group of **05 students (maximum)** shall be allotted for the each minor project.
- Minor project may involve design or investigation of a technical problem that may take design, experimental or analytical character or combine element of these areas. The project work shall involve sufficient work so that students get acquainted with different aspects of design or analysis.
- Each student is required to maintain separate log book for documenting various activities of minor project.
- The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of minor project. Maximum four minor project groups shall be assigned to one teaching staff.
- Assessment of the project for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-A.**
- Before the end of semester, student shall deliver a seminar and submit the seminar report (paper bound copy)in following format:
    - Size of report shall be of minimum 25 pages.
    - Student should preferably refer minimum five reference books / magazines/standard research papers.
    - Format of report
        - Introduction.
        - Literature survey.
        - Theory (Implementation, Methodology, Applications, Advantages, Disadvantages. etc)
        - Future scope.
        - Conclusion.

Assessment of Minor Project

Name of the Project: _____
Name of the Guide: _____

Table-A

SN	Exam Seat No	Name of Student	Project Selection	Documentation	Design /Simulation/Logic	PCB/hardware/programming	Result Verification	Presentation	Total
			5	10	10	10	10	5	50

Seminar-I
COURSE CONTENT

Seminar-I **S-I**
Course Title Short Title Course Code
Semester-VI

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**10**	**20**	**2**

Examination Scheme
Internal Continuous Assessment (ICA): 25 Marks

1. For Seminar-I every student will individually study a topic assigned to him / her and submit a report and shall deliver a short lecture / Seminar on the topic during the term.
2. The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Seminar-I. Seminar shall be related state of the art topic of his choice approved by the committee.
3. Seminar topic should not be repeated and registration of the same shall be done on first come first serve basis.
4. Topic of Seminar shall be registered within a two week from commencement of VI Semester and shall be approved by the committee.
5. Maximum six seminar supervision shall be allotted to each teacher.
6. Before the end of semester, student shall deliver a seminar and submit the seminar report (paper bound copy).

7. **ASSESSMENT OF SEMINAR-I**

Assessment of the Seminar-I for award of ICA marks shall be done by the guide and a departmental committee jointly, as per the guidelines given in **Table- B**

Title of Seminar: _____
Name of Guide: _____

Table-B

SN	Exam Seat No	Name of Student	Topic Selection	Literature survey	Report writing	Depth of understanding	Presentation	Total
			5	5	5	5	5	25

North Maharashtra University, Jalgaon
New Syllabus with effect from Year 2008-09
BE Computer
Term I

Sr. No	Subject	Teaching Scheme per Week			Examination Scheme				
		L	T	P	Paper Hr.	Paper	TW	PR	OR
1	Elective I	4	-	2	3	100	25	-	25
2	Artificial Intelligence	4	-	-	3	100	25	-	-
3	Advanced Unix Programming *	4	-	2	3	100	25	25	-
4	Object Oriented Modeling and Design *	4	-	2	3	100	25	-	25
5	Advanced Computer Network	4	-	-	3	100	-	-	-
6	Seminar	-	-	2	-	-	25	-	-
7	Project I			2	-	-	25	-	25
	Total	20	0	10		500	150	25	75
	Grand Total	**30**			**750**				

Elective I
Operation Research *
Embedded Systems *
Image Processing *

Term II

Sr. No	Subject	Teaching Scheme per Week			Examination Scheme				
		L	T	P	Paper Hr.	Paper	TW	PR	OR
1	Elective II	4	-	2	3	100	25	-	25
2	Data Warehousing and Mining *	4	-	2	3	100	25	-	25
3	Software Metrics and Quality Assurance *	4	-	2	3	100	25	-	25
4	Advanced Computer Architecture	4	-	2	3	100	25	-	-
5	Industrial Visit / Case Study		-				25	-	-
6	Project II		-	6	-		100	-	50
	Total	16	0	14		400	225	0	125
	Grand Total	**30**			**750**				

Elective II
Fuzzy Logic and Neural Networks
Mobile Network*
Compiler Construction

* Common subject with BE IT

NORTH MAHARASHTRA UNIVERSITY, JALGAON

BE (COMPUTER ENGINEERING / IT)
(w.e.f. 2008-09)

TERM – I

Elective – I
Operation Research

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25
Oral: 25

Unit – I **(10 Hrs. 20 Marks)**

Introduction to Operation Research – Modeling in operation research, principles of modeling, Main phases of operation research, scope, role of operation research in decision making, linear programming, model formulation, graphical method, simplex method, advantages of Linear Programming.

Unit – II **(10 Hrs. 20 Marks)**

Dynamic Programming - Introduction, Basic concepts and applications, characteristics of dynamic programming approach, special techniques of Linear programming, Transportation problems, North – West corner rule, Least cost method, Vogel's approximation method, Balanced and unbalanced problems, Assignment problems, Hungarian method, balanced and unbalanced problems, traveling sales man problem.

Unit – III **(10 Hrs. 20 Marks)**

Project Planning Using PERT/CPM : Phases of project management, construction of network or arrow diagrams, time estimates, earliest expected time, latest allowable time and slack, critical path computations for PERT, calculations on CPM networks various floats for activities, critical path, Difference between CPM and PERT , Project time Vs project cost, use of CPM/PERT in project management.

Unit – IV **(10 Hrs. 20 Marks)**

Replacement Model – Deterministic and probabilistic considerations, Replacement of old equipment by the most efficient by the sudden failure items, failure trees, examples of failure trees, sequencing model Terminology and notations, Principles assumptions, Solution of sequencing problems, Processing of n jobs through two machines, Processing n jobs through three machines, Two jobs through m machines, Processing n jobs through m machines .

Unit – V **(10 Hrs. 20 Marks)**

Decision theory and game theory: Decision trees, classes of decision model, decision under certainty, uncertainty and risk.

Game Theory: Theory concept characteristics, maximum and minimum principles saddle points, dominance, basic concept, terminology of two persons zero sum game, MXZ and ZX games subgames methods, graphical method.

Reference Books:

1. N. D. Vohra, Quantitative Techniques in Management, TMH
2. Taha H. A., Operation Research – An Introduction PHI
3. S. D. Sharma, Operation Research, Kedarnath Ramnath Compay
4. N. G. Nair, Operation Research, Dhanpat Rai
5. Prem kumar Gupta, D. S. Hira, Operation Research, S. Chand & Company
6. L. S. Srinath, PERT and CPM Principles & Applications, EWP

Term work:

Assignment based on:

1. Implementation of Linear Programming Model
2. Implementation of Simplex Method
3. Implementation of Dynamic Programming
4. Implementation of transportation model
5. Implementation of assignment model
6. Implementation of Traveling Sales man problem
7. Implementation of sequencing model
8. Implementation for replacement model
9. Game playing with min / max search
10. Program for decision tree

Any Five Lab Assignment should be framed by concern staff member based on above list.

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(w.e.f. 2008-09)

TERM – I

Elective – I
Embedded Systems

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25
Oral: 25

Unit – I **(10 Hrs. 20 Marks)**

Embedded system Introduction

Introduction to Embedded System, History, Design challenges, optimizing design metrics, time to market, applications of embedded systems and recent trends in embedded systems, embedded design concepts and definitions, memory management, hardware and software design and testing, communication protocols like SPI, SCI, I2C, CAN etc

Unit – II **(10 Hrs. 20 Marks)**

System Architecture

Introduction to ARM core architecture, ARM extension family, instruction set, thumb Instruction set, Pipeline, memory management, Bus architecture, study of on-chip peripherals like I/O ports, timers, counters, interrupts, on-chip ADC, DAC, RTC modules, WDT, PLL, PWM, USB etc.

Unit – III **(10 Hrs. 20 Marks)**

Interfacing and Programming

Basic embedded C programs for on-chip peripherals studied in system architecture. Need of interfacing, interfacing techniques, interfacing of different displays including Graphic LCD (320X240), interfacing of input devices including touch screen etc, interfacing of output devices like thermal printer etc., embedded communication using CAN and Ethernet, RF modules, GSM modem for AT command study etc.

Unit – IV **(10 Hrs. 20 Marks)**

Real time Operating System Concept

Architecture of kernel, task scheduler, ISR, Semaphores, mailbox, message queues, pipes, events, timers, memory management, RTOS services in contrast with traditional OS. Introduction to uCOSII RTOS, study of kernel structure of uCOSII, synchronization in uCOSII, Inter-task communication in uCOSII, memory management in uCOSII, porting of RTOS.

Unit – V **(10 Hrs. 20 Marks)**

Embedded Linux
Introduction to the Linux kernel, Configuring and booting the kernel, the root file system, Root file directories, /bin, /lib etc., Linux file systems, Types of file system: Disk, RAM, Flash, And Network. Some debug techniques- Syslog and strace, GDB, TCP/IP Networking- Network configuration, Device control from user space- Accessing hardware directly, Multi processing on Linux and Inter Process Communication- Linux process model and IPCs, Multithreading using pThreads - Threads vs. Processes and pThreads, Linux and Real-Time- Standard kernel problems and patches.

Reference Books:

1. Rajkamal, “Embedded Sytems “, TMH.
2. David Simon, “Embedded systems software primer”, Pearson
3. Steve Furber, “ARM System-on-Chip Architecture”, Pearson
4. DR.K.V.K.K. Prasad, “Embedded /real time system”, Dreamtech
5. Iyer,Gupta, “Embedded real systems Programming“, TMH

Laboratory exercise

- Integrated Development Environment Overview (Project creation, down load & debug)
- Study of JTAG Debugger/on-board debugger-emulator.
- ARM Instructions execution (Barrel Shifter, LDR/STR, SMT/LDM)

Term Work:

Group - A
1) Writing basic C-programs for I/O operations
2) C-Program to explore timers/counter
3) C-programs for interrupts
4) Program to demonstrate UART operation

Group - B
5) Program to demonstrate I2C Protocol.
6) Program to demonstrate CAN Protocol.

Group - C
7) Program to interface LCD
8) Program to interface Keyboard and display key pressed on LCD
9) Program to interface stepper motor

Group - D
10) Program to demonstrate RF communication
11) Program to implement AT commands and interface of GSM modem
12) Implementation of USB protocol and transferring data to PC.
13) Implementation of algorithm /program for the microcontroller for low power modes.
uCOSII /Embedded Linux RTOS Examples

Group - E
14) Interfacing 4 x 4 matrix keyboards and 16 x 2 character LCD display to microcontroller / microprocessor and writing a program using RTOS for displaying a pressed key.
15) Writing a scheduler / working with using RTOS for 4 tasks with priority. The tasks may be keyboard, LCD, LED etc. and porting it on microcontroller/ microprocessor.

Group - F
16) Implement a semaphore for any given task switching using RTOS on microcontroller board.
17) Create two tasks, which will print some characters on the serial port, Start the scheduler and observe the behavior.

Group – G
18) RTOS based interrupt handling using Embedded Real Time Linux.

19) Program for exploration of (Process creation, Thread creation) using Embedded Real Time Linux.

Group – H

20) Program for exploring Message Queues using Embedded Real Time Linux.
21) Ethernet Based Socket Programming using Embedded Real Time Linux.

Note: 1) At least one practical should be performed from each group.
2) Two practicals should be performed using the JTAG debugger/on-board Debugger-emulator.

Term work will be based on above list.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

BE (COMPUTER ENGINEERING / IT)
(w.e.f. 2008-09)

TERM – I

Elective – I
Image Processing

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25
Oral: 25

Unit – I **(10 Hrs. 20 Marks)**

Introduction - What is digital image processing?, Fundamental steps in digital image processing, A simple Image formation model, Image sampling and quantization , Representing Digital Images, Basic relationship between pixels,

Image Enhancement in the spatial domain: Basic Gray level transformations, Histogram Processing(Equalization, Matching), Basics of spatial filtering, Smoothing spatial filters, Sharpening spatial filters.

Unit – II **(10 Hrs. 20 Marks)**

Image Enhancement in the frequency domain: Fourier Transform and Frequency domain, Filtering in the frequency domain, Basics of filtering in the frequency domain, Basic filters and their properties, Smoothing Frequency domain filters, Sharpening Frequency domain filters, Homomorphic Filtering
Properties of 2 D Fourier Transform, The Convolution and Correlation Theorems

Unit – III **(10 Hrs. 20 Marks)**

Image Restoration: Model Of Image Restoration/ Degradation Process, Noise Models, Restoration in the presence of Noise- Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Filtering Techniques to restore image.

Image Compression- Compression models- Lossy Compression- Lossless Compression.

Unit – IV **(10 Hrs. 20 Marks)**

Color Image Processing : Color Fundamentals, Color Models, Converting Colors from different color models, Gray Level to Color Transformations, Color Transformations, Color Slicing, Color Image Smoothing.

Morphological Image Processing
Basic Concepts, Dilation, Erosion, Thinning, Thickening, Pruning, Gray level Morphology

Unit – V **(10 Hrs. 20 Marks)**

Segmentaion- Edge linking and Boundary detection, Thresholding, Region Based Segmentation, Histogram Analysis,

Application of Image Processing,
Introduction to Content Based Image Retrieval.

Reference Books:

1. R.C. Gonzalez, R.R. Woods, Digital Image Processing Person Education, Pearson Education
2. B. Chanda, D.Datta Mujumdar, "Digital Image Processing And Analysis", PHI ,
3. William Pratt, "Digital Image Processing", John Willey & Sons
4. Anil Jain, "Fundamentals Of Digital Image Processing", PHI

Term work:

1. Develop C/C++ code to create a simple image and save the same as bitmap image in .bmp file.
2. Develop C/C++ code to implement basic gray level transformations(Any One)
3. Develop C/C++ code to perform basic image enhancement operations
4. Develop C/C++ code to implement image histogram processing (Equalization or Matching)
5. Develop C/C++ code to find basic relationship between pixels.(Any One)
6. Develop C/C++ code to implement image compression (any one algorithm)
7. Implement gray scale thresholding to blur an image.
8. Implement C/C++ code to implement an algorithm for edge detection.
9. Implement C/C++ code to implement image morphological operations.(Any One)

The term work will be based on any 5 assignments from above list.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

BE (COMPUTER ENGINEERING)
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TERM – I

Artificial Intelligence

Teaching Scheme:
Lectures: 4 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25

Unit – I **(10 Hrs. 20 Marks)**

Introduction to Artificial Intelligence: Definition, AI Problems, physical symbol system and hypothesis, AI Technique, Turing test, Problem as a state space search, production system, Problem characteristics, breadth first search, depth first search, AI representation, Properties of internal Representation, Heuristic search techniques, Best files search, A* and AO* Algorithms, Mean and ends analysis

Unit – II **(10 Hrs. 20 Marks)**

Knowledge Representation using Predicate Logic: Predicate calculus, Predicates and Arguments, ISA hierarchy, Frame notation, Resolution, Natural deduction.

Knowledge Representation using Non-monotonic Logic: TMS (Truth Maintenance System), Statistical and probabilistic reasoning, Fuzzy Logic, Knowledge representation, Semantic Net, Frames, Script, Conceptual dependency.

Unit – III **(10 Hrs. 20 Marks)**

Planning: Types of planning, Block world, strips, Implementation using goal stack, Nonlinear planning with goal stacks, Hierarchical planning, List commitment strategy.

Perception: Action, Robot architecture, Vision, Texture and images, Representing and recognizing scenes, Walzs algorithm, Constraint determination, Trihedral and Nontrihedral figures labeling.

Unit – IV **(10 Hrs. 20 Marks)**

Learning: By training neural networks, Introduction to neural networks, Neural net architecture and

applications.
Natural Language Processing and understanding, Pragmatic, Syntactic, and Semantic analysis, Finite State Machine, ATN, Understanding sentences.

Unit – V **(10 Hrs. 20 Marks)**

Expert System: Utilization and functionality, architectures of Expert system, Knowledge representation, Two case studies on expert systems.
Game Playing: Minimize search procedure, Alpha-beta cutoffs, Waiting for Quiescence, Secondary search.

Reference Books:

1. Elaine Rich, Kerin Knight, "Artificial Intelligence". TMH
2. B. Yegnanarayana, “Artificial Neural Network”, PHI
3. Dan W. Patterson, “Introduction to artificial intelligence and expert system”, PHI
4. Timothy J Ross, “Fuzzy Logic with Engineering Application”, TMH

Term Work:

Assignments based on:

1. Implementation of single perceptron training algorithm.
2. Implementation of fuzzy membership function.
3. Implementation of Unification Algorithm.
4. Hill Climbing Algorithm.
5. Game playing with Min/Max Search.
6. Implementation of Dynamic database.
7. Parsing method implementation.
8. Development of Mini Expert System using Prolog.
9. Application development using Neural Network.
10. Development of Intelligent Perception System.

Any six lab assignments should be framed by concern staff member based on above list.

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TERM – I

Advanced Unix Programming*

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25
Practical: 25

Unit – I **(10 Hrs. 20 Marks)**

UNIX System Overview – Introduction, UNIX Architecture, Logging In, Files and Directories, Input and Output, Programs and Processes, Error Handling, User Identification, Signals, Time Values, System Calls and Library Functions.

File I/O – Introduction, File Descriptors, open Function, creat Function, close Function, lseek Function, read Function, write Function, I/O Efficiency, File Sharing, Atomic Operations, dup and dup2 Functions, sync, fsync, and fdatasync Functions, fcntl Function, ioctl Function, /dev/fd.

Files and Directories – Introduction, stat, fstat, and lstat Functions, File Types, Set-User-ID and Set-

Group-ID, File Access Per missions, Ownership of New Files and Directories, access Function, umask Function, chmod and fchmod Functions, Sticky Bit, chown, fchown, and lchown Functions, File Size, File Truncation, File Systems, link, unlink, remove, and rename Functions, Symbolic Links, symlinkand readlink Functions, File Times, utime Function, mkdirand rmdir Functions, Reading Directories, chdir, fchdir, and getcwd Functions, Device Special Files, Summary of File Access Per mission Bits.

Unit – II **(10 Hrs. 20 Marks)**

System Data Files and Information – Introduction, Password File, Shadow Passwords, Group File, Supplementary Group Ids, Implementation Differences, Other Data Files, Login Accounting, System Identification, Time and Date Routines.

Process Environment – Introduction, main Function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables, setjmp and longjmp Functions, getrlimit and setrlimit Functions.

Process Control – Introduction, Process Identifiers, fork Function, vfork Function, exit Functions, wait and waitpid Functions, waitid Function, wait3 and wait4Functions, Race Conditions, exec Functions, Changing User IDs and Group IDs, Interpreter Files, system Function, Process Accounting, User Identification, Process Times.

Unit – III **(10 Hrs. 20 Marks)**

Signals – Introduction, Signal Concepts, signal Function, Unreliable Signals, Interrupted System Calls, Reentrant Functions, SIGCLD Semantics, Reliable-Signal Terminology and Semantics, kill and raise Functions, alarm and pause Functions, Signal Sets, sigprocmask Function, sigpending Function, sigaction Function, sigsetjmp and siglongjmp Functions, sigsuspend Function, abort Function, system Function, sleep Function, Job-Control Signals, Additional Features.

Advanced I/O – Introduction, Nonblocking I/O, Record Locking, STREAMS, I/O Multiplexing, 2 poll Function, Asynchronous I/O, readv and writev Functions, readn and written Functions, Memory-Mapped I/O.

Unit – IV **(10 Hrs. 20 Marks)**

Threads – Introduction, Thread Concepts, Thread Identification, Thread Creation, Thread Termination, Thread Synchronization.

Thread Control – Introduction, Thread Limits, hread Attributes, Synchronization Attributes, Reentrancy, Thread-Specific Data, Cancel Options, Threads and Signals, Threads and fork, Threads and I/O.

Daemon Processes – Introduction, Daemon Characteristics, Coding Rules, Error Logging, Single-Instance Daemons, Daemon Conventions, Client-Server Model.

Unit – V **(10 Hrs. 20 Marks)**

Interprocess Communication – Introduction, Pipes, popen and pclose Functions, Coprocesses, FIFOs, XSI IPC, Message Queues, Semaphores, Shared Memory, Client-Server Properties.

Network IPC: Sockets – Introduction, Socket Descriptors, Addressing, Connection Establishment, Data Transfer, Socket Options, Out-of-Band Data, Nonblocking and Asynchronous I/O.

Advanced IPC – Introduction, STREAMS-Based Pipes, Unique Connections, Passing File Descriptors, An Open Server, Version 1, An Open Server, Version 2.

Reference Books:

1. W. Richard Stevens and Stephen A. Rago, Advanced Programming in the UNIX Environment, 2/E, Pearson Education
2.W. Richard Stevens, Unix Network Programming - Interprocess Communications, Volume 2, 2/E, Pearson Education

Term Work:

Concerned staff members should suitably frame the term work (at least 6) based on above syllabus and implementation of Unix commands using library functions as well as implementation of shell scripts.

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TERM – I

Object Oriented Modeling and Design

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practicals: 2 Hrs./Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25 Marks
Oral: 25 Marks

Unit – I **(10 Hrs. 20 Marks)**

Review of Object Modeling, New Paradigms, Object Oriented Thinking, UML Concepts: Overview of UML.
UML 2.0 New Features.
Rational Unified Process emphasizing Inception, Elaboration, Construction, Transition Phases. 4+1 View architecture, Architectural approaches: Use case Centric, Architecture driven, Iterative approach, OO Concepts Review.

Unit – II **(10 Hrs. 20 Marks)**

Introduction to UML. UML MetaModel. Extensibility mechanisms like stereotypes, tagged values, constraints and profiles. OCL. Overview of all diagrams in UML 2.0.

Unit – III **(10 Hrs. 20 Marks)**

Object diagrams, CRC method, Review of OO concepts. Class diagrams, Classes and Relationships, Interfaces and ports, Templates, Active Objects, Advanced relationships generalization, association, aggregation, dependencies. Composite structure diagrams including composite structures, collaborations.

Unit – IV **(10 Hrs. 20 Marks)**

Interaction diagrams. Interaction Overview diagrams including interactions, signals, exceptions, regions, partitions, Sequence diagrams, Communication diagrams.
State Machine diagrams, States, encapsulation of states, transitions, submachine, state generalization. Timing diagrams, Activity diagrams, Activities, sub activities, signals, exceptions, partitions, regions.

Unit – V **(10 Hrs. 20 Marks)**

Support for modeling Architecture in UML. Package diagrams, Component diagrams, Deployment diagrams. Applications of UML in embedded systems, Web applications, commercial applications.

Reference Books:

1. Grady Booch, James Rumbaugh, Ivar Jacobson “Unified Modeling Language User Guide”, Addison-Wesley
2. Joseph Schmuller “SAMS Teach yourself UML in 24 Hours”, Third edition.
3. Martin Fowler, “UML Distilled: A Brief Guide to the Standard Object Modeling Language”, Third Edition (Paperback) ,Addision Wesley
4. Dan Pilone, Neil Pitman “UML 2.0 in a Nutshell”, O'Reilly
5. Rambaugh, “Object Oriented Modeling and Designing”. PHI

6. Bouch. “Object Oriented Analysis and Design with Applications”. Addison Wesley.
7. Schah, “Introduction to OOAD with UML and Unified Process”, TMH

Term Work:
Concerned staff members should suitably frame the term work at least 5 assignments based on above syllabus. Each assignment must consider definition, analysis, design and modeling of a project.

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TERM – I

Advanced Computer Network

Teaching Scheme:
Lectures: 4 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)

Unit – I **(10 Hrs. 20 Marks)**

Introduction to wireless Networking: Why Wireless? What makes Wireless Network different? A Network by Any other name.
Overview of 802.11 Networks: IEEE 802 Network Technology Family tree, 802.11 Nomenclature and design, 802.11 Network Operation, Mobility Support.

802.11 MAC Fundamentals: Challenges for the MAC,MAC Access Modes and Timing, Contention-Based Access Using the DCF, Fragmentation and Reassembly, Frame Format, Encapsulation of Higher-Layer Protocols Within 802.11,Contention-Based Data Service, Frame Processing and Bridging.

802.11 Framing in Detail: Data Frames, Control Frames, Management Frames, Frame Transmission and Association and Authentication States

Unit – II **(10 Hrs. 20 Marks)**

Management Operations: Management Architecture, Scanning, Authentication, Pre-authentication, Association, Power Conservation, Timer Synchronization, Spectrum Management

Contention-Free Service with the PCF: Contention-Free Access Using the PCF, Detailed PCF Framing, Power Management and the PCF

Physical Layer Overview: Physical-Layer Architecture , The Radio Link , RF Propagation with 802.11, RF Engineering for 802.11

Unit – III **(10 Hrs. 20 Marks)**

The Frequency-Hopping (FH) PHY: Frequency-Hopping Transmission ,Gaussian Frequency Shift Keying (GFSK) FH PHY Convergence Procedure (PLCP), Frequency-Hopping PMD Sublayer, Characteristics of the FH PHY

The Direct Sequence PHYs: DSSS and HR/DSSS (802.11b): Direct Sequence Transmission, Differential Phase Shift Keying (DPSK), The "Original" Direct Sequence PHY, Complementary Code Keying, High Rate Direct Sequence PHY
802.11a and 802.11j: 5-GHz OFDM PHY: Orthogonal Frequency Division Multiplexing (OFDM), OFDM as Applied by 802.11a, OFDM PLCP, OFDM PMD Characteristics of the OFDM PHY

Unit – IV **(10 Hrs. 20 Marks)**

Wired Equivalent Privacy (WEP): Cryptographic Background to WEP, WEP Cryptographic Operations, Problems with WEP, Dynamic WEP

User Authentication with 802.1X: The Extensible Authentication Protocol, EAP Methods, 802.1X: Network Port, Authentication, 802.1X on Wireless LANs
802.11i: Robust Security Networks, TKIP, and CCMP: The Temporal Key Integrity Protocol (TKIP), Counter Mode with CBC-MAC (CCMP), Robust Security Network (RSN) Operations

Unit – V **(10 Hrs. 20 Marks)**

Ad Hoc Wireless Networks: Introduction, Issues in Ad Hoc Wireless Networks, Ad Hoc Wireless Internet
Routing Protocols for Ad Hoc Wireless Networks: Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classifications of Routing Protocols, Table-Driven Routing Protocols, On Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power-Aware Routing Protocols
Wireless Sensor Networks: Introduction, Sensor Networks Architecture, Data Dissemination, Data Gathering, MAC Protocols for Sensor Networks, Location Discovery, Quality of a Sensor Network.

Reference Books:

1. Matthew Gast, 802.11 Wireless Networks: The Definitive Guide, Second Edition, O'Reilly
2. C.Siva Ram Murthy, B.S. Manoj, Ad Hoc Wireless Networks: Architectures and Protocols, Pearson

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TERM – I

Seminar

Teaching Scheme:
Practical: 2 Hrs./ Week

Examination Scheme:
Term Work: 25 Marks

1. For seminar every student will individually study a topic assigned to him / her and submit a report and shall deliver a short lecture / Seminar on the topic at the end of term.
2. Selection of topic should be done by students in consultation with concerned guide
    a. Topic should be related to branch but it should be extended part of the branch (latest and advance topic).
    b. The topic should be such that the student can gain latest knowledge. Student should preferably refer at least one research paper
3. Seminar topic should not be repeated in the department and registration of the same should be done on first come first served basis
4. Seminar report should be submitted in paper bound copy prepared with computer typing
    a. Size of report depends on advancement of topic.
    b. Student should preferably refer minimum 5 reference books / magazines.
    c. Format of content
        i. Introduction.
        ii. Literature survey.
        iii. Theory
            1. Implementation
            2. Methodology
            3. Application
            4. Advantages, Disadvantages.
        iv. Future scope.
        v. Conclusion.
5. ASSESSMENT OF SEMINAR for TERM WORK

Title of seminar : _____
Name of guide : _____

Sr. No.	Exam Seat No.	Name of Student	Assessment by examiners					Grand Total
			Topic Selection 5	Literature Survey 5	Report Writing 5	Depth of understanding 5	Presentation 5	25

6. Assessment of Literature survey will be based on
    a. collection of material regarding history of the topic,
    b. implementation,
    c. recent applications.

7. Assessment of Depth of understanding will be based on
    a. Questioning by examiners.
    b. Questioning by students.
    c. What the student understands i.e. conclusion regarding seminar.

8. Assessment of presentation will be based on;
    a. Presentation time (10 minutes)
    b. Presentation covered (full or partial)
    c. Way of presentation
    d. Questioning and answering (5 minutes)
9. Examiners should be a panel of two one of them must be guide. Examiner must have experience at least 3 years. Examiners will be appointed by HOD in consultation with Principal.

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TERM – I

Project - I

Teaching Scheme:
Practical: 2 Hrs./ Week

Examination Scheme:
Term Work: 25
Oral: 25

1. Every student individually or in a group (group size is of 3 students. However, if project complexity demands a maximum group size of 4 students, the committee should be convinced about such complexity and scope of the work) shall take a project in the beginning of the (B.E. first Term) seventh term in consultation with the guide and the project must be completed in the (B.E. Second Term) eighth term.

2. The project proposal must be submitted in the institute in the beginning of the (B.E. first Term) seventh term. While submitting project proposal care is to be taken that project will be completed within the available time of two term i.e 2 Hrs per week for (B.E. first Term) seventh term and 4 Hrs per week for (B.E. Second Term) eighth semester (total time become 12*2 + 12*4 = 72 Hrs per project partner). The final title of

the project work should be submitted at the beginning of the (B.E. Second Term) eighth semester. .

3. Project title should be precise and clear. Selection and approval of topic:
   Topic should be related to real life or commercial application in the field of Computer Engineering

OR

Investigation of the latest development in a specific field of Computer Engineering

OR

Commercial and Interdisciplinary projects should be encouraged. The examination will be conducted independently in respective departments.

4. The group should maintain a logbook of activities. It should have entries related to the work done, problems faced, solution evolved etc., duly signed by guide.
5. The group is expected to complete details system/problem definition, analysis, design, etc. in (B.E. first Term) seventh term, as a part of term work in the form of a joint report. Project report must be submitted in the prescribed format only. No variation in the format will be accepted.
6. One guide will be assigned at the most three project groups.
7. The guides should regularly monitor the progress of the project work.
8. Assessment of the project for award of term work marks shall be done by the guide and a departmental committee (consisting of minimum two teachers with experience more than three years) as per the guidelines given in the following table.

A) ASSESSMENT OF PROJECT I TERMWORK B.E. FIRST TERM

NAME OF THE PROJECT: _____
NAME OF THE GUIDE: _____

Sr No	Exam Seat No	Name Of Student Marks	Assessment by guide (70%)					Assessment by Departmental committee (30%)			Grand Total	Out of 25 Marks
			Literature survey	Topic Selection	Docum-entation	Attendance	Total	Evaluation (10%)	Pres-ntaion (20%)	Total		
			10	05	15	05	35	05	10	15	50	25

Sign of Guide Sign. of Committee Members Sign. of H. O. D.

9. The guide should be internal examiner for oral examination (If experience is greater than three years).
10. The external examiner should be from the related area of the concerned project. He should have minimum of five years of experience at degree level / industry.
11. The evaluations at final oral examination should be done jointly by the internal and external examiners.

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TERM – II

Elective – II
Fuzzy Logic and Neural Networks

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25
Oral: 25

Unit – I **(10 Hrs. 20 Marks)**

Introduction to Biological Neurons: Neurons, Axon, Synaptic links, Dendrites, Working,
Artificial Neuron Model: McCulloch-Pitts Neuron Model, Neuron Modeling for Artificial Neural Systems, Activation Functions.
Models of Artificial Neural Networks: Feed forward Network, Feedback Network, Neural Processing, Learning and Adaptation, Supervised and Unsupervised Learning.

Unit – II **(10 Hrs. 20 Marks)**

Neural Network Learning Rules: Hebbian Learning, Perceptron Learning, Delta Learning, Widrow-Hoff Learning, Correlation Learning, Winner-Take-All Learning, Single Layer Perceptron Classifier: Classification Model, Features, Decision Regions, Discriminants Functions, Linear Machine and Minimum Distance Classification, Nonparametric Training Concept.

Unit – III **(10 Hrs. 20 Marks)**

Training and Classification using Discrete Perceptron, Single Layer Continuous Perceptron Networks for Linearly Separable Classifications, Multi-category Single Perceptron Networks.
Multilayer Feedforward Networks: Linearly Nonseparable Pattern Classification, Delta Learning Rule for Multiperceptron Layer, Generalized Delta Learning Rule.

Unit – IV **(10 Hrs. 20 Marks)**

Feed Forward Recall and Error Back Propagation Training, Learning Factors, Single Layer Feedback Networks, Basic Concepts, Hopfield Networks, Boltzmann Machine, Kohonens self organizing maps.
Applications of Neural Networks: Pattern Recognition, Classification and clustering.

Unit – V **(10 Hrs. 20 Marks)**

Fundamentals of 'Fuzzy System, Crisp Sets, Membership Functions, Fuzzy Sets, Fuzzy Set Properties and Manipulation, Linguistic Variables, Fuzzy System Architecture, Fuzzy System Design and implementation.
Fuzzy Neural Networks: Introduction to Neuro – Fuzzy Systems, Types of Fuzzy-Neural Nets, Nero-Fuzzy Systems Design and implementation.

Reference Books:

1. Robert J. Schalkoff, "Artificial Neural Networks", McGraw – Hill
2. B. Yegnarayan, " Artificial Neural Networks", PHI
3. Timoty J Ross, "Fuzy Logic with Engineering Applications", McGraw-Hill
4. Satish Kumar, "Neural Network:A Classroom Approach", TMH
5. J. M. Zurada, "Introduction to Artificial Neural Networks", Jaico Publishing House.

Term Work:

1. Implementation of basic learning rules using single neuron
2. Implementation of Single layer discrete perceptron

3. Implementation of Single layer continues perceptron
4. Implementation of operations of fuzzy sets
5. Design and Implementation of fuzzy sets and its membership functions
6. Mini application development using fuzzy sets
7. Mini application development using neural network

Any six-lab assignments should be frame by the concern staff based on above list.

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TERM – II

Elective – II
Mobile Network

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25
Oral: 25

Unit – I **(10 Hrs. 20 Marks)**

Introduction – PCS Architecture, Cellular Telephony, Cordless Telephony and Low-tier PCS, Third Generation wireless system

Mobility Management – Handoff, Inter - BS handoff, Intersystem handoff, Roaming management, Roaming management under SS7 and Roaming management for CT2.

Handoff Management – Detection and Assignments, Handoff detection, Strategies for handoff detection, Mobile controlled handoff, Network controlled handoff, Mobile assisted handoff, Handoff failure, Channel assignment, Non- prioritized scheme and Reserved channel scheme, Queuing priority scheme, Sub rating scheme, Implementation issues, Hard handoff – MCHO link transfer, MAHO/NCHO link transfer, Sub rating MCHO link transfer, Soft handoff – adding new BS, dropping a BS.

Unit – II **(10 Hrs. 20 Marks)**

GSM Overview – GSM Architecture, location tracking and call setup, Security, Data Services – HSCSD, GPRS, Unstructured supplementary service data.
GSM Network Signaling – GSM MAP service frame work, MAP protocol machine, MAP dialogue.
GSM Mobility management – GSM location update, Mobility databases, Failure restoration, VLR Identification algorithm, VLR Overflow control.

Unit – III **(10 Hrs. 20 Marks)**

GSM short message service – SMS architecture, SMS protocol hierarchy, Mobile originated messaging, Mobile terminated Messaging.
International Roaming for GSM – International GSM call setup, Reducing the International call delivery cost
GSM Operations, Administration, and Maintenance – Call recording functions, Performance Measurement and Management, Subscriber and Service data Management.
Mobile number portability – Fixed network number portability, Number portability for Mobile networks, Mobile number portability mechanism.

Unit – IV **(10 Hrs. 20 Marks)**

VoIP Service for mobile networks – GSM on the Net, iGSM wireless VoIP solution, iGSM procedures and Message flows.

General Packet Radio Services – Architecture, Network nodes, Interfaces, Procedures, Billing, Evolving from GSM to GPRS.

Unit – V **(10 Hrs. 20 Marks)**

Wireless Application Protocol – WAP Model, WAP Gateway, WAP Protocol – WDP, WTLS, WTP, WSP, WAE, Mobile station Application execution environment.

Third Generation Mobile Services – Paradigm shifts in 3G Systems, W-CDMA, cdma 2000, Improvements on core network, Quality of service in 3G, Wireless Operating System for 3G Handset.

Paging Systems – Paging Network Architecture, User Access Interface – Telocator Alphanumeric Input Protocol (TAP), Telocator Message Entry Protocol (TME), Intersystem Interface.

Wireless Local Loop – WLL Architecture, WLL technologies.

Reference Books:

1. Yi-Bing Lin and Imrich Chlamtac "Wireless and Mobile Network Architecture", Wiley Publication.
2. Kasera Sumit, Narang Nishit, "3G Networks: Architecture, Protocols and Procedures", TMH

Term Work:

1. Setting up wireless network with and without infrastructure support.
2. Configuring Access Point with bridging mode (Point to Point and Point to Multi Point).
3. Configuring Routing between wired and wireless Networks.
4. Configuring Security in wireless network with and without infrastructure support.
5. At least 3 lab assignments based on above syllabus using any network simulator such as NS2, OPNET, OMNET etc.

Concerned staff members should suitably frame the term work (at least 6) based on above syllabus. Oral will be conducted based on the above syllabus and the term work submitted in the form of journal.

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TERM – II

Elective – II
Compiler Construction

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25
Oral: 25

Unit – I **(10 Hrs. 20 Marks)**

Introduction to Compiling: System software's introduction: Assembler, Loader, Linker. The phases of compiler, preprocessors, overview of simple one pass compiler.

Lexical Analysis: Role of lexical analyzer, input buffering, token specification, token recognition, language for lexical analysis specification, Finite Automata, NFA to DFA, RE to NFA, RE to DFA, state minimization of DFA. LEX tools

Unit – II **(10 Hrs. 20 Marks)**

Syntax Analysis: The role of the parser, context free grammar, ambiguity in grammar and it's elimination, Top down parsing: recursive descent, predictive, LL(1) parsers. Construction of predictive parsing tables, FIRST and FOLLOW, LL(1) grammar, Error recovery in Predictive parsing . Bottom up parsing: Handle pruning, stack implementation and conflicts of shift reduce parsing, LR parsers: LR parsing algorithm, constructing SLR, canonical LR, LALR parsing tables. Error recovery in LR parsing, YACC tools.

Unit – III **(10 Hrs. 20 Marks)**

Syntax Directed Translation: Syntax directed definition, inherited attributes, construction of syntax tree, directed acyclic graphs for expressions, Bottom up evaluation of S-attributed definitions, L-attributed definitions, top down translation, bottom up evaluation of inherited attributes.

Intermediate Code Generation: Intermediate language, various intermediate forms, TAC, syntax directed translation into TAC, Declaration, Assignment statements, Boolean expressions, case statements, Back patching, Procedure calls.

Unit – IV **(10 Hrs. 20 Marks)**

Code generation: Design issues of code generation, the target machine, run time storage management, basic blocks and flow graphs, a simple code generator, the DAG representation of basic blocks, Peephole optimization, Generating code for DAGs.

Code Optimization: Criteria for code improving transformation, code optimization sources: Local and global common sub-expression elimination, dead code elimination, Induction variable reduction, loop invariant computation, Optimization of basic blocks, loops in flow graph, reducible flow graph, code improving transformations.

Unit – V **(10 Hrs. 20 Marks)**

Run time environments: activation trees, control stacks, storage organization, subdivision of run time memory, activation records, storage allocation strategies: static allocation, stack allocation, heap allocation, symbol table management: hash tables, dynamic storage allocation techniques, explicit allocation of fixed size and variable size blocks.

Reference Books:

1. Aho, Sethi, Ulman, “Compilers Principles, Techniques and Tools”, Addision Wesley
2. Dhamdhere, “Compiler Construction- Principles and Practices”, MacMillan India.
3. Andrew Appel, “Modern Compiler Implementation in C”, Cambridge University Press
4. J.P.Bennett, “Introduction to Compiling Techniques”, TMH
5. Holub A.J., “Complier Design In ‘C’”, Prentice Hall

Term Work:

1. Study of LEX and YACC.
2. Calculator (text or graphics) using LEX and YACC.
3. Lexical analyzer for a subset of a C using LEX.
4. Design of a Predictive parser.
5. Implementation of code generator
6. Implementation of code optimization for
   Common sub-expression elimination, Loop invariant code movement.

Any 5 laboratory assignments should be framed by concern staff member based on above list.

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TERM – II

Data Warehousing and Mining

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25

Oral: 25

Unit – I **(10 Hrs. 20 Marks)**

Evolution of database technology, What is data mining?, Data Mining Applications, Steps in Knowledge Discovery, Architecture of typical data mining System, Data mining- On What kind of data, Data mining Functionalities, Classification of data mining systems, Major Issues in Data Mining.

What is Data Warehouse? Difference between Operational Database systems and Data Warehouse (OLTP and OLAP), Why Separate Data Warehouse?

A Multidimensional Data Model, Schemas for Multidimensional Databases: Stars, Snowflakes, and Fact Constellations. Measures, Concept Hierarchies, OLAP Operations in the Multidimensional Data Model.

Unit – II **(10 Hrs. 20 Marks)**

Data Warehouse Architecture, Process of Data Warehouse design, A Three tier Data Warehouse Architecture., Types Of OLAP servers.

Data Preprocessing: Why Preprocess Data? Data Cleaning Techniques, Data Integration and Transformation, Data Reduction Techniques, Discretization and Concept Hierarchy Generation for numeric and categorical data.

Data mining Primitives, A Data Mining Query Language.

Unit – III **(10 Hrs. 20 Marks)**

Concept Description: What is Concept Description? Data Generalization and Summarization-Based Characterization, Attribute Oriented Induction, Analytical Characterization: Attribute Relevance Analysis, Methods, Mining Descriptive Statistical Measures in Large Databases.

Mining Association Rules: Association Rule Mining, Market Basket Analysis, Association Rule classification, Mining Single-Dimensional Boolean Association Rules from Transactional Databases, The Apriori Algorithm, Mining Multilevel Association Rules, Constraint-Based Association Mining.

Unit – IV **(10 Hrs. 20 Marks)**

Classification and Prediction: What is Classification and Prediction? Data Classification Process, Issues Regarding Classification and Prediction., Classification by Decision Tree Induction, Bayesian Classification, , Classification by Back propagation, A Multilayer Feed Forward Neural Network, Classification Based on Association Rule Mining, Other Classification Methods

Cluster Analysis: What is Cluster Analysis? Types of Data in Cluster Analysis, A Categorization of Clustering Methods, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Model Based Clustering Methods.

Unit – V **(10 Hrs. 20 Marks)**

Cluster Analysis: What is Cluster Analysis? Types of Data in Cluster Analysis, A Categorization of Clustering Methods, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Model Based Clustering Methods

Mining Complex Types Of Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Mining Multimedia Databases, Mining Text Databases, Mining the World Wide Web.

Reference Books:

1. Han and Kamber, “Data Mining: Concepts and Techniques”, Morgan Kaufmann Publishers
2. Alex and Berson, “Data warehousing, Data Mining and OLAP”, TATA McGraw Hill

Term Work:

1. Develop a application to construct a multidimensional data model (Star, Snowflake or Fact constellations)
2. Develop a application to perform OLAP operations.
3. Develop a application to implement data preprocessing techniques.
4. Develop a application to implement data integration techniques.
5. Develop a application to implement data generalization and summarization techniques
6. Develop a application to extract association mining rules.
7. Develop a application for classification of data.
8. Develop a application for implementing one of the clustering technique.
9. Study of commercial data mining tools.

Any 6 laboratory assignments should be framed by concern staff member based on above list.

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TERM – II

Software Metrics and Quality Assurance

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25
Oral: 25

Unit – I **(10 Hrs. 20 Marks)**

Software Measurements: Measurement in Software Engineering, Scope of Software Matrices, The representational theory of measurements, Measurement and Models, Measurements Scales and scale types, Meaningfulness in measurement, Classifying software measures, Applying the framework, Software measurement validation.

Unit – II **(10 Hrs. 20 Marks)**

Measuring internal product attributes: Size- Aspects of software size, Length, Reuse, Functionality, Complexity.

Measuring internal product attributes: Structure- Types of structural measures, Control-flow structure, Modularity and information flow attributes, Data structure, Difficulties with general "complexity" measures.

Measuring internal product attributes: Modeling software quality, Measuring aspects of quality.

Unit – III **(10 Hrs. 20 Marks)**

Software Reliability: Basics of reliability theory, software reliability problem, parametric reliability growth models, predictive accuracy, importance of operational environment.

Good estimates, cost estimation: problems and approaches, models of effort and cost, problem with existing modeling methods, dealing with problems of current estimation methods, implication for process predictions.

Unit – IV **(10 Hrs. 20 Marks)**

Software documentation, Standards, Practices, Conventions and metrics, The software inspection process, The walkthrough process, Audit process, Document verification, The ISO 9000 Quality Standards, Comparison of the ISO 9000 model with SEI's CMM.

Unit – V **(10 Hrs. 20 Marks)**

Cleanroom Software Engineering: The cleanroom approach, Functional Specification, Cleanroom design, Cleanroom testing.

Reengineering: Business process reengineering, Software reengineering, Reverse reengineering, Reconstructing, Forward engineering, The economics of reengineering.

Reference Books:

1. Flanton, Pfleeger, "Software Metrics- A Rigorous and Practical Approach", Thompson Learning
2. Mordechai Ben-menachem/Garry S.Marliss, "Software Quality", Thompson Learning
3. Roger S. Pressman, "Software Engineering- A Practitioner's Approach", TMH
4. Swapna Kishore and Rajesh Naik, "ISO 9001:2000 for Software Organizations", TMH

Term Work:

Concerned staff members should suitably frame the term work at least 5 assignments based on above

syllabus.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

BE (COMPUTER ENGINEERING)
(w.e.f. 2008-09)
TERM – II

Advanced Computer Architecture

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25

Unit – I **(10 Hrs. 20 Marks)**

Introduction to Parallel Processing: Evolution of computer Systems, Parallelism in uni-processor Systems, Parallel Computer Structure, Architectural Classification Schemes, Clock rate and CPI, performance factors, system Attributes MIPS rate ,Throughput rate, Implicit parallelism, Explicit parallelism, Parallel processing applications.
Program and Network Properties: Condition of Parallelism, Program partitioning and Scheduling, Program flow mechanism, system Interconnect architectures.

Unit – II **(10 Hrs. 20 Marks)**

Processor and Memory Hierarchy: Design space of processors, Instruction set architectures, CISC scalar processors, RISC scalar Processors, Super scalar and Vector Processors.
Inclusion, coherence and Locality, memory capacity planning. Bus, cache and shared memory.
Back, plane Bus System: Back plane bus specification, addressing and timing protocol, Arbitration and Interrupt, shared memory organization: Interleaved memory organization, Bandwidth and fault tolerance, memory allocation schemes.
Principles of Pipelining: Principles of Linear pipelining, classification of pipeline processor, General pipelines and Reservation tables.

Unit – III **(10 Hrs. 20 Marks)**

Pipelining and Super scalar Techniques: Linear pipeline processors, nonlinear pipeline processors, Instruction pipeline design, Arithmetic pipeline design, Super scalar and Super pipeline design.
Array Processors: SIMD Array processors: SIMD Computer Organization, Masking and data Routing Mechanism, Inter-PE Communications SIMD Interconnection networks.
Parallel Algorithms for array processor: SIMD Matrix Multiplication, Parallel sorting.
Associated array processing: Associative search Algorithms.

Unit – IV **(10 Hrs. 20 Marks)**

Multiprocessor Architecture: Loosely Coupled Multiprocessors, Tightly Coupled multiprocessors, Processor characteristics for multiprocessing.
Parallel Algorithms for Multiprocessing: Classification of parallel Algorithms, Synchronized and Asynchronous parallel Algorithms, Multiprocessor OS.
Vector Processing: Vector processing principles , vector access memory schemes, characteristics of vector processing.

Unit – V **(10 Hrs. 20 Marks)**

Data Flow Computers: Data driven computing and languages, data flow computer architectures.
Principles of Multithreading: Issues and solution, multiple context processor, Multidimensional Architectures, Multithreading.
Parallel Programming Modules: Shared-variable model, message- passing model, data- parallel model, object- oriented model, Functional and logic models.
Parallel languages: languages features for parallelism, parallel language construction.

Reference Books:

1. Kai Hwang, "Advance Computer Architecture, Parallelism, Scalability, Programmability", Mc-Graw Hill Publication
2. Kai Hwang and Faye A Briggs, "Computer Architecture and Parallel Processing"

Term Work:

Any five lab assignments should be framed by concern staff member based on above syllabus.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

BE (COMPUTER ENGINEERING)
(w.e.f. 2008-09)

TERM – II

Industrial Visit / Case Study

Teaching Scheme:

Examination Scheme:
Term Work: 25

EDUCATION TOUR / TECHNICAL VISITS / CASE STUDY AND ITS EVALUATION

1. During (B.E. First Term / Second Term) seventh and / or eighth terms or during vacation between (B.E. First Term / Second Term) seventh and eighth terms, every student; shall visit minimum two industries, factories arranged by colleges and accompanied by teachers. There shall be at least one teacher for a group of 20 students and at least one non-teaching staff accompanied with the students.

2. The colleges should obtain appropriate certificates of visit from the concerned organizations just after the visits.

3. Students should submit written report about the visits individually at the end of (B.E. Second Term) eighth term.

4. The report should contain information about the following points:

   (a) The organization - activities of organization and administrative setup technical personnel and their main duties.
   (b) The project / industry brief description with sketches and salient technical information.
   (c) The work / processes observed with specification of materials, products, equipments etc. and role of engineers in that organization.
   (d) Suggestions (if any) for improvement in the working of those organizations.

5. The evaluation of the report of technical visits will be made by panel of two teachers appointed by principal based on following points:

   (a) Coverage aspect: All above points should be covered.
   (b) Detailed observations: System / Process / Product explained with data, diagram specifications.
   (c) Quality of presentation: Report should be very objective and should consist of clear

and systematic organization of topics and information.

(d) Viva - voce: A viva -voce shall be conducted on the technical visit report by the teachers to assess the specific knowledge gained by the students for technical applications.

6. The case study should include the study problem in Computer Engineering branch.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

BE (COMPUTER ENGINEERING)
(w.e.f. 2008-09)

TERM – II

Project - II

Teaching Scheme:
Practical: 6 Hrs./ Week

Examination Scheme:
Term Work: 100
Oral: 50

1. The Project group in (B.E. first Term) seventh term will continue the project work in (B.E. Second Term) eighth term and complete project.
2. The group should maintain a logbook of activities. It should have entries related to the work done, problems faced, solution evolved etc., duly signed by guide.
3. The guides should regularly monitor the progress of the project work.
4. The project work along with project report should be submitted as part of term work in (B.E. Second Term) eighth term on or before the last day of the (B.E. Second Term) eighth term.
5. Project report must be submitted in the prescribed format only. No variation in the format will be accepted.
6. Assessment of the project for award of TW marks shall be done by the guide and a departmental committee (consisting of minimum two teachers with experience more than three years) as per the guidelines given in the following table.

B) ASSESSMENT OF PROJECT II TERMWORK (B.E. SECOND TERM)

NAME OF THE PROJECT: _____
NAME OF THE GUIDE: _____

Sr. No	Exam. Seat No	Name Of Students	Assessment by guide (70%)						Assessment by department (30%)			Grand Total
			Fabrication /software / actual work	Execution of project	Project report	Scope/ Cost / Utility	Attende-nece	Total	Evaluation (10%)	Prese-ntaion (20%)	Total	
		Marks	20	10	20	10	10	70	10	20	30	100

Sign of Guide Sign. of Committee Members Sign. of H. O. D.

7. The guide should be internal examiner for oral examination (If experience is greater than three years).
8. The external examiner should be from the related area of the concerned project. He should have minimum of five years of experience at degree level / industry.
9. The evaluation at final oral examination should be done jointly by the internal and external examiners.
10. The Project work should be kept in department for one academic year after University Examination.

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Syllabus for

Second Year Electrical Engineering

Faculty of Engineering and Technology

COURSE OUTLINE

SEMESTER – III and IV

W.E.F 2013 – 2014

North Maharashtra University, Jalgaon
Syllabus Structure for Second year Electrical Engineering w.e.f. 2013 – 2014
SEM III

Course Code	Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
							Theory		Practical		Total	
			Theory Hrs /wk	Tutorial Hrs/wk	Practical Hrs/wk	Total	ISE	ESE	ICA	ESE		
	Engineering Mathematics – III(TH)	A	3	1	--	4	20	80	--	--	100	4
	Power Plant Engineering (TH)	B	3	--	--	3	20	80	--	--	100	3
	Electrical Measurement – I (TH)	D	3	1	_	4	20	80	--	--	100	4
	Power System – I (TH)	D	3	--	--	3	20	80	--	--	100	3
	Electrical Engg. Materials (TH)	D	3	_	_	3	20	80	--	--	100	3
	Soft Skill – III (LAB)	C	1	--	2	3	--	--	50	--	50	2
	Power Plant Engineering (LAB)	B	--	--	2	2	--	--	50	--	50	1
	Electrical Workshop (LAB)	D	--	--	2	2	--	--	25	25 (OR)	50	1
	Electrical Measurement – I (LAB)	D	--	--	2	2	--	--	25	25 (PR)	50	1
	Electrical Engg. Materials (LAB)	D	--	--	2	2	--	--	25	25 (PR)	50	1
Total			**16**	**2**	**10**	**28**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA : Internal Continuous Assessment**

North Maharashtra University, Jalgaon
Syllabus Structure for Second year Electrical Engineering w.e.f. 2013 – 2014
SEM IV

Course Code	Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
							Theory		Practical		Total	
			Theory Hrs /week	Tutorial Hrs/wk	Practical Hrs/wk	Total	ISE	ESE	ICA	ESE		
	Analog & Digital Electronics (TH)	D	3		_	3	20	80	--	--	100	3
	Network Analysis (TH)	D	3	1	_	4	20	80	--	--	100	4
	Electrical Machine – I (TH)	D	3	1	_	4	20	80	--	--	100	4
	Electrical Installation Estimation &Distribution (TH)	D	3	--	--	3	20	80	--	--	100	3
	Numerical Techniques (TH)	D	3	--	--	3	20	80	--	--	100	3
	C – Programming / MATLAB(LAB)	B	1	--	2	3	--	--	50	--	50	2
	Analog & Digital Electronics(LAB)	D	--	--	2	2	--	--	50	--	50	1
	Network Analysis(LAB)	D	--	--	2	2	--	--	25	25 (PR)	50	1
	Electrical Machines – I (LAB)	D	--	--	2	2	--	--	25	25 (PR)	50	1
	Electrical Installation Estimation & Distribution (LAB)	D	--	--	2	2	--	--	25	25 (OR)	50	1
Total			**16**	**2**	**10**	**28**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA : Internal Continuous Assessment**

Course Title	Short Title	Course Code
Engineering Mathematics-III	**EM-III**	

Course Description:

This course is an advanced level Engineering Mathematics which will further strengthen the knowledge of the students who have completed Engineering Mathematics I and II in their first year which were elementary in nature. The course coverage explores Liner Differential Equation**,** function of a complex variable, Integral transforms like Laplace, Fourier, and Z-transform and vector integration. The goal of this course is to understand various differential equations and their solutions with various Integral Transform techniques, together with vector integration and their applications in engineering field.

Lectures	**Hours/Week**	**No. of Weeks**	**Total Hours**	**Credits**
	03	**14**	**42**	**04**
Tutorial	**01**	**14**	**14**	

Prerequisite Course(s): knowledge of HSC , Engineering Mathematics –I & Engineering Mathematics –II subject of first year of engineering.

Objectives of the subject:

1. Students will understand second and higher order differential equations and their solutions by general method as well as some short cut methods. Also application of differential equations to electrical engineering problems are discussed which will allow them to apply to engineering problems.
2. Students will understand function of a complex variable, definition of analytic function and its use in solving real or complex integration. Cauchy Integral theorem and Cauchy residue theorem are very important tools in solving many problems. They will learn these techniques.
3. Students will understand integral transforms such as Laplace transform (L.T.) of a function in t-domain. They will learn L.T. and their inverses of various standard functions as well as special functions such as Heaviside function, Dirac delta function, error function etc. Also they will learn the techniques to solve Initial Value Problems through Laplace transform techniques.
4. Students will understand Fourier transforms, Fourier Sine Transforms, Fourier Cosine transforms and their Inverses which are again very useful in solving Initial Value Problems.
5. Students will also learn Z-Transform and their inverses.
6. Students will understand vector integration such as line integral, surface integral etc which is very much essential in various problems.

7. Students will also learn the important theorems of vector integration like Green's, Gauss' and Stokes' theorems.
8. Students will learn Maxwell's equations which are very important for them.

Course Outcomes:

Upon successful completion this course a students will be

1. Able to apply methods of solving differential equations to the engineering problems they face in industry.
2. Able to understand analytic function of a complex variable. Able to apply Cauchy Integral theorem and Cauchy residue theorem to solve contour integrations
3. Able to apply Laplace Transform and Inverse Laplace Transform which are very useful in solving Initial Value Problems.
4. Able to apply Laplace Transform in solving problems related to their engineering field and other future courses.
5. Able to use Fourier transforms, Fourier Sine Transforms, Fourier Cosine transforms, Z transforms and their Inverses to solve various integration problems.
6. Able to use mathematics in higher studies for analysis and optimal design of system.

Engineering Mathematics – III

(Course Contents)

Semester-III **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

Tutorials : 1 Hr/Week **(ESE) End Semester Exam duration: 03 Hours**

UNIT-I: Linear Differential Equations: 09 Hours, 16 Marks

a. Solution of LDE of order n with constant coefficients.
b. Method of variation of parameters (Only Second Order).
c. Cauchy's linear equation.
d. Legendre's linear equation.
e. Applications of Linear differential equations to electrical circuits.

UNIT-II: Function of Complex Variable 09 Hours, 16 Marks

a. Analytic Functions, Cauchy-Riemann equations.
b. Cauchy's Residue theorem (Without proof)
c. Cauchy's Integral theorem and Cauchy's Integral Formula (without proof).
d. Conformal mapping, Bilinear transformations.

UNIT-III: Laplace Transform 08 Hours, 16 Marks

a. Definition and Existence of Laplace transforms.
b. Laplace Transform of elementary/standard functions.
c. LT of some special Functions viz., error, Periodic, Unit step, unit Impulse.
d. Theorems & Properties of Laplace Transform (without proof).
e. Inverse Laplace Transform.
f. Applications of LT for Network Analysis.
g. Applications of LT to solution of linear differential equation.

UNIT –IV: Fourier Transform and Z-Transform 08 Hours, 16 Marks

F) Fourier Transform:

a. Introduction to Fourier Integral theorem.
b. Fourier Transforms, Fourier Cosine Transforms, Fourier Sine Transform and their inverse.

G) Z-Transform:

a. Definition and standard properties (without proof)
b. Region of Convergence.
c. Z-Transform of standard /elementary sequences.
d. Inverse Z-transform.

UNIT-V: Vector Calculus and its applications **08 Hours, 16 Marks**

a. Introduction to Gradient, Divergence, Curl, Solenoid and Irrotational vector fields.
b. Vector integration: Line Integral, Surface and Volume integrals.
c. Gauss's Stokes and Green's Theorems (without proof).
d. Applications to Maxwell's equation.

Reference Books:

1. H.K. Dass , "Advanced Engineering Mathematics", S. Chand Publication, New Delhi.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley Eastern Ltd.
3. B.S. Grewal , "Higher Engineering Mathematics", Khanna Publication, Delhi
4. Wylie C.R. & Barrett , "Advanced Engineering Mathematics", Mc Graw Hill
5. B.V. Raman, "Engineering Mathematics", Tata Mc- Graw – Hill.
6. N. P. Bali, "A Text Book of Engineering Mathematics", Laxmi Publication
7. http://nptel.iitm.ac.in

Course Title	Short Title	Course Code
Power Plant Engineering	**PPE**	

Course Description:
This course provides knowledge of basic fundamentals and components required in power plant engineering, working principals and performance evaluation. The course also provides the latest technology involved in power plant engineering.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**3**	**14**	**42**	**3**

Prerequisite Course(s): Knowledge of HSC and basic fundamentals of Engineering Thermodynamics from first year Engineering.

General Objectives:
The objective of the course is to impart the fundamental knowledge about the power plants. Students develop their ability to apply the specific procedures to analyze the performance and their suitability of power plant components. The students will able to understand basic components of power plant their working principles and will be familiar with the use of different equipments. Safety precautions on work place. This makes bridge on theoretical knowledge and practical practices.

Course Outcomes:
Upon successful completion of this course the students will be able to:

1. Apply basic knowledge of science, mathematics and engineering for understanding thermal studies.
2. Understand advantages, disadvantages of different types of power plant on the basis of economy and environmental aspects.
3. Understand basic working, selection of different boilers, their mountings and accessories.
4. Understand selection of water turbine for hydro electric power plant and working of diesel engine power plant.
5. Understand basic working of Nuclear power plant, social, safety and environmental considerations.
6. Do professional duties in technical field of power plants for economical development.

Power Plant Engineering

(Course contents)

Semester-III **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

Unit 1:- Thermodynamics of Power Plant **09 Hours,16 Marks**

a. Introduction to different types of fuels , classification of fuels.
b. Combustion , excess air.(No numerical treatment on combustion of fuels)
c. Thermodynamic Cycles of steam flow.
d. Rankine Cycle, Reheat cycle.
e. Regenerative cycle(numerical based on above Cycles) gas power cycles.
f. Pulverized coal firing systems, fluidized bed combustion.

Unit 2:- Thermal power plants **09 Hours,16 Marks**

a. Types of boilers and boilers mountings and accessories.
b. Heat balance sheet for boiler plant (numerical) layout of thermal power plant,
c. Site selection of thermal power plant.
d. Requirement of electric power station design.
e. Selection of turbine generator set.
f. Coal handling , Storage , preparation and feeding ,out plant handling, storage of coal at plant.

Unit 3:- Hydro electric power plant **08 Hours,16 Marks**

a. Introduction , classification of hydro electric plant.
b. Selection of site for hydroelectric plant.
c. Estimation of power available.
d. Hydraulic turbine, Pelton wheel, Francis and Kaplan turbine.
e. Performance of water turbines (numerical) cavitation in water turbines.
f. Draft tubes ,selection of hydraulic turbines.
g. Governing of turbines, safety measures in hydrostation.

Unit 4:- Nuclear power plant **08 Hours,16 Marks**

a. Introduction , plant siting , basic principles of nuclear Energy
b. Energy mass relationship, structure of the atom , radio active decay, mass defect and binding energy
c. Nuclear Chain reaction, main parts of Nuclear reactor and control , classification
d. Basic reactor system, Radioactive waste disposal ,safety features
e. Diesel power plant:- Introduction, site selection ,main components and its working , Diesel plant Efficiency, choice and characteristic of Diesel power plant.

Unit 5:- power plant Economics and Instrumentation Control. 08 Hours,16 Marks

a. Introduction ,cost analysis, Estimation and predication of load
b. Some commonly used terms, factors affecting economics of generation
c. Distribution of power ,tariffs, load shearing
d. Instrumentation and control of system electric power station
e. Measurement of chemical composition
f. Impurity measuring instruments, steam generator control

Reference Books:

1. Arora, Domkumdawar, "Power Plant Engineering" Dhanpatrai and Sons,
2. G. D. Rai , "An Introduction to Power Plant Technology", , Khanna Publication.
3. R. K. Rajput , Power Plant Engineering, S .Chand
4. J. B. Gupta, "Power Plant Engineering".
5. P. k Nag, "Power Plant Engineering", Tata Mccgraw Hills
6. S . P. Sukhatma ;- "Solar Energy"
7. Chakraborti, Soni, Gupta " A Power Plant System Engg", Dhanpatrai Publication
8. http://nptel.iitm.ac.in

Course Title	Short Title	Course Code
Electrical Measurement-I	**EM-I**	

Course Description:

This course provides a brief introduction to International system of units, dimension of Electrical quantities, methods of magnetic measurements, measurement of resistances. Construction, principle of working, torque equation ,Characteristics, error and adjustment of different types measuring instruments like PMMC, Moving iron and Electro-static instruments, ammeters, voltmeters, wattmeters and energy meters. This course also includes a brief introduction to instrument transformers.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**3**	**14**	**42**	**4**
Tutorial	**1**	**14**	**14**	

Prerequisite Course(s) : Knowledge of H.S.C. and first year subject Elements of Electrical & Electronics Engineering .

General Objectives:

The objective of the course is to provide the knowledge of system of units, absolute and secondary measurement of electrical & magnetic quantities with different methods. In this course students will also learn available methods of measurement of electrical quantities and equipments for measurement. Students will also get the knowledge about construction, principle of operation, torque equations and different torques acting on measuring instruments. They will also learn errors & their adjustment during their use.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Understand the basic concepts in measurement and measuring instruments.
2. Understand the need and process of standardization, calibration of instruments, their significance in process and manufacturing industries for international acceptance.
3. Understand the working principles of measuring instruments and their applications with extension of ranges.
4. Select instruments on basis of accuracy, sensitivity and response time in generation transmission, manufacturing, power system ,testing and energy auditing purposes.
5. Perform technical and professional duties in any type of industries.
6. Do higher studies and use of modern instruments for techno-economical developments.

Electrical Measurement-I

(Course Contents)

Semester-III **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

Tutorial : 1 Hrs/Week **(ESE) End Semester Exam duration: 03 Hours**

UNIT-I: **09 Hours, 16 Marks**

a. International system of units.
b. Dimension of Electrical quantities.
c. Absolute measurements of current and resistance.
d. Magnetic measurements: Flux meter, permeameters.
e. B-H curve of a ring specimen.
f. Hysteresis loop.
g. Iron loss test at power frequency.
h. Effect of voltage, frequency , form factor on iron loss.
i. Separation of iron losses.

UNIT-II: **09 Hours, 16 Marks**

a. Measurement of Active, Reactive and Apparent power in 3 phase circuit.
c. Effect of power factor on wattmeter reading.
d. Measurements of resistance : Classification,
e. D.C. potentiometer,
f. Kelvin's double bridge,
g. Measurements of high resistance & insulation resistance.
h. Measurement of earth resistance, factor effecting on earth resistivity

Unit-III: **08 Hours, 16 Marks**

a. Measuring instruments (General theory)
b. Definitions and description of Static and Dynamic Characteristic of an instrument, accuracy, linearity, sensitivity, resolution, speed of response.
c. Galvanometer: Construction.
d. Deflection, controlling, damping & balancing systems of D'Arsonval, galvanometers.
e. Ballistic galvanometers.
f. Vibration galvanometers.

UNIT-IV: **08 Hours, 16 Marks**

a. Ammeters and Voltmeters : Construction
b. Principle of operations,
c. Torque equations and errors of PMMC,
d. Moving iron and Electro-static instruments. Extension of ranges using short and multipliers.
e. Instrument transformers : Theory,

f. Expression for ratio and phase angle errors.
g. Design consideration and testing.
h. Precautions in using the instruments transformers.
i. Introduction to capacitive voltage transformer CVT.

Unit-V: **08 Hours, 16 Marks**

a. Wattmeter and Energy-meter : Construction and principle of operation of electrodynamics and induction type wattmeter.
b. Construction and working of low P. F. wattmeters,
c. Errors and their compensation.
d. Construction and principle of operation
e. Torque equation for the induction type of energy-meter.
f. Error and adjustments.

Reference Books:

1. E. W. Golding. , "Electrical Measurements and Measuring instruments", Reem Publication.
2. C. T. Baldwin. , "Fundamentals of Electrical Measurements", Kalyani Publication
3. Cooper and Derfllick, "Electronic Instrumentation and Measurements Techniques", 3rd edition, Prentice-Hall of India.
4. A. K. Sawney. "Electrical & Electronic Measurement and Instrumentation" Danpant Rai & Co.
5. J.B. Gupta, "Electrical & Electronic Measurement and Instrumentation", S K Kataria & Son.
6. http://nptel.iitm.ac.in

Course Title	Short Title	Course Code
Power System-I	**PS-I**	

Course Description:

This course provides an introduction to generation transmission & distribution of power system. This course also provides introduction of different components of transmission system, concept and calculation of transmission line components .Course also provides knowledge of non convectional power plant, different parts and auxiliaries in power plants.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**3**	**14**	**42**	**3**

Prerequisite Course(s) : knowledge of H.S.C. and first year subject Elements of Electrical & Electronics Engineering .

General Objectives:

The objective of the course is to provide students with a firm grasp of the basic principles of generation of electrical power, power plant auxiliaries, transmission and distribution. This course will also help students to understand the concepts and terminologies which are used in generation and transmission systems. It is in-depth electrical course related to power generation systems.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Apply basic knowledge of science and mathematics and understand various power generating plants.
2. Understand the factors to be consider in site selection for different power plants in view of social, environmental and safety.
3. Understand need and concept of different auxiliaries in power plants.
4. Understand hydrology, load factor, load duration curves in view of economical considerations.
5. To familiarize with different transmission systems and their components.
6. Do higher studies in generation planning, generation scheduling and load dispatch.

Power System –I

(Course contents)

Semester-III **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

UNIT-I: G**eneration** **09 Hours, 16 Marks**

a. **Generation:** types of generating plants, basic requirements, site selection principle of working of Hydro Electric power plant, main components and auxiliary components of Hydro Electric power plant.
b. Schematic block diagram and role played by each block for Hydro Electric power plant
c. Basic requirements, site selection and principle of working of Thermal Electric power plant.
d. Main components and auxiliary components of Thermal Electric power plant.
e. Schematic block diagram and role played by each block for Thermal Electric power plant
f. Basic requirements, site selection and principle of working of Nuclear Electric power plant.
g. Main components and auxiliary components of Nuclear Electric power plant.
h. Schematic block diagram and role played by each block for Nuclear Electric power plant

Unit-II: **Non-conventional sources of energy** **09 Hours, 16 Marks**

a. Principle of working, main components and auxiliary components and of solar power plant
b. Schematic block diagram and role played by each block of solar power plant
c. Principle of working, main components and auxiliary components, schematic block diagram and role played by each block of tidal power plant
d. Principle of working, main components and auxiliary components and of MHD power plant
e. Schematic block diagram and role played by each block of MHD power plant
f. Principle of working, main components and auxiliary components of fuel cells
g. Schematic block diagram and role played by each block of fuel cells
h. Principle of working, main components and auxiliary components, schematic block diagram and role played by each block of geothermal energy

UNIT-III: **Power Plant Terminology** **08 Hours, 16 Marks**

a. Classification of power plants as Base load Peak load & Intermediate load plants.
b. Hydrograph
c. Flow duration curve

d. Category of load and load curves
e. Load duration curve.
f. Load factors.
g. Demand factor, Diversity factor.
h. Plant capacity factor, Plant use factor.

UNIT-IV: **Major Electrical Equipments In Power Plants** **08 Hours, 16 Marks**

a. Descriptive treatment of ratings of alternators.
b. Special features and field of use of alternators.
c. Descriptive treatment of ratings, special features and field of use of transformers.
d. Descriptive treatment of ratings, special features and field of use of bus bars.
e. Descriptive treatment of ratings, special features and field of use of exciters, and excitation systems.
f. Descriptive treatment of ratings, special features and field of use of CT and PT
g. Descriptive treatment of ratings, special features and field of use of metering equipments in generating stations.

UNIT-V: **Transmission System** **08 Hours, 16 Marks**

a. Importance of 3 phase overhead transmission lines in power systems & factors to be considered while planning their layout.
b. Resistance, skin effect.
c. Inductance and its estimation for two-wire-single-phase system.
d. Inductance and its estimation for 3 wire 3phase system.
e. Single and double circuit lines, with and without transposition.
f. Equal/unequal and horizontal spacing.
g. Circuit representation of lines: Classification of lines based on length as short, medium & long transmission lines.
h. Representation of transmission line as tee & pie circuit using R-L-C parameter, voltage and current relation of short & medium transmission line.

Reference Books: -

1. B.R.Gupta, “Generation of Electrical Energy”, S Chand Publication
2. William Stevenson ,”Elements of Power System Analysis” M-H international addition
3. OllE Elgerd, “Electrical Energy System Theory”, second edition, TMH.
4. J.B.Gupta, “A Course in Electrical Power System”, Dhanpat Rai and Sons’ Publication
5. http://nptel.iitm.ac.in

Course Title	Short Title	Course Code
Electrical Engineering Materials	**EEM**	

Course Description: The objective of this course is to introduce the students to the fundamental knowledge of various materials used in electrical engineering. The course provides the essential knowledge for the selection of different conducting and insulating materials. This course includes the classification and application of electrical engineering materials. Applications of modern electrical engineering materials for nanotechnology and solar photovoltaic systems.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**3**	**14**	**42**	**3**

Prerequisite Course(s) : knowledge of H.S.C. and first year subject Elements of Electrical & Electronics Engineering .

General Objectives: The objective of the course is to provide the knowledge of different electrical engineering materials and their applications in designing electrical equipments. The course also provides the study of thermal properties for the efficient design and long life cycle of electrical equipments.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Classify different electrical engineering materials and testing of various electrical engineering materials.
2. Understand the electrical and thermal characteristics of conducting, semiconducting, insulating and magnetic materials for the manufacturing of electrical machines and electronic components.
3. Understand and plot the B-H curve of different magnetic materials, their suitability in manufacturing of energy efficient electrical machines.
4. Understand dielectric properties of insulating materials in static and alternating fields.
5. Recognize the materials used for solar photovoltaic systems and nanotechnology.
6. Do higher studies in solar photovoltaic material for green and clean power generation in view of sustainable development through environmental and safety aspects.

Electrical Engineering Materials

(Course Contents)

Semester-III **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

UNIT I: Conductors **09 Hours, 16 Marks**

a. Classification: High conductivity, high resistivity materials
b. Fundamental requirements of high conductivity materials and high resistivity materials
c. Mobility of electron in metals
d. Factors affecting conductivity and resistivity of electrical material.
e. Thermoelectric Effect: See back effect, Peltier effect.
f. Commonly used high conducting materials, copper, aluminum, bronze brass, properties, characteristics
g. Constantan, platinum, nichrome, properties, characteristics and applications
h. Materials used for AC and DC machines.

UNIT II: Semi-Conductors and Superconductors **09 Hours, 16 Marks**

a. General concepts, energy bands,
b. Types of semiconductors: intrinsic Semi-conductors, extrinsic Semi-conductors.
c. Compound semiconductor, amorphous semiconductor.
d. Hall effect, drift, mobility, diffusion in Semiconductors.
e. Semi-conductors and their applications.
f. Superconductors: Superconductivity, Properties of Superconductors, Critical field
g. Meissner effect, Type-I and type-II Superconductors.

UNIT III: Dielectrics and Insulators **08 Hours, 16 Marks**

a. Properties of gaseous, liquid and solid dielectric, dielectric as a field medium
b. Electric conduction in gaseous, liquid and solid dielectric
c. Breakdown in dielectric materials, mechanical and electrical properties of dielectric materials,
d. Effect of temperature on dielectric materials, polarization, loss angle and dielectric loss
e. Petroleum based insulating oils, transformer oil, capacitor oils, and properties.
f. Classification of insulation (Solid) and application in AC and DC machines.
g. Solid electrical insulating materials, fibrous, paper boards, yarns, cloth tapes, sleeving wood, impregnation, plastics, filling and bounding materials, fibrous, film, mica, rubber, mica based materials, ceramic materials.

UNIT IV: Magnetic Materials **08 Hours, 16 Marks**

a. Basic terms, Classification of magnetic material, diamagnetic, paramagnetic, ferromagnetic, anti- ferromagnetic and amorphous material.
b. Hysteresis loop, magnetic susceptibility, coercive force, curie temperature.
c. Magneto-striction, factors affecting permeability and hysteresis loss.
d. Common magnetic materials
e. Soft and hard magnetic materials.
f. Electric steel, sheet steel, cold rolled grain oriented silicon steel, hot rolled grain oriented silicon steel, hot rolled silicon steel sheet

UNIT V: Modern Engineering Materials **08 Hours, 16 Marks**

Materials for Electronic Components

a. Resistors, Capacitors
b. Inductors, Relays
c. Bipolar transistors, Field effect transistor (FET)
d. Integrated circuits
e. Power devices

Nano-materials

f. Introduction, Nanotechnology
g. Nano-devices.

Solar/Photovoltaic Cell

i. Introduction, Photo generation of charge carriers, p-n junction
ii. Light absorbing materials: Silicon thin films, concentrating photovoltaic.

Reference Books:

1. A.J.Dekker, "Electrical Engineering Materials".
2. S.P.Seth and P.V.Gupta, "A course in Electrical Engineering Materials", Dhanpat Rai .
3. C.S.Indulkar and S.Thiruvengadam, "Electrical Engineering Materials", S Chand Pub
4. S.P.Chhaiotra and B.K.Bhat, "Electrical Engineering Materials".
5. Electrical Engineering Materials: T.T.T.I Chennai, TMH.
6. R.K.Rajput, "Electrical Engineering Materials", Laxmi Publication.
7. http://nptel.iitm.ac.in

Course Title	Short Title	Course Code
Soft Skills – III	**SK-III**	

Course Description: Through this course we have tried to prepare the students for the industry. Most companies test mathematical and logical ability through an aptitude test. This subject aims at working on these skills of a student through strategies formulae and practice exercises.

Lecture	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
	1	14	14	2
Practical	2	14	28	

Prerequisite Course(s): Fundamental knowledge of High School Mathematics.

Soft Skills – III
(Course Contents)

Semester-III **Examination Scheme:**
Teaching Scheme: **(ICA) Internal Continuous Assessment: 50 Marks**
Lectures : 1 Hrs/Week
Practical : 2 Hrs/Week

Unit-I: Arithmetic-1 **04 Hours, 10Marks**

1. **Basic Formulae**
   i. Divisibility Rules
   ii. Speed Maths
   iii. Remainder Theorem
   iv. Different Types of Numbers
   v. Applications

b. HCF, LCM and Linear Equations

i. HCF – Successive Division and Prime Factorization Methods
ii. LCM – Successive Division and Prime Factorization Methods
iii. Applications
iv. Linear Equations – Elimination Method
v. Substitution Method
vi. Applications

c. Averages and Mixtures

i. Concept of Average
ii. Faster Ways of Finding It

iii. The Allegation Method
iv. Applications

Unit-II: Arithmetic–II **04 Hours, 10Marks**

2. Percentages

i. Concept of Percentage
ii. Working with Percentages
iii. Applications

b. Profit and Loss

i. Difference between Cost and Selling Price
ii. Concept of Profit Percentage and Loss Percentage
iii. Applications

c. Time and Work

i. Basic Time and Work Formula
ii. Relation between Time and Work
iii. Applications

Unit-III: Arithmetic–III **03 Hours, 10Marks**

3. Permutations and Combinations

i. Sum Rule of Disjoint Counting
ii. Product Rule of Counting
iii. Concept of Factorial
iv. Permutations
v. Linear Permutations
vi. Combinations
vii. Circular Permutations
viii. Applications

b. Probability

i. Definition and Laws of Probability
ii. Mutually Exclusive Events
iii. Independent Events
iv. Equally Likely Events
v. Exhaustive Events
vi. Cards
vii. Dice
viii. Applications

c. Time and Distance

i. Speed
ii. Conversion Factors for Speed
iii. Average Speed
iv. Moving Bodies – Passing, Crossing and Overtaking
v. Relative Speed

vi. Boats and Streams
vii. Applications

Unit-IV: Non-Verbal Reasoning **03 Hours, 10Marks**

4. Analogies

i. Examples
ii. Applications

b. Classification

i. Examples
ii. Applications

c. Sequences

i. Examples
ii. Applications

Unit-V: Analytical Reasoning **03 Hours, 10Marks**

5. Analytical Puzzles

i. Classification Puzzles
ii. Ordering Puzzles
iii. Assignment Puzzles
iv. Applications

b. Letter and Number Series

i. Different Types of Letter Series
ii. Different Types of Number Series
iii. Mixed Series

c. Coding and Decoding

i. Letter Coding
ii. Number Coding
iii. Mixed Coding
iv. Odd Man Out
v. Applications

Guide lines for ICA:

ICA will be based on credit tests and assignments submitted by the student in the form of journal.

Reference Books:

1. R. S. Aggarwal, "Quantitative Aptitude", S. Chand Publication, New Delhi, 2012.
2. R. S. Aggarwal, "A Modern Approach to Verbal Reasoning", S. Chand Publication, New Delhi, 2012.
3. R. S. Aggarwal, "A Modern Approach to Non-Verbal Reasoning", S. Chand Publication, New Delhi, 2012.

Course Title	Short Title	Course Code
Power Plant Engineering Lab	**PPE Lab**	

Course Description:
In this laboratory, course emphasis on imparting the practical knowledge about power plant engineering, their working , safety precaution at work place.

Practical	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	2	**14**	**28**	**1**

Prerequisite Course(s): Knowledge of HSC and basic fundamentals of Engg. Thermodynamics from First year Engineering.

General Objectives:
The objective of the laboratory is to impart the fundamental knowledge about the power plant. Students develop their ability to apply the specific procedures to analyze the experimental results. The students will able to understand basic components of power plant their working principles and will be familiar with the use of different equipments. This makes bridge on theoretical knowledge and practical practices.

Course Outcomes:
After successful completion of this lab students will be able to:

1. Analyze the practical data for determination of performance of power plant components.
2. Understand basic of thermal, hydroelectric, nuclear power plant.
3. Understand selection of boiler as per load requirement.
4. Understand basic working of different boilers and their mountings and accessories.
5. Understand selection of water turbine for hydro electric power plant.
6. Understand working, safety, environmental considerations of diesel power plant and nuclear power plant.

Power Plant Engineering Lab

(Lab Course Contents)

Semester: III **Examination Scheme:**

Practical: 2Hr/Week **(ICA) Internal Continuous Assessment : 50 Marks**

Teacher should facilitate learning following lab experiments:

1. Study of modern thermal power plant .
2. Study of boiler mountings and accessories
3. Demonstration and trail on diesel engine
4. Study of modern hydro electric power plant
5. Demonstration and trail on any water turbine i.e. Pelton wheel/Francis/Kaplan
6. Study of modern nuclear power plant.
7. Assignment on boiler heat balance sheet and cycles.
8. Assignment on economics of power plant
9. Assignment on instrumentation and control of power plant

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Reference Books:

1. Arora, Domkumdawar, “Power Plant Engineering” Dhanpatrai and Sons,
2. G. D. Rai , “An Introduction to Power Plant Technology”, Khanna Publication.
3. R. K. Rajput , Power Plant Engineering, S .Chand
4. J. B. Gupta, “Power Plant Engineering”.
5. P. K Nag, “Power Plant Engineering”, Tata Mccgraw Hills
6. S . P. Sukhatma, “Solar Energy”
7. Chakraborti, Soni, Gupta “ A Power Plant System Engg”, Dhanpatrai Publication

Course Title	Short Title	Course Code
Electrical Workshop	**EW Lab**	

Course Description:

This course provides the basic practical knowledge about the electrical engineering. The course includes the study of different electrical symbols, electrical shocks and safety precautions, equipments used for the measurement and testing of electrical devices, different types of cables and wires, wiring accessories, lamp circuits. The course includes visit to the electrical industries or power plant for the enhancement of practical knowledge.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Practical	**2**	**14**	**28**	**1**

Prerequisite Course(s) : knowledge of H.S.C. and first year subject Elements of Electrical & Electronics Engineering .

General Objective:

The objective of the course is to provide knowledge about practical practices used in electrical engineering. This course will help students to use various tools for measurement and testing of electrical apparatus. The subject provides scope for practical applications of electrical engineering. The course will also help students to use and implement efficient and techno commercial aspect of maintenance and installation.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Understand various electrical symbols and their use in electrical drawing.
2. Familiar with the safety precautions and practices while working in industrial and domestic premises.
3. Understand various maintenance schemes such as preventive, breakdown maintenance.
4. Select correct size and type of cables and wires for different applications.
5. Use different types of measuring and testing equipments.
6. Select correct rating of fuse and MCB for protection scheme and safety.
7. Discharge the professional duties in technical field of maintenance and installation.

Electrical Workshop

(Lab Course contents)

Semester: III **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25Marks**

Practical: 2 Hrs/Week **(ESE) End Semester Examination Practical (OR) : 25Marks**

1. **Study of different electrical symbols.**
2. **Electrical Shocks and safety precautions.**
3. **Study of different Cables:**
   a. Classification of cable, Types of three Phase cable
   b. Cable standards and specifications
   c. Insulating materials for cables, Cable joining
   d. Coaxial cable, twisted pair cable, Flat ribbon cable.
4. **Study of different wires**
   a. Size selection of wires
   b. Standard wires TRC and CTS wires
   c. Weather proof wires, Flexible wires.
5. **Study of wiring accessories:**
   a. Types of switches
   b. Types of lamp holders, ceiling rose, mounting blocks, socket outlets plugs, wooden boards
   c. main switches (ICDP/ICTP/MCB), Junction boxes, Distribution boxes, fuse boards.
6. **Selection of fuse & MCB.**
7. **Study and use of:**
   a. DC/AC voltmeter and ammeter.
   b. Analog multi-meter and Digital multi-meter for the measurement of electrical quantities.
   c. Megger, Clip-on meter.
   d. Power factor meter.
8. **Domestic wiring and Lamp circuits:**
   a. Simple circuit, series and parallel circuit,
   b. Fluorescent lamp circuits, domestic switch board wiring.
9. **Industrial Visit:** Electrical power station, electrical substation, electrical workshop, electrical process industries (minimum two visits) and its reports.

Note: The term work should include a minimum **eight** experiments. Workshop practical practices should be based on above mentioned topics. Practical should explain with model and samples on each topic.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked questions on practical. Evaluation will be based answers given by students in oral examination.

Reference Books:

1. William A. Thue, “Electrical power cable engineering”
2. S L Uppal, “Electrical Wiring, Estimation and Costing”
3. Surjit Singh, “Electrical wiring, Estimation and Costing”
4. S K Bhattacharya, “Electrical wiring, Estimation and Costing”
5. B R Gupta, “Electrical Wiring, Estimation and Costing”

Course Title	Short Title	Course Code
Electrical Measurement– I Lab	**EM- I Lab**	

Course Description:
In this laboratory, course emphasis on imparting the practical knowledge and understanding of basic principles, characteristic, performance of different measuring instruments and measurement of different electrical quantities. It also gives the platform to understand need and importance of calibration and standardization.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Practical	**2**	**14**	**28**	**1**

Prerequisite Course(s): Knowledge of HSC and Element of Electrical & Electronic Engg at First year Engineering.

General Objectives:
The objective of the laboratory is to impart the fundamental knowledge of measuring instruments. Students develop their ability to select the specific instrument in reference of ranges and resolution of instruments for proper and correct analysis. The students will able to understand the characteristic of measuring instruments. In this lab course, students will be familiar with the use of different equipments, safety precautions on work place. This makes bridge on theoretical knowledge and practical practices.

Course Outcomes:
Upon successful completion of this lab students will be able to:

1. Conduct practical and able to analyze the practical data for various purposes.
2. Measure various electrical quantities and circuit parameters
3. Able to select the measuring instrument with proper range and type for practical uses.
4. Understand methods of measurement of power and energy.
5. Calibrate various types of instruments as per IS .
6. Do professional duties in technical field and able to use advance measuring instruments.

Electrical Measurement-I LAB

(Lab Course Contents)

Semester: III **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25Marks**

Practical: 2 Hrs/Week **(ESE) End Semester Examination Practical (PR) : 25Marks**

Teacher should facilitate learning following lab experiments:

1. Measurement of active power in three phase circuit by two wattmeter method.
2. Measurement of reactive power by two wattmeter and single wattmeter.
3. Calibration of single phase energy meter at different P.F.'s
4. Calibration of three phase two elements energy meter at different P.F.'s
5. D.C. potentiometer for calibration of ammeter and voltmeter.
6. Kelvin's double bridge: Measurement of low resistance.
7. Measurements of phase angle error and ration error of current Transformer
8. Measurements of phase angle error and ration error of Potential Transformer.
9. Epstein square.
10. Measurement of earth resistance.
11. Measurement of insulation resistance by Megger

Note: The term work should include a minimum **eight** experiments from the above list

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical . Evaluation will be based on paper work and performance in the practical.

Reference Books:

1. E. W. Golding. , "Electrical Measurements and Measuring instruments", Reem Publication.
2. C. T. Baldwin. , "Fundamentals of Electrical Measurements", Kalyani Publication
3. Cooper and Derfllick, "Electronic Instrumentation and Measurements Techniques", 3rd edition, Prentice-Hall of India.
4. A. K. Sawney. "Electrical & Electronic Measurement and Instrumentation" Danpant Rai & Co.
5. J.B. Gupta, "Electrical & Electronic Measurement and Instrumentation", S K Kataria & Son.

Course Title	Short Title	Course Code
Electrical Engineering Materials	**EEM Lab**	

Course Description:
The objective of this course is to introduce the students to the fundamental knowledge of various materials used in electrical engineering. Testing of electrical engineering material and application. Testing of insulation oil as per IS.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Practical	**3**	**14**	**28**	**1**

Prerequisite Course(s) : knowledge of H.S.C. and first year subject Elements of Electrical & Electronics Engineering .

General Objectives: The objective of the course is to provide students with the essential knowledge of different electrical engineering materials and their applications in designing electrical equipments. The students will able to carry different test on electrical engineering materials to find characteristic and applications. The students will able to select the material for different applications. This course also provide a platform for further studies in solar electric power generation.

Course Outcomes:
Upon successful completion of this course the students will be able to:

1. Apply basic knowledge of science and understand the characteristic of conducting material and their applications.
2. Analyze the practical data for determination of properties of materials.
3. Understand break down mechanisms for insulating materials.
4. Do testing of transformer oil as per IS.
5. Recognize the materials used for solar photovoltaic systems and nanotechnology.
6. Do higher studies in solar photovoltaic material for green, clean power generation in view of development through environmental aspects.

Electrical Engineering Material LAB

(Lab Course Contents)

Semester: III **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25Marks**

Practical: 2 Hrs/Week **(ESE) End Semester Examination Practical (PR) : 25Marks**

1. Testing of insulating oil as per I.S.
2. Testing of solid insulating materials as per IS
3. Testing of power capacitors as per IS
4. Measurements of resistivity of conducting materials.
5. Measurements of resistivity of resistive material.
6. Study and use of Gauss meter.
7. Use of spark gap for high voltage testings.
8. To study See back and Peltier effects.
9. Study of hysteresis loop of ferromagnetic materials.
10. Study of various insulating materials.

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical. Evaluation will be based on paper work and performance in the practical.

Reference Books:

1. A.J.Dekker, “Electrical Engineering Materials”.
2. S.P.Seth and P.V.Gupta, “A course in Electrical Engineering Materials”, Dhanpat Rai .
3. C.S.Indulkar and S.Thiruvengadam, “Electrical Engineering Materials”, S Chand Pub
4. S.P.Chhaiotra and B.K.Bhat, “Electrical Engineering Materials”.
5. Electrical Engineering Materials: T.T.T.I Chennai, TMH.
6. R.K.Rajput, “Electrical Engineering Materials”, Laxmi Publication.

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Syllabus for

Second Year Electrical Engineering

Faculty of Engineering and Technology

COURSE OUTLINE

SEMESTER –IV

W.E.F 2013 – 2014

Course Title	Short Title	Course Code
Analog & Digital Electronics	**ADE**	

Course Description:
This course provides knowledge about electronic devices, their characteristic and ability to control high power electrical equipments. This course also provides the knowledge of digital electronics.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**3**	**14**	**42**	**3**

Prerequisite Course(s): Knowledge of mathematics and sciences at HSC & Element of Electrical and Electronic Engg at first year Engg.

General Objectives: Evolution of analog integrated circuits and digital circuits the space requirement is also reduced. The advancements in digital system design manufacturing, computer technology and information systems have caused the rapid increase in the use of digital circuits. Hence this subject is intended to learn facts, concepts, principles and applications of analog integrated circuits digital electronic. Thus, students can sharpen their skills of developing the logic using digital techniques.

Course Outcomes:
Upon successful completion of this course the students will be able to:

6. Apply basic knowledge of science and engineering to understand electronic devices and circuits.
7. Understand the construction and working principles of different electronic devices.
8. Analyze the circuit for determination of circuit parameters and response of electronic devices.
9. Understand the use of different electronic devices such as BJT,FET,OPP,IC 555, PLL,etc
10. Understand and implement simple digital electronic circuits, able to use updated software and tools for continuous updating of knowledge.
11. Do higher studies in Power Electronics, Modern Drives and Flexible AC Transmission System (FACTS).

Analog & Digital Electronics

(Course Contents)

Semester-IV **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

Unit –I **09 Hours, 16 Marks**

a. Review of rectifiers using diodes.
b. Introduction, BJT as a amplifier .
c. Analysis of CE and CC configuration using BJT,
d. Introduction to FET and FET as amplifier ,
e. Multistage amplifier,
f. Basic configuration of differential amplifier.

Unit- II **09 Hours, 16 Marks**

a. Operational amplifier, Op-amp parameters such as CMRR, slew rate , frequency response and gain limitations. (concept only).
b. Inverting ,non inverting amplifier.
c. Summer and substractor .
d. Op-amp applications: Integrator , differentiator .
e. Op-amp as Comparator , Schmitt trigger,
f. Instrumentation amplifier , precision rectifiers(Half wave and full wave rectifiers)
g. Waveform generation using Op-amp – sine, square , and triangular.

Unit-III **08 Hours, 16 Marks**

a. Types of voltage regulators only concepts
b. Series and shunt voltage regulators (Transistor series regulator),
c. Protection circuits for voltage regulators,
d. Fixed and variable voltage regulators using ICs Viz 78xx,79xx,LM723, LM317,
e. Study of VCO and PLL,
f. IC 555 and modes of operation-Astable, Monostable,

Unit-IV **08 Hours, 16 Marks**

a. Introduction to K Map- two, three and four variables, K Map with examples
b. Concept of Latch, SR Flip flop, D type Flip flop
c. Type of triggering- age and level
d. JK flip flop, Race around condition JK Flip flop, D and T type flip flop.
e. JK Master slave flip flop, Applications
f. Opto coupler , opto isolator, opto decoder, opto encoder

UNIT-V **08 Hours, 16 Marks**

a. Shift register, various types and concept
b. Bidirectional shift register,
c. Ripple counter(asynchronous)counter,
d. Synchronous counter only two and three bit operation
e. Twisted ring counter,
f. Up – down counter,

Reference Books:

1. Gaikwad R, "Operational Amplifier", PHI New Delhi
2. K.R.Botkar, "Integrated Circuit" , Khanna Publication,New Delhi
3. Milman Halkias , "Principles of Electronics", TMH
4. R P Jain, "Digital Electronics", TMH
5. Salivahen, "Electronic Devices and Circuit" , TMH
6. http://nptel.iitm.ac.in

Course Title	Short Title	Course Code
Network Analysis	**NA**	

Course Description:

This course provides a brief introduction to students to analyze, design and synthesize network with passive and active elements. This course also includes network topologies, circuit theorems, initial conditions of network, Laplace Transform of signals, two port network parameters & Fourier Series of signals. This course provides brief description about sinusoidal steady –state analysis of R-L-C circuits

	Hours/Week	No. of Weeks	Total Hours	Credits
Lectures	**03**	**14**	**42**	**04**
Tutorial	**01**	**14**	**14**	

Prerequisite Course(s) : knowledge of H.S.C. and first year subject Elements of Electrical & Electronics Engineering .

General Objectives:

The objective of the course is to help the students in basic concepts and modern engineering methods of circuit analysis with passive and active elements. Students will be able to learn the application of Kirchoff's laws including node voltage and mesh current methods in circuit analysis, sinusoidal steady state analysis, network theorems in DC and AC cases, analysis of signal waveforms, Laplace Transformation and its applications in electric circuits, mutually coupled circuits, two port networks, Graph theory and Fourier analysis.

Course Outcomes: Upon successful completion of this course the students will be able to:

1. Identify the network, principal elements of electric circuits: nodes, loops, mesh, branches, voltage and current sources and topological description of a network.
2. Solve problems related to initial and final condition of a network.
3. Write the differential equation of first-order and second –order circuits in standard form and determine the complete solution of first-order and second order circuits excited by switched DC sources.
4. Analyze waveform using Laplace & Fourier transform.
5. Compute different theorems for networks containing linear resistors and independent and dependent sources.
6. Understand the meaning of steady state and transients by inductor and capacitor in circuits and write differential equations for such circuits.
7. Do higher studies in power system analysis under transient condition with help of modern tools.

Network Analysis

(Course Contents)

Semester-IV **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures: 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

Tutorials : 1 Hr/Week **(ESE) End Semester Exam duration: 03 Hours**

Unit-I: **09 Hours, 16 Marks**

Introduction: Continuous and Discrete, Fixed and Time varying systems

a. Linear and Nonlinear, Lumped and Distributed systems
b. Passive and Active networks and systems
c. Independent and Dependent sources, Impulse, Step, Ramp signals
d. Sinusoidal, Square, Saw tooth signals

Coupled circuits:

e. Magnetic coupling, Concept of Self and Mutual inductance
f. Coefficient of coupling, Inductive coupling in series and parallel
g. Dot convention in Coupled coils, Modeling of coupled circuits

Unit-II: **08 Hours, 16 Marks**

a. Source transformation.
b. Mesh and super-mesh analysis, Loop analysis.
c. Node and super-node analysis.
d. Network theorems (Application in AC circuits with independent and dependent sources**):** Superposition theorem.
e. Thevenin's and Norton's theorem.
f. Maximum power transfer theorem.
g. Millman's theorem and its application in three phase unbalanced circuit analysis.

Unit-III: **08 Hours, 16 Marks**

Laplace transforms:

a. Impulse, Step & Sinusoidal response of RL, RC, and RLC circuits.
b. Transient analysis of different electrical circuits with initial conditions.
c. Transient analysis of different electrical circuits without initial conditions.
d. Concept of Convolution theorem and its applications.
e. Solution of Problems with DC & AC sources.

Fourier method of waveform analysis: Fourier series and Fourier Transform (in continuous domain only)

f. Application in circuit analysis.

Unit-IV: **08 Hours, 16 Marks**

Graph theory and Networks equations:

a. Concept of Network graph, Terminology used in network graph: oriented or directed graph, branch, tree, co-tree,.
b. Incidence matrix.
c. Tie-set matrix, Cut set matrix.
d. Network Equilibrium equations in matrix form: Mesh or Loop or KVL Equilibrium equations Node or KCL Equilibrium equations.
e. Duality: Construction of dual networks by mathematical and graphical method.

Unit-V: **08 Hours, 16 Marks**

Two port networks analysis:

a. Open circuit Impedance parameters, Short circuit Admittance parameters, Transmission parameters, Hybrid parameters
b. Inter conversion of parameters
c. Interconnection of Two port parameters: cascade connection, series connection, parallel connection
d. System and Network functions: Driving point impedance and Admittance functions, transfer impedance and admittance, voltage and current transfer ratio
e. Solution of Problems

Filter circuits: Analysis and synthesis of Low pass filters,

f. High pass, Band pass, Band reject filters.
g. All pass filters (first and second order only) using operational amplifier.

Reference Books:

1. W.H. Hyat, J.E. Kemmerly & S.M. Durbin, "Engineering Circuit Analysis", Tata Mc Graw Hill .
2. D. Roy Chowdhury, "Networks and Systems", New Age International Publishers
3. C.L. Wadhwa , "Network Analysis and Synthesis", New Age International Publishers
4. A. Sudhakar & S.S. Palli, Circuit and Networks: Analysis and synthesis, 4th edition. TMH.l
5. M.E. Valkenburg, "Network Analysis", Pearson Education .
6. D. Chattopadhay & P.C. Rakshit , "Fundamental of Electric Circuit Theory", S. Chand.
7. M. Nahvi & J.A. Edminister, Schum's outline series ,Electric Circuit, Tata Graw Hill.
8. Charles K. Alexander, Mathew. N.O. Sadiu , "Fundamental of Electric Circuits", Tata Mc Graw Hill
9. Syed A. Nasar, "Schaum's Solved Problem Series, Electric Circuits", Tata Mc Graw Hill
10. http://nptel.iitm.ac.in

Course Title	Short Title	Course Code
Electrical Machines – I	**EM/C – I**	

Course Description:
This course provides knowledge about D. C. machines and transformers to familiarize students with construction, their working, operation, performance and applications.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**3**	**14**	**42**	**04**
Tutorial	**1**	**14**	**14**	

Prerequisite Course(s) : Knowledge of HSC and first year subject Element of Electrical and Electronics.

General Objective:
The course aimed at acquiring an understanding on basic principles, operation, performance and control of dc machine and transformer. The subject is helpful in the studies of technological aspects such as utilization of electrical energy, switch gear & protection, manufacturing processes & testing & maintenance of electrical machines. The subject provides scope for higher study and able to use updated software.

Course Outcomes:
Upon successful completion of this course the students will be able to:

1. Apply basic knowledge of science and engineering for understanding electrical machines.
2. Understand construction, concepts, principles of operation & testing of dc machines and transformers.
3. Analyze data for qualitative and quantitative parameters to determine characteristics of machines.
4. Apply knowledge of electrical machines for technological subjects such as utilization of electrical energy, switch gear & protection, manufacturing processes and safety precautions.
5. Discharging duties in technical field for economical, societal and sustainable developments.
6. Do higher studies and able to use updated software for continuous updating of knowledge.

Electrical Machine-I

(Course Contents)

Semester-IV **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

Tutorial : 1 Hrs/Week **(ESE) End Semester Exam duration: 03 Hours**

Unit – I: **D.C .Machines** **09 Hours, 16 Marks**

a. Introduction of D C machine and its construction .
b. Construction of field and armature winding, Type of armature windings.
c. **D.C. generator:** Basic principles of working, e.m.f. generation, Classification of DC generator.
d. Process of commutation, types of commutation, Causes of bad commutation and remedies.
e. Characteristics and applications of different types of d.c. generator.
f. Losses and power stages in dc generator.
g. Armature reaction, effect and estimation of amp-turns.

Unit – II: **D.C. Motors** **09 Hours, 16 Marks**

a. Working principle of DC motor & significance of back e.m.f.
b. Need of starter and reversing direction of rotation.
c. Classification of DC motors and torque equitation.
d. Speed control by armature voltage and field control.
e. Characteristics and applications of different types of d.c. Motors.
f. Power stages in DC motor & Condition of maximum efficiency .

Unit – III: **Testing of DC Motors** **08 Hours, 16 Marks**

a. Testing of d.c. Machines: Type of tests like routine, type test and supplementary test.
b. Brake test.
c. Swinburne's test.
d. Regenerative or Hopkinson's test .
e. Field's test for series motor.

Unit – IV: **Single Phase Transformers** **08 Hours, 16 Marks**

a. Constructional working details, arrangements of core and coils in shell type and core type transformer.
b. EMF equation, voltage and current ratios, concept of leakage flux and its effect.
c. Leakage reactance and leakage impedances of transformer windings, voltage regulation.
d. General phasor diagrams on no load and load.
e. Open and short circuit test on transformer.
f. Exact and approximate equivalent circuit referred to either side.

g. Efficiency, maximum efficiency, all day efficiency transformer rating, Autotransformers.

Unit – V: **Three – Phase Transformers** **08 Hours, 16 Marks**

a. Poly-phase Transformers-connecting a bank of three identical single phase transformer for three phase transformation,
b. Comparison between a bank of three identical single phase transformers and a single three phase transformer.
c. Standard connections for three phase transformers, their voltage phaser diagrams, phaser groups, suitability of particular connection for supplying unbalanced loads.
d. Factor affecting the choice of connection.
e. Parallel operation of three phase transformers, tap changer on transformer.
f. Open delta or V-V connection, application and vector diagram.
g. Scott connection for three phase to two phase transformation and vice-versa ,applications.
h. Labeling and polarity test of three phase transformer.

Reference Books:

1. E.W.Clayton. "Design and Performance of D.C. Machines"
2. M.G.Say. "Design and Performance of A.C. Machines" CBS Publication
3. Langsdorf, " A.C.Machines," TMH.
4. P.C.Sen. "D.C. Machines", TMH.
5. Nagrath and Kothari "Electric Machine" –TMH
6. B. L. Theraja, "Electrical Technology", Vol – II, S. Chand Publucation
7. P. S Bimbhra, "Electrical Machinery" 2/E, Khanna Publishers
8. Ashfaq Husain, "Electrical Machines", Dhanpat Rai & Co.
9. http://nptel.iitm.ac.in

Course Title | Short Title | Course Code

Electrical Installation Estimation and Distribution | **EIED**

Course Description:

This course provides the knowledge about the various aspects of transmission & distribution system. The course includes the study of different components of transmission & distribution system, types of tariffs, earthing systems, different types of modern advanced tools such as PLC, SCADA to control system efficiently & economically, & basics of illumination engineering.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**3**	**14**	**42**	**03**

Prerequisite Course(s) : knowledge of H.S.C. and first year subject Elements of Electrical & Electronics Engineering .

General Objectives:

The objective of the course is to provide students with a firm grasp of the essential principles of a.c. and dc transmission and distribution systems. This course will help student to understand the concepts and terminology that are used in illumination engineering, designing & installation of electrical power system. The subject provides scope for practical applications of electrical power system engineering. The course provide bridge for higher studies in efficient and techno commercial aspect of power system.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Understand various methods of power distribution system.
2. Analyze parameter and design of different transmission components.
3. Draw substation layout as per the requirements, design of conductor size and components of systems as per IS.
4. Prepare the detailed wiring, earthing estimates of residential, commercial building and industrial sectors.
5. To familiarize with different scheme of illumination systems.
6. Discharge the professional duties in the field of electrical installations.

Electrical Installation Estimation and Distribution

(Course Contents)

Semester-IV **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures: 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

UNIT-I: **Supply Systems** **09 Hours, 16 Marks**

a. Supply Systems: Typical A.C. Supply Scheme
b. A.C. transmission, D.C. transmission and comparison between them based on technical, stability and cost effectiveness.
c. Types of transmission: overhead transmission, underground transmission and comparison between them.
d. Various systems of transmission: Dc systems : Two wire dc, two wire dc with midpoint earthed, dc three wire system.
e. Single phase ac systems : Single phase two wire, single phase two wire with midpoint earthed, single phase three wire system .
f. Two phase ac systems: Two phase three wire system, two phase four wire system .
g. Three phase ac system : Three phase three wire system, three- phase four wire system.

UNIT-II: **Overhead Transmission Line Components** **09 Hours, 16 Marks**

a. The support –poles, towers, and their types, cross arm and clamps, guys and stays.
b. Conductors-characteristics of conductor material, types of conductor- solid conductor, bundle conductor, concentrically standard conductor (ACA, ACSR conductor).
c. Insulators – types (pin, strain, shackle and suspension insulator), failure of insulators, potential distribution over suspension insulator string.
d. String efficiency, method of improving of string efficiency.
e. Underground cables **;** classification , construction of cable, requirements of insulating materials , insulation resistance.
f. capacitance dielectric stress in single-core/multi-core/ sheathed /armored cables.
g. Grading of cables – capacitance grading and inter sheath grading.

UNIT-III: **Earthing and Design of Distribution System** **08 Hours, 16 Marks**

a. Earthing : System earthing, Equipment earthing, method and material for earthing.
b. Design of distribution system **:** General design consideration for distribution system.
c. Connection scheme of distribution system.
d. Requirements of distribution system.
e. Service mains, feeders,distributors.
f. A.C. distribution and D.C Distribution
g. Feeder design based on Kelvin's law .

UNIT-IV: **Design and Estimation** **08 Hours, 16 Marks**

a. IE rules related to estimation and installation.
b. Design and estimation of installation of residential buildings, commercial, industrial heads as per IE rules .
c. Different types of tariffs.
d. Introduction to SCADA and PLC panels.

UNIT-V: **Illumination** **08 Hours, 16 Marks**

a. Illumination : nature of light , definitions –plane angle , luminous flux luminous intensity , illuminance and their units, luminous efficiency.
b. Laws of illumination – inverse square law and Lambert's cosine law , polar curves.
c. Requirements of good lighting scheme: Polar curves, direct, indirect , semi direct , semi-indirect lighting
d. Design of lighting scheme : factors to be considered , working plane space to height ratio, absorption factor, maintenance factor , depreciation factor , coefficient of utilization
e. Design of illumination schemes for industrial workshops assembly halls, street lighting.
f. Design of flood lighting schemes**:** factors like reflection factor , waste light factor and beam factor and design of such schemes for typical installation.

Reference Books:

1. J.B.Gupta, "Transmission and Distribution" S.K.Kataria and Sons, New Delhi.
2. S.L.Uppal , "Electrical Wiring , Estimation and Costing" ,Khanna Publishers, New Delhi.
3. V.K.Mehta, "Principle of Power System" ,S.Chand, New Delhi
4. S.L.Uppal, "Electric Power", Khanna Publishers, New Delhi.
5. H.Pratap , "Art and Science of Electrical Utilization" ,Dhanpat Rai and Sons, New Delhi.
6. B.D.Arora, "Electric Wiring, Estimating and Costing", New Heights, New Delhi
7. S.K.Bhattacharya, "Electrical Estimation and Costing"
8. I.E.Rules.
9. http://nptel.iitm.ac.in

Course Title	Short Title	Course Code
Numerical Techniques	**NT**	

Course Description:
This course provides knowledge of numerical methods and optimization technique.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	3	**14**	**42**	**3**

Prerequisite Course(s) : Knowledge of mathematics and science at HSC & First Year Engineering.

General Objectives:
To familiarize with number system in computations, polynomial equations, concept of roots of an equation & methods to find the same. To study various differentiation & integration methods. To understand the tradeoff between programming ease, computation time, data storage, truncation and round off errors.

Course Outcomes:
Upon successful completion of this course the students will be able to:

1. Solve polynomial and transcendental equations,
2. Solve linear algebraic equations, simultaneous equations.
3. Solve Interpolate by Lagrange's & Newton methods.
4. Solve ordinary differential equations by using Euler's method, Runge Kutta method, Taylor's Method and predictor - corrector method.
5. Develop computer program for above methods.
6. Do higher studies in power system such as load flow study and power system optimization.

Numerical Techniques

(Course Contents)

Semester-IV **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

Unit I **09 Hours, 16 Marks**

a. Number systems & errors in digital computations,
b. Transcendental & polynomial equations,
c. Concept of roots of an equation & methods to find the same.
d. Secant method,
e. Newton- Raphson method,
f. Regula-Falsi method.
g. Method of matrix Inversion (Shipley inversion method)

Unit II **09 Hours, 16 Marks**

Linear algebraic simultaneous equations:

a. Gauss method, ,
b. Gauss Elimination,
c. Gauss Jordan,
d. Jacobi Iteration,
e. Triangular Factorization (L-U Factorization),
f. Gauss Seidal method.

Unit III **08 Hours, 16 Marks**

Interpolation:

a. Newtons's forward and backward interpolation formula
b. Gauss's forward and backward interpolation formula
c. Lagrange & Newton interpolations,
d. Central difference operators, interpolating polynomials using finite differences,
e. Least squares approximation.

Unit IV **08 Hours, 16 Marks**

Differentiation & Integration:

a. Numerical differentiation methods based on interpolation,
b. Finite differences, undetermined coefficients.
c. Integration using Simpson's 1/3 rule
d. Trapezoidal rule.

Unit V **08 Hours, 16 Marks**

Ordinary differential equations and their solutions:

a. Euler's method,
b. Taylor series method,
c. Runge-Kutta methods,
d. predictor-corrector methods.

Reference Books:

1. Jain & Iyengar, "Numerical Methods for Scientific & Engineering Computation", 3rd edition, New Age international.
2. S.K.Gupta, "Numerical Methods for Engineers", New Age international.
3. Anita, "Numerical Methods for Scientists & Engineers", Tata McGraw Hill.
4. S.S. Shashtry, "Introductory Methods of Numerical", Tata McGraw Hill.
5. Rajaraman, "Numerical Methods & Computations", Tata McGraw Hill.
6. Kanti Swarup , P. K. Gupta, Man Mohan, "Operation Research", Sultan Chand & Son.
7. Yashwant Kanitkar., "Let us C".

Course Title	Short Title	Course Code
C – Programming / MATLAB	**CP/MATLAB**	

Course Description:
The objective of this course is to introduce the students to the fundamental concepts of the C and C++ programming language, MATLAB and enable them to apply these concepts for solving real world problems. This course includes the basic structure and statements required for simple mathematical problems in MATLAB. This course provides the basic concepts of plot and other useful tools required to solve the problems.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**1**	**14**	**14**	**2**
Practical	**2**	**14**	**28**	

Prerequisite Course(s): Knowledge of mathematics and subject computer programming at first year engineering.

General Objectives: The objective of the course is to provide students with the essential knowledge of C language and MATLAB programming. This course will help students to use various modern tools for solving the problems of electrical engineering. The subject provides scope for practical applications of electrical engineering. The course will help students to analyze the electrical systems using the software. The course provides the effective approach for the higher studies in the efficient system design.

Course Outcomes:
Upon successful completion of this course the students will be able to:

1. Know use of the appropriate statements available in the C and C++ language and MATLAB.
2. Implement small and medium programs of varying complexity using the most commonly used features of the language.
3. Employ good programming style, standards and practices during program development.
4. Solve the different numerical techniques and perform Matrix operations.
5. Understand and use of MATLAB for solving simple mathematical problems.
6. Plot simple, 2-D and 3-D plots using MATLAB.
7. Use modern engineering tools in MATLAB which are useful for analyzing and designing of electrical power system.

C – Programming / MATLAB

(Course Contents)

Semester-IV **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 50 Marks**

Lectures : 1 Hrs/Week

Practical : 2 Hrs/Week

Unit-I C Language Review: **03 Hours**

a. Algorithms, flowcharts
b. Data types in C
c. The C character set: Constants, Variables and keywords.
d. The decision control structure

Unit-II Program Development Concepts: **03 Hours**

a. The loop control structure
b. Functions and pointers
c. Arrays

Unit-III Numerical computational techniques 1 **03 Hours**

a. Solution of transcendental & polynomial equation.
b. Solution of bisection method.
c. Solution of Newton Raphson method.

Unit-IV Numerical computational techniques 2 **02 Hours**

a. Solution of secant method.
b. Solution of linear equations using Gauss elimination method and Gauss-Jordan methods.
c. Numerical integration and differentiation: trapezoidal rule Simpson's 1/3 and 3/8 rule.

Unit-V MATLAB **03 Hours**

a. Introduction, Basics of MATLAB
b. Working with arrays of numbers
c. Creating and printing simple plots
d. Creating and executing a Script file, function file.
e. Interactive computations: Matrices and vectors, Matrix and array operation.
f. Graphics: Basic 2-D plots, 3-D plots.

C – Programming / MATLAB
(Lab Course Contents)

Teacher should facilitate learning following lab experiments:

1. Bisection Method program.
2. Secant Method program.
3. Newton Raphson Method program.
4. Gauss Elimination Method Program.
5. Gauss seidal Method Program.
6. Simpson`s 1/3 rd and 3/8 th rule program.
7. Arithmetic operations on matrix using MATLAB.
8. Plot the simple, 2-D and 3-D plots using MATLAB.
9. Find the roots of polynomial equations using MATLAB.
10. Find eigenvalues and eigenvectors, LU factorization.

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and assignment submitted by the student in the form of journal.

Reference Books:

1. Yashavant Kanetkar, "Let Us C", BPB Publications, 10/E, 2010.
2. Stephen G Kochan "Programming in C", Pearson Education, 3/E, 2004.
3. Vikas Gupta, "Computer Concepts and C Programming", Dreamtech Press, 2009.
4. Jain & Iyengar, "Numerical Methods for Scientific & Engineering Computation", 3rd edition, New Age international.
5. S.K. Gupta, "Numerical methods for Engineers", New Age international.
6. Anita, "Numerical methods for scientists & Engineers", Tata McGraw Hill.
7. Using MATLAB, Version 6, The Math Works, Inc., 2000.
8. MATLAB function reference, The Math Works, Inc., 2000.
9. Using MATLAB Graphics, Version 6, The Math Works, Inc., 2000.
10. MATLAB Release Notes for Release 12, The Math Works, Inc., 2000.

Course Title	Short Title	Course Code
Analog & Digital Electronics Lab	**ADE Lab**	

Course Description:
This lab course provides knowledge about electronic devices, their characteristic and ability to control high power electrical equipments. This course also provides the knowledge of digital electronics

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**3**	**14**	**28**	**1**

Prerequisite Course(s): Knowledge of mathematics and sciences at HSC & FE level and basic electronics

General Objectives: Evolution of analog integrated circuits and digital circuits the space requirement is also reduced. The advancements in digital system design manufacturing, computer technology and information systems have caused the rapid increase in the use of digital circuits. Hence this subject is intended to learn facts, concepts, principles and applications of analog integrated circuits digital techniques. Thus, students can sharpen their skills of developing the logic using digital techniques.

Course Outcomes:
Upon successful completion of this course the students will be able to:

1. Apply basic knowledge of science and engineering to understand electronic circuits.
2. Conduct practical and able to analyze the data for determination of circuit parameters and response of electronic devices.
3. Understand the use of different electronic devices such as BJT,FET,OPP,IC 555, PLL, etc
4. Understand and implement simple digital electronic circuits, able to use updated software and tools for continuous updating of knowledge.
5. Do higher studies in Power Electronics, Modern Drives and Flexible AC Transmission System (FACTS).

Analog & Digital Electronics Lab
(Lab Course Contents)

Semester-IV **Examination Scheme:**
Teaching Scheme: **(ICA) Internal Continuous Assessment: 50 Marks**
Practical : 2 Hrs/Week

Teacher should facilitate learning following lab experiments:

1. Op-amp as square & sine wave generator using IC 741.
2. Op-amp as comparator & Schmitt trigger IC 741.
3. Instrumentation amplifier using 3 Op-amps .
4. IC 555 application – Astable, Monostable, Square wave generator, Square counter.
5. IC 565 application ,calculation of lock range and capture range.
6. Study of JK flip flop IC 7476.
7. Study of binary counter using IC 7493.
8. Study of up down counter using IC 74492.
9. Study of IC 723 as low / high voltage regulator.
10. IC 7805 used as fixed voltage regulator, elevated voltage and current, constant current source.

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA:
ICA shall be based on continuous evaluation of student performance throughout semester and assignment submitted by the student in the form of journal.

Reference Books:-

1.Gaikwad R, “Operational Amplifier”, PHI New Delhi
2.K.R.Botkar, “Integrated Circuit” , Khanna Publication,New Delhi
3.Milman Halkias , “Principles of Electronics”, TMH
4.R P Jain, “Digital Electronics”, TMH.

Course Title	Short Title	Course Code
Network Analysis Lab	**NA Lab**	

Course Description:
This laboratory provides introduction to Electrical engineering students with a focus on circuit components and analysis. This laboratory provides comprehensive study of fundamental concepts of ac and dc networks, network theorems, measurement of circuit parameters and transient response of simple RLC circuits.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**14**	**28**	**1**

Prerequisite Course(s): Knowledge of HSC & subject Element of Electrical & Electronic Engg. at first year Engineering.

General Objectives:
The objective of the lab course is to provide students with the essential principles of ac and dc electric circuit and basic circuit parameters. This course will help student to understand concept of network theorems, transient response of series and parallel RLC circuits and coupled circuits and two port networks. This course will help the student to apply the network concepts to solve the real life electrical engineering problems. The scope of this course is very wide and it is very important for the further studies and research work.

Course Outcomes:
Upon successful completion of this lab course the students will be able to

1. Introduce the concept of circuit elements, lumped circuits, circuit laws and reduction.
2. Analyze the electric network concepts, topology and equations.
3. Know the solution of differential equations & Laplace transform.
4. Use the knowledge of different theorems, pole zeros & different types of network.
5. Relate the knowledge of Z, Y, H parameters, Fourier series to understand the behaviors of network.

Network Analysis Lab

(Lab contents)

Semester-IV **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**

Practical : 2 Hrs/Week **(ESE) End Semester Examination(PR): 25 Marks**

Teacher should facilitate learning following lab experiments:

1. Verifications of Thevenin's Theorem for two port network.
2. Verification of Norton's Theorem for two port network.
3. Verification of Superposition Theorem for two port network.
4. Pole and Zero plot of one port network.
5. Measurement of Z parameter of two port network.
6. Measurement of Y parameter of two port network.
7. Measurement of ABCD parameter of two port network.
8. To plot frequency response of series RLC circuit.
9. To plot frequency response of parallel RLC circuit.
10. Study of filters

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guidelines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of above practicals. Evaluation will be based on paper work and performance in the practical.

Reference Books:

1. M.E. Van Valkenberg , "Network Analysis" , Third edition, Printice Hall of India.
2. William Hayt, Jack Kemmerly, "Engineering Circuits Analysis", Fifth editions, McGraw Hill International edition.
3. D. Roy Choudhary, "Networks and Systems", New Age International.
4. Franklin Koo, "Network analysis and Synthesis", New Age International
5. Shyam Mohan and sudhakar, "Network Analysis", TMH Publications.

Course Title	Short Title	Course Code
Electrical Machines – I Lab	**EMC – I Lab**	

Course Description:

In this laboratory, course emphasis on imparting the practical knowledge and understanding of basic principles, characteristic , performance and testing of DC Machines, Speed control DC Motor and use of other measuring equipment their class of accuracy. It also give the platform to understand construction, working ,performance , testing and selection of transformer.

Practical	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	**14**	**28**	**1**

Prerequisite Course(s): Knowledge of HSC and First year Engineering.

General Objectives:

The objective of the laboratory is to impart the fundamental knowledge of Machines and transformers. Students will able to develop their ability to apply the specific procedures for analyze the experimental results. The students will able to understand the characteristic of DC machines and application in process and manufacturing. Application of transformer in power system. In this lab course, students will be familiar with the use of different equipments, safety precautions on work place. This makes bridge on theoretical knowledge and practical practices.

Course Outcomes:

After successful completion of this lab students will be able to:

1. Understand constructional details of dc electrical machines and transformer.
2. Understand specifications of machines.
3. Conduct practicals for determination of characteristics of different type of generator , motors and transformers.
4. Able to analyze the test data for practical for applications, design and manufacturing processes.
5. Understand methods of speed control and starters for dc motors.
6. Select motor and transformer based on technical specifications, safety precautions and application.
7. Do professional duties in technical field for economical development.

Electrical Machine-I Lab

(Lab Course Contents)

Semester-IV **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**

Practical : 2 Hrs/Week **(ESE) End Semester Examination(PR): 25 Marks**

Teacher should facilitate learning following lab experiments:

1. Determination of magnetization, external , internal characteristics and critical field resistance of d. c. shunt generator
2. Determination of external characteristics of d.c. compound generator as i) differential compound, ii) cumulative compound generator.
3. Speed control of D.C shunt motor by armature and field control.
4. i) Study of 3 and 4 point starters. ii) Reversal of motor rotation of D. C. motor.
5. Determination of performance characteristic of DC series motor by direct load.
6. Swinburne's test on DC shunt Motor: Determination of losses & efficiency.
7. Polarity and Ratio test on single phase transformer/three phase transformer.
8. Determination of performance of single phase transformer by direct load test.
9. Determination of performance of single phase transformer by conducting Open circuit and short circuit test.
10. Parallel operation of two single phase transformer.
11. Study of phaser and vector group of three phase transformer.
12. Scott connection of two single phase transformer on no load and at balanced load.

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical. Evaluation will be based on paper work and performance in the practical.

Reference Books:

1. E.W.Clayton. "Design and Performance of D.C. Machines"
2. M.G.Say. "Design and Performance of A.C. Machines" CBS Publication
3. Langsdorf, " A.C.Machines," TMH.
4. P.C.Sen. "D.C. Machines", TMH.
5. Nagrath and Kothari "Electric Machine" –TMH

6. B. L. Theraja, “Electrical Technology”, Vol – II, S. Chand Publucation
7. P. S Bimbhra, “Electrical Machinery” 2/E, Khanna Publishers
8. Ashfaq Husain, “Electrical Machines”, Dhanpat Rai & Co.

Course Title Short Title Course Code

Electrical Installation, Estimation and Distribution Lab EIED Lab

Course Description:

This course provides an introduction to generation transmission & distribution of power system also in this course study of different components of transmission system, types of earthing systems & Different types of latest control system such as PLC, SCADA, Design of transmission line components and different parts

Practical	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	14	28	1

General Objectives:

The objective of the course is to provide students with a firm grasp on the essential principles of transmission and distribution. This course will help student to understand the concepts and terminology which are used in transmission and distribution systems. It is not an in-depth electrical course but, rather a course aimed at acquiring an understanding of basic principles that are used in electrical engineering.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Analyze and design of different transmission components.
2. Design of conductor size and components of systems
3. Describe concept and conditions of different interconnected systems in transmission systems
4. Understand construction and working different earthing systems
5. Familiarize with different illumination systems.
6. Understand safety precautions in electrical installations.

Electrical Installation, Estimation and Distribution Lab

(Lab Course Contents)

Semester-IV **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**

Practical : 2 Hrs/Week **(ESE) End Semester Examination(OR): 25 Marks**

Teacher should facilitate learning and drawing sheets:

1. Transmission line components : Five insulators –one piece pin, three piece pin type , suspension insulator (one disc) string insulator (one disc), shackle insulator; towers for single circuit and double circuit lines; lightening arrestor, stays, clamps, pin; typical pole including service mains, HT, LT lines supporting pole , 'H' type pole.
2. Distribution substation; Two views (front view and side view) of distribution substation layout ; single line diagram, pipe earthing , plate earthing.
3. Wiring diagrams and symbols**:** minimum 25 symbols as per IS standards. Any one circuit diagram out of the following: 1) Rotor resistance starter, 2) Automatic star /delta starter, 3)Maximum demand indicator.
4. Project on illumination design of laboratory / workshop or small scale industrial establishment along with estimation.
5. Project on electrification of given area showing distributors, feeders and substations.

The drawing sheet along with report on each topics.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of drawing sheet and journal.

Guide lines for ESE:-

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked questions on practical. Evaluation will be based answers given by students in oral examination.

Reference Books:

1. J.B.Gupta, "Transmission and Distribution" S.K.Kataria and Sons, New Delhi.
2. S.L.Uppal , "Electrical Wiring , Estimation and Costing" ,Khanna Publishers, New Delhi.
3. V.K.Mehta, "Principle of Power System" ,S.chand, New Delhi
4. S.L.Uppal, "Electric Power", Khanna publishers, New Delhi.
5. H.Pratap , "Art and Science of Electrical Utilization" ,Dhanpat Rai and Sons, New Delhi.
6. B.D.Arora, "Electric Wiring, Estimating and Costing", New Heights, New Delhi
7. S.K.Bhattacharya, "Electrical Estimation and Costing"
8. I.E.Rules.

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Syllabus for

Third Year Electrical Engineering

Faculty of Engineering and Technology

COURSE OUTLINE

SEMESTER – V and VI

W.E.F 2014 – 2015

PROGRAM EDUCATIONAL OBJECTIVES. (PEOs)

The Board of Studies in Electrical Engineering of North Maharashtra University, Jalgaon(India) has defined a set of program education objectives. The Program Educational Objectives of Electrical Engineering programs are designed to provide graduates with:

PEO1: Professional Knowledge: Graduates shall acquire the fundamental and advanced knowledge in Electrical Engineering subjects along with additional knowledge about other subjects like Mathematics, Basic Sciences, Inter-disciplinary Engineering, Management and Economics to solve basic and complex engineering problem. Graduates will be able to design system within realistic constraints for sustainable developments.

PEO2: Professional Employability: Graduates will have a successful career in Electrical Engineering. Graduates will succeed in getting the entry-level engineering positions in Generation, Transmission, Manufacturing, Government sectors at regional, national levels and an Entrepreneur.

PEO3: Higher Studies & Life Long Learning: Graduates may pursue their professional development through self learning, advanced degree and continue life-long learning. Graduates will be able to use software and modern engineering tools.

PEO4: Social Engineering: Graduates will aware of social responsibility, ethical values, safety standard, economical and environmental issues so that they serve the society better.

PROGRAM OUTCOMES (POs)

a. An ability to apply knowledge of mathematics, science, and engineering.

b. An ability to design and conduct experiments, as well as to analyze and interpret data.

c. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

d. An ability to function on multidisciplinary teams.

e. An ability to identify, formulates, and solves engineering problems.

f. An understanding of professional and ethical responsibility.

g. An ability to communicate effectively.

h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

i. Recognition of the need for, and an ability to engage in life-long learning.

j. Knowledge of contemporary issues.

k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

l. An ability to work professionally in both software and hardware system areas including the design and realization of such systems.

North Maharashtra University, Jalgaon.

Syllabus Structure For Third Year Electrical Engineering w.e.f year 2014-15

Semester –V

Course Code	Name of the Course	Group	Teaching Scheme				Evaluation Scheme				Total	Credits
							Theory		Practical			
			Theory Hrs /week	Tutorial Hrs /week	Practical Hrs /week	Total	ISE	ESE	ICA	ESE		
	Electrical Machines – II (TH)	D	3	--	--	3	20	80	--	--	100	3
	Power System – II (TH)	D	3	--	--	3	20	80	--	--	100	3
	Power Electronics (TH)	D	3	--	--	3	20	80	--	--	100	3
	Electromagnetic Engineering (TH)	D	3	--	--	3	20	80	--	--	100	3
	Industrial Organization & Management (TH)	C	3	--	--	3	20	80	--	--	100	3
	Electrical Machines –II (LAB)	D	--	--	2	2	--	--	25	25 (PR)	50	1
	Power System -II (LAB)	D	--	--	2	2	--	--	25	25 (PR)	50	1
	Power Electronics (LAB)	D	--	--	2	2	--	--	25	25 (OR)	50	1
	Electrical and Electronic Workshop (LAB)	D	--	--	2	2	--	--	25	--	25	1
	Software Application – I (LAB)	B	1	--	2	3	--	--	50	--	50	2
	Industrial Training/EDP/ Special Study	D	--	--	--	-	--	--	25	--	25	2
	Total		**16**	**--**	**10**	**26**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination ESE: End Semester Examination ICA : Internal Continuous Assessment

North Maharashtra University, Jalgaon.

Syllabus Structure For Third Year Electrical Engineering w.e.f year 2014-15

Semester –VI

Course Code	Name of the Course	Group	Teaching Scheme				Evaluation Scheme				Total	Credits
							Theory		Practical			
			Theory Hrs /week	Tutorial Hrs /week	Practical Hrs /week	Total	ISE	ESE	ICA	ESE		
	Control System – I (TH)	D	3	--	--	3	20	80	--	--	100	3
	Electrical Measurement – II (TH)	D	3	--	--	3	20	80	--	--	100	3
	Electrical Machine Design (TH)	D	3	--	--	3	20	80	--	--	100	3
	Microprocessor & Microcontroller (TH)	D	3	--	--	3	20	80	--	--	100	3
	Entrepreneurship Development (TH)	C	3	--	--	3	20	80	--	--	100	3
	Control System – I (LAB)	D	--	--	2	2	--	--	25	25 (OR)	50	1
	Electrical Measurement – II (LAB)	D	--	--	2	2	--	--	25	25 (PR)	50	1
	Microprocessor & Microcontroller (LAB)	D	--	--	2	2	--	--	25	25 (PR)	50	1
	Software Application – II (LAB)	B	--	--	2	2	--	--	25	--	25	1
	Minor Project	D	--	--	2	2	--	--	50	--	50	2
	Seminar-I	D	--	--	2	2	--	--	25	--	25	2
	Total		**15**	**--**	**12**	**27**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination ESE: End Semester Examination ICA : Internal Continuous Assessment

Course Title	Short Title	Course Code
Electrical Machines – II	**EMC-II**	

Course Description:

This course is an advanced level Electrical Machines-I which will further strengthen the knowledge of the students. The course explores on understanding of construction, basic principles underlying the operation of electrical machines, performance, characteristic and testing of AC Machines, Voltage regulation of synchronous alternator, parallel operation and salient features and characteristic of synchronous motor. It also gives the platform to understand construction, working, performance and application of three phase and single phase motors.

Lectures	Hours/Week	No. of Weeks	Total Hours	Credits
	03	15	42	03

Prerequisite Course(s): Knowledge of Electrical Machine-I at second year Engineering.

General Objectives:

The object of syllabus to impart the fundamental knowledge of Synchronous machines. Students will able to develop their ability to apply the specific procedures for comprehensive treatment of rotating machines. In the earlier stage the machine worked in isolation and its simple analysis was sufficient. Now the electric machines form an integral part of large system comprising of other components as well. The object is not great depth, but presentation through enough to give theory at a level that can be understood by undergraduate. With this beginning, the students will have the foundation to continue his education and able to do better in professional duties in the field of manufacturing, testing operation and control.

Course Outcomes:

After successful completion of this lab students will be able to:

1. Apply basic knowledge of science and engineering to understand electrical machines.
2. Understand construction, concepts, principles of operation, testing and application of synchronous machines, induction motor and special function motors.
3. Understand the behavior of synchronous machine on infinite bus and analyze data for qualitative and quantitative parameters to determine characteristics of machines by performing practical.
4. Perform professional duties in team of manufacturing, testing, operation and maintenance with the sense of safety precautions.
5. Apply knowledge for technological subjects such as utilization of electrical energy, switch gear and machine design for economical and sustainable developments.
6. Do higher studies and able to use updated software and tools for continuous updating of knowledge.

Electrical Machines – II

(Course Contents)

Semester-V **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

UNIT-I: Synchronous Alternator-I **09 Hours, 16 Marks**

Principle of generator, construction, excitation system, Arrangement of armature winding, E.M.F. equation , winding factors.

Alternator on- load , effect of armature current ; armature reaction ;resistance drop; Concept leakage reactance, synchronous reactance and synchronous impedance.

Voltage regulation of non salient pole alternator by direct load testing, synchronous impedance method; (e.g. method), m.m.f. method and potier triangle method

UNIT-II: Synchronous Alternator-II **09 Hours, 16 Marks**

Two reaction theory for salient pole machines, direct axis and quadrature axis reactance; their determination by slip test; Voltage regulation of salient pole alternator.

Power: power angle relation for non salient pole machines and salient pole

Parallel operation of alternator: need, conditions and method of parallel operation, Two alternators working in parallel, Effect of changing mechanical torque and excitation. Load sharing between two parallel connected alternators. Alternator on an infinite bus . induction generator

Unit-III: Synchronous Motors: **08 Hours, 16 Marks**

Motor action , phasor diagram on the basis of synchronous impedance, expression for gross mechanical power develop; power flow. Operation with constant load and variable excitation : locus of tip of current phasor under the above condition and v curve

Operation with const. excitation and variable load : locus of tip of current phasor circle phasor. Starting method, hunting and it causes and remedies.

Unit-IV: Poly Phase Induction Machines **08 Hours, 16 Marks**

Type and construction , working principal of induction motor, induction motor as generalized transformer, ,slip, rotor e.m.f. current, power, torque relations, torque slip characteristics, condition for maximum torque ,power stage in induction motor, losses and efficiency circle diagram and computation, Methods of starting of slip-ring and cage rotor induction motor ,varies types of starters, double squirrel cage motors, cogging, crawling of induction motor , Speed control of induction motor.

Unit-V : Single Phase Motor **08 Hours, 16 Marks**

Classification, production of magnetic field, equivalent circuit, production of toque, speed torque characteristic and application of capacitor start induction motor, split phase induction motor, shaded pole induction motor, AC series and universal motor. Comparison of single phase and three phase induction motor.

Special purpose machines:- single phase synchronous motor, repulsion motor, reluctance motor, hystresis motor, and linear induction motor.

Reference Books:

1. E.W.Clayton. "Design and Performance of D.C. Machines"
2. M.G.Say. "Design and Performance of A.C. Machines" CBS Publication
3. Langsdorf, " A.C.Machines," TMH.
4. Nagrath and Kothari "Electric Machine" –TMH
5. S K Bhaticharya, "Electrical Machines" –TMH
6. B. L. Theraja, "Electrical Technology", Vol – II, S. Chand Publucation
7. P. S Bimbhra, "Electrical Machinery" 2/E, Khanna Publishers
8. Ashfaq Husain, "Electrical Machines", Dhanpat Rai & Co
9. V K Mehta and Rohit Mehta, ' Principles of Electrical Machines" S Chand Publication
10. http://nptel.iitm.ac.in

Course Title	Short Title	Course Code
Power System – II	**PS-II**	

Course Description:

Power System-II explores the knowledge of parameter, characteristic and performances of transmission line. The subject emphasis on different faults calculation and concept of load flow analysis.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**3**	**15**	**42**	**3**

Prerequisite Course(s): Knowledge of Power System-I at second year Engineering.

General Objectives:

The approach has always been to develop the thinking process of students in reaching a sound understanding of broad range of topic in power system area of electrical engineering. The object is to promote the students' interest in learning more about the electric power industry. The object is not great depth, but presentation through enough to give theory at a level that can be understood by under graduate. With this beginning, the students will have the foundation to continue his education and able to do better in professional duties in the field of power system.

Course Outcomes:

After successful completion of this course students will be able to:

1. Apply basic knowledge of science and engineering to understand power system.
2. Describe the role of Power System Engineer and necessity of power system analysis to provide good quality, uninterruptable service to the consumer.
3. Represent synchronous machine, transmission line and power transformer to evaluate the performance of power system.
4. Evaluate reactance of synchronous machine on no load and loaded condition.
5. Analyze the power system in terms of symmetrical and unsymmetrical components to calculate the effect of symmetrical and unsymmetrical faults on power system.
6. Understand the concept of load flow analysis for continuous monitoring of power system by using modern computational techniques.
7. Do higher studies in the field of power system analysis and discharge the professional duties as Power System Engineer for economical development through modern technology.

Power System-II

(Course contents)

Semester-V **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

Unit I: Line parameters **09 Hours,16 Marks**

Introduction: Constituents of power system and role, necessity of power system analysis Real, reactive , complex power and its direction.

Line parameters: Inductance of three phase line with equilateral and unsymmetrical spacing, Bundled conductor, parallel circuit lines .

Capacitance of transmission line: capacitance of two wire, capacitance of equilateral and unsymmetrical spacing, effect of earth on the capacitance of three phase transmission line, bundled conductors, parallel circuit three phase line.

Unit II: Representation of power system component and characteristic of transmission line: **09 Hours,16 Marks**

Representation of power system: Single phase representation of balance three phase network, one line diagram, impedance diagram (reactance diagram), per unit system, representation of synchronous machine and power transformer.

characteristic and performance of Long transmission line:equivalent circuit of long line, Ferranti effect, power flow through transmission line method of voltage control, receiving end circle diagram.

Unit III: Symmetrical fault analysis **08 Hours,16 Marks**

Transient on transmission line, short circuit current and reactances of synchronous machine on no load and loaded condition, The bus impedance in fault calculations, algorithm for short circuit studies.

Synthesis of unsymmetrical phasors from their symmetrical components, operators, symmetrical components of unsymmetrical phasors, power in terms of symmetrical components.

Unit IV:- Unsymmetrical faults **08 Hours,16 Marks**

Single line to ground fault (LG) on an unloaded generator , line to line fault (LL)on an unloaded generator, double line to ground fault(LLG)on an unloaded generator, unsymmetrical fault on power systems, Single line to ground fault (LG)on a power system, line to line fault (LL)on a power system , double line to ground fault(LLG)on a power system Faults through impedance, analysis of unsymmetrical faults

Unit V:- Load flow analysis: **08 Hours,16 Marks**

Load flow analysis: Introduction, bus classifications, nodal admittance matrix (YBUS), development of load flow equations, load flow solution using Gauss Seidel and Newton-Raphson method, approximation to N-R method,

Traveling Waves: Introduction to surge Impedance loading and its derivation, Introduction to travelling wave on long transmission line

Reference Books:

1. Kothari & Nagrath, "Modern Power System Analysis" 4th edition Tata Mc. Graw Hill
2. W.D. Stevenson, Jr. " Elements of Power System Analysis", Mc Graw Hill.
3. C.L. Wadhwa, "Electrical Power System", New Age International.
4. Stagg and El-Abiad, "Computer Methods in Power System Analysis" TMH.
5. Hadi Sadat; "Power System Analysis", Tata McGraw Hill.
6. L. P. Singh; "Advanced Power System Analysis & Dynamics", New Age International
7. Chakraborthy, Soni, Gupta & Bhatnagar, "Power System Engineering", Dhanpat Rai & Co.
8. T.K Nagsarkar & M.S. Sukhija, "Power System Analysis" Oxford University Press,2007.
9. http://nptel.iitm.ac.in

Course Title	Short Title	Course Code
Power Electronics	**PE**	

Course Description:

Technology has improved by lips and bounds making the power devices more closely to an ideal switch. Power electronics has already found an important place in modern technology and has revolutionized control of power and energy. As the voltage and current ratings and switching characteristics of power semiconductor devices keep improving, the range of applications continues to expand in areas such as lamp controls, power supplies to motion control, factory automation, transportation, energy storage, multimegawatt industrial drives, and electric power transmission and distribution. The greater efficiency and tighter control features of power electronics are becoming attractive for applications in motion control by replacing the earlier electro-mechanical and electronic systems. Applications in power transmission include high-voltage dc (HVDC) converter stations, flexible ac transmission system (FACTS), and static-var compensators. In power distribution these include dc-to-ac conversion, dynamic filters, frequency conversion, and Custom Power System. The syllabus of Power Electronic deals with constructional and operational characteristic of power semiconductor devices, ac to dc , dc to ac converters, choppers and ac to ac converters.

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Lecture	**3**	**15**	**42**	**3**

Prerequisite Course(s) : Knowledge first year subject Elements of Electrical & Electronics Engineering and second year subject Analog and Digital Electronic .

General Objectives:

Power Electronics is the art of converting electrical energy from one form to another in an efficient, clean, compact, and robust manner for convenient utilization. The objectives of Power electronic is to create an awareness about the general nature of Power electronic devices, key features of the principal Power Electronic Devices, operational analysis of single phase uncontrolled half wave and full wave rectifiers supplying resistive, inductive, capacitive and back emf type loads. The objectives intended to understand the different configurations of inverters , coppers and cycloconverters.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Describe the role of Power Electronics as an enabling technology in various applications such as flexible production systems, energy conservation, renewable energy, transportation etc.
2. Understand the behavior of semiconductor devices operated as power switches.
3. Learn the basic concepts of operation of dc-dc converters in steady state in continuous and discontinuous modes and be able to analyze basic converter topologies.
4. Ability to analyze and design ac-to-dc circuits.
5. Ability to analyze and design dc-to-ac inverters.
6. Design power factor correction (PFC) circuits to draw sinusoidal currents at unity power factor.
7. Understand and design single-phase and three-phase thyristor converters.
8. Ability to design, set up, and test power electronic circuits in the laboratory
9. Learn the role of Power Electronics in utility-related applications which are becoming extremely important.

Power Electronics

(Course Contents)

Semester-V **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

UNIT-I: **Modern Power Semi-conducting Devices** **09 Hours, 16 Marks**

Thyristors: Introduction, Basic Structure, Operating Characteristics of SCR (Static Characteristics and Dynamic Characteristics during Turn-on and Turn-off), Thyristor Turn-on Methods, Thyristor Protection, di / dt , dv/dt Protection, Design of Snubber Circuits,

Introduction, Basic Structure, ON-OFF Control and Operational characteristics and Applications: DIAC, TRIAC, Gate turn-off thyristor (GTO), PUT, Light Activated thyristor (LASCR), MOS Controlled Thyristors (MCT)

UNIT-II: **Firing circuits, Commutation Techniques, Multi-Connections of SCRs**

09 Hours, 16 Marks

Introduction, Basic Structure, ON-OFF Control and Operational characteristics and Applications Insulated Gate Bipolar Transistor (IGBT), Metal- Oxide Field Effect Transistor (MOSFET), MOS Controlled Thyristors (MCT),

Gate Triggering Circuits/ Firing circuits: R, RC firing circuits(half wave and full wave firing circuits), Ramp and Pedestal triggering,

Commutation Techniques/ Turn-off methods: Forced and Natural, Classification of Forced Commutation- Class A, Class B, Class C, Class D, Class E, Class F

Multi-Connections of SCRs: Series, Parallel connection, String Efficiency

Unit-III: Full Wave controlled Rectifiers **08 Hours, 16 Marks**

Single phase Full Wave Bridge Rectifiers (B-2) connection: With Resistive and Inductive load (R-L load in rectifying and inverting mode), Single phase Full Wave Mid-point converters(Rectifiers) (M-2) connection: With Resistive and Inductive load (R-L load in rectifying and inverting mode), Single phase Symmetrical and Asymmetrical Semiconverters (Half Controlled Bridge Circuits): With Resistive and Inductive load, Three phase Full Wave Full-Controlled Bridge Rectifiers (B-6) connection: With Resistive and Inductive load, Effect of Source Impedance and Effect of Overlap angle (Single phase and Three phase Full Wave Full-Controlled Bridge Rectifiers)

UNIT-IV: **Inverters** **08 Hours, 16 Marks**

Inverters classification, Series inverter, Single Phase Parallel inverter, Single Phase Half Bridge and Full Bridge Voltage Source Inverters (With Resistive and Inductive load), Harmonic reduction, Three Phase Bridge Inverters (180-Degree and 120-Degree mode Voltage source inverters)

Dual Converters: Principle of Operation Ideal and Non-ideal, Dual Converters With and Without circulating current Schemes

Cycloconveters: Principle, Single Phase Cycloconveters

Unit-V: **Choppers** **08 Hours, 16 Marks**

Principle of Operation, Step Down, Step Up Chopper, Multi-Phase Choppers, AC Choppers, Chopper Configuration: Class A, Class B, Class C, Class D, Class E,

AC Regulators**:** Single Phase Half and Full wave with Resistive and Inductive load, Three Phase AC regulators

Speed Control of DC motors: Chopper fed Separately Excited DC motors and DC Series Motors

Reference Books:

1. M. Rashid, "Power Electronics", PHI Pub.
2. M.D. Singh and Khanchandani, "Power Electronics", TMH Pub.
3. M. Rammamurty, "An Introduction to Thyristors and its Applications", East-West Press
4. Mohan , Undeland and Riobbins, "Power Electronics", Wiley India Pvt. Ltd.
5. L Umanand, "Power Electronics Essentials & Applications", Wiley India Pvt. Ltd.
6. P S Bhimbra, "Power Electronic" Khanna Publishers
7. http://nptel.iitm.ac.in

Course Title	Short Title	Course Code
Electromagnetic Engineering	**EME**	

Course Description:
Electromagnetic field theory is an important fundamental course with great academic relevance progress in this exciting theory has made possible the advent of many technologies, such as wireless communication, antennas and wave propagation, micro wave engineering, etc. Interference and electrical noise problems that affect industry can also be better understood and their solutions can be provided using field theory.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**3**	**15**	**42**	**3**

Prerequisite Course(s): knowledge of H.S.C. and first year subject Elements of Electrical & Electronics Engineering.

General Objectives: Electromagnetic field theory is the subject of great research, academic and industrial importance and has a large number of applications**.** The objectives to understand basic concepts of static electric field and its associated quantities, Know the boundary condition particularly a boundary between conducting material and free space. The course also deals with significance of moving charges, force between two current carrying conductors, time varying field and radiation and antennas.

Course Outcomes:
Upon successful completion of this course the students will be able to:

1. Apply basic concepts of scalars and vector quantities to evaluate the impact of electromagnetic fields.
2. Understand the basic concepts of static electric field and its associated quantity to evaluate the force between two point charges using Coulomb's Law.
3. Know the boundary condition, particularly a boundary between conducting material and free space.

a. Use Poisson's and Laplacian equations to calculate potential, capacitance and electric field.

4. Understand the magnetization principle and Biot-savart law and its importance.
5. Analysis how a time varying magnetic field induces an electric field and apply Maxwell's equation for analysis of static , dynamic field conditions.
6. Understand of different antennas, parameters, principle pattern multiplication

Electromagnetic Engineering

(Course contents)

Semester-V **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

Unit – I: **Electrostatics** **09 Hours, 16 Marks**

a. Coulomb's Law, Concept of electric field and field due to point charge.
b. Concept of volume charge density: electric field due to line charge, sheet of charge
c. Electric flux-density, Gauss's law and Divergence theorem
d. Energy expanded in moving a point charge in electric field, Concept of potential difference between two points and potential due to point charge
e. Potential-gradient and relationship between electric field and potential

Unit – II: **Dipoles, Conductors, Dielecrics And Capacitance** **09 Hours, 16 Marks**

b. Dipole and its electric field and dipole-moment, Energy-density in electrostatic field
c. Concept of current-density, Current continuity equation, properties of conductors
d. Boundary conditions between conductor and free-space, Boundary conditions between two perfect dielectrics
e. Capacitance between parallel plates, co-axial cable and spherical shells, Energy stored in capacitors
f. Poisson's and Laplace's equations to calculate potential, capacitance and electric field

Unit – III: **Magnetostatics** **08 Hours, 16 Marks**

a. Biot-savart law and its vectorial form
b. Ampere's circuital law and its applications to co-axial law
c. Curl operator, magnetic flux-density.
d. Scalar and Vector magnetic potential
e. Magnetic flux-density, Stoke's theorem
f. Lorentz's force equation, Energy stored in magnetic field

Unit – IV: **Time Varying Fields** **08 Hours, 16 Marks**

a. Maxwell's equations in integral and differential form in time-varying fields, free-space, phasor form
b. Uniform plane-wave, Wave motion in free-space, perfect conductor, skin-effect
c. Wave motion in perfect dielectric and lossy dielectric medium
d. Poynting theorem

e. Reflection of uniform plane wave by perfect dielectric (Normal and oblique incidence)
f. Reflection of uniform plane wave by perfect conductor (Normal and oblique incidence)

Unit – V: **Radiation and Antennas** **08 Hours, 16 Marks**

a. Antenna fundamentals: Radiation intensity, Directive gain and Directivity, Power gain and efficiency, Effective length, Effective aperture, Radiation resistance
b. Reciprocity between transmitting and receiving antennas
c. Vector retarted potential, Radiation pattern
d. Antenna Arrays: Broadside arrays, End-fire Array, Binomial Array, Tchebyscheff Array
e. Principle of pattern multiplication
f. Types of Antennas: Folded dipole, Yagi-Uda Antenna, Horn Antenna, Parabolic and Cassegain Antenna

Reference Books:

1. W.H. Hyat, "Engineering Electromagnenic", Tata Mc Graw Hill.
2. S. P. Seth, "Elements of Electromagnetic fields", Dhanpat Roy and Sons
3. R G Kaduskar, " Principles of Electromagnetics", Publication- Wiley
4. Gottapu Sasibhushana Rao, " Electromagnetic Field Theory and Transmission Lines", Publication- Wiley
5. Edward C. Jordan & K. G. Balmain, Electromagnetic Waves & Radiating Systems Second Edition, PHI
6. K.D. Prasad, Antenna and Wave Propagation, Satya Publication
7. http://nptel.iitm.ac.in

Course Title | Short Title | Course Code

Industrial Organization & Management | **IOM**

Course Description:

The course explores concepts of management and functioning of organizations. It introduces both theoretical concepts and empirical applications, focusing particularly on production industries. Management studies have influenced every aspect of business thinking and planning. Apart from this, it also influenced our day-today lives in the form of technological advancements. The syllabus explores the knowledge of principle of management, financial management, human resource management, operational management and marketing management.

	Hours per Week	No. of Weeks	Total Hours	Semester
Lecture	**3**	**15**	**42**	**3**

Prerequisite Course(s) : knowledge basic science and Electronics Engineering .

General Objectives: This subject is designed to expose the students to fundamental concepts of management, its processes and behavioral dynamics in organizations. It will also look at recent developments in business in the context of economic theory. It also aims at making students understand concepts, philosophies, and processes of managing the marketing & financial operations of a firm.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Understand various aspects of management.
2. Understand the concepts of human resource management, marketing management, financial management, production and operation management.
3. Estimate the financial feasibility of business and identify the various sources of financing Understand different industrial laws in views of safety, pollutions and societal developments.
4. Discharge professional duties in field of manufacturing and operational management.
5. Function on multidisciplinary teams and able to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
6. Do higher study in various new disciplines in the area of management like entrepreneurs in view of economic objectives of country, such as industrial development, regional growth, employment generation and development.

Industrial Organization & Management

(Course Contents)

Semester-V **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

UNIT I: Principles of Management **09 Hours, 16 Marks**

a. Basic Concepts: Definition, Nature, Importance, Management: Art and Science & as a Profession, Management Vs Administration, Evolution of Management: Introduction to Scientific Management by Taylor, Administrative, Management by Fayol, Contribution of Peter Drucker, Levels & Functions of Management, Forms of Business Organization.

b. Approaches to Management: Decision Theory Approach, Contingency Approach, Systems Approach.

c. Organization: Formal & Informal, Line & Staff relationship, Centralization vs. Decentralization, Span of Management, Departmentation, MBO.

UNIT II:- Managerial Economics: **09 Hours, 16 Marks**

a. Introduction:Meaning & Scope of Economics, Basic Theories, Law of Demand & Supply, Elasticity of Demand & Supply.

b. Consumer Theories: Meaning of Utility & Law of Diminishing Utility.

c. Cost Concepts: Opportunity Costs, Sunk Costs, Marginal Cost, Total & Variable Costs, Fixed Costs, Contribution, Law of Diminishing Return.

UNIT III: Operational Management **08 Hours, 16 Marks**

a. Plant location and layout: Factor affecting plant location, different type of plant layout, CPM PERT, quality control manufacturing system, store and inventory control

b. Work study –techniques of work study method study, work measurement, different charts and diagrams used in method study.

UNIT IV: Human Resource Management **08 Hours, 16 Marks**

a. Human resource planning, Recruitment, Selection, Placement & Induction, Performance Appraisal & Development, Employee Training, Internal & External Mobility & Retention Management, Wage & Salary Administration, Fringe Benefits & Incentives Payments, Collective Bargaining, Performance appraisal , compensation

b. Industrial Laws: The factories Act 1947, The Workmen's Compensation Act 1923, Maternity Benefit Act The Payment of Wages Act 1936, The Apprentices Act 1961, industrial safety, prevention of accidents pollution control act

UNIT V: Marketing Management & Financial Management 08 Hours, 16 Marks

a. Introduction to Marketing: Concept of Market, Types of Market, Definition, Nature & Scope of Marketing, Marketing Approaches, Marketing Process, Functions of Marketing Management, 7 P's of Marketing. Advertising media of advertising market forecasting.

b. New trends in Marketing: Green Marketing, e- marketing & Viral Marketing.

c. Introduction to Financial Management: Meaning, Nature & Scope of Financial Management, Capital Structure, Types & Sources of Finance, Money Market & Capital Market, Role of Financial Institutions in Industry.

Reference Books:

1. O P Khanna, "Industrial Engineering Managements"
2. L.M.Prasad, "Principles of Management", Himalaya Publications Ltd
3. D.N. Dwivedi, "Managerial Economics", Vikas Publications
4. S.Chand by S.S.Khanka "Human resource Management"(Text & Cases),
5. P.Subba Rao "Essentials of HRM & IR" (Text, Cases & Games), Himalaya Publishing House
6. R.S.N. Pillai, Bhagavathi , "Legal Aspects of Business" (Mercantile Laws including Industrial & Company Laws)
7. Philip Kotler, "Marketing Management", Tata McGraw Hill
8. Ravi M. Kishor, "Financial Management", Taxmann Publication.

Course Title	Short Title	Course Code
Electrical Machines – II Lab	**EMC – II Lab**	

Course Description:

In this laboratory course emphasis on imparting the practical knowledge and understanding of basic principles, determination of characteristic , performance and testing of AC Machines, Voltage regulation of synchronous alternator. Application of single phase motors

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Practical	**2**	**15**	**28**	**1**

Prerequisite Course(s): Knowledge of Electrical Machine-I at second year Engineering.

General Objectives:

The objective of the laboratory is to impart the fundamental knowledge of Synchronous machine and AC motors. Students will able to develop their ability to apply the specific procedures for analyze the experimental results. The students will able to understand the characteristic of Synchronous alternator and motor, application in process and manufacturing. Application of different methods to find voltage regulation of synchronous alternator. In this lab course, students will be familiar with the use of different equipments, safety precautions on work place. This makes bridge on theoretical knowledge and practical practices.

Course Outcomes:

After successful completion of this lab course students will be able to:

1. Apply basic knowledge of science and engineering to understand electrical machine
2. Understand construction, concepts, and principles of operation, testing of synchronous machines and special function motors.
3. Analyze data for qualitative and quantitative parameters to determine characteristics of machines by performing practical
4. Apply knowledge for technological subjects such as utilization of electrical energy, switch gear & protection, manufacturing processes and safety precautions.
5. Discharging duties in technical field for economical, societal and sustainable developments.
6. Do higher studies and able to use updated software and tools for continuous updating of knowledge.

Electrical Machines-II Lab

(Lab Course Contents)

Semester-V **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**

Practical : 2 Hrs/Week **(ESE) End Semester Examination(PR): 25 Marks**

Teacher should facilitate learning following lab experiments:

1. Determination of voltage regulation and efficiency of three phase alternator by direct load test.
2. Open and short circuit test on three phase alternator: determination of its regulation by e.m.f. method and m.m.f. method.
3. Zero power factor test on three phase alternator: determination of regulation by Potier trangle method.
4. Determination of direct axis and quadrature axis reactance by slip test on synchronous machine. Determination of voltage regulation by two reactance theory.
5. Synchronizing alternators: lamp methods and use of synchroscope.
6. Synchronous alternator on infinite bus: behavior of machine under change in mechanical power and excitation.
7. Characteristic of synchronous motor at constant load and variable excitation.
8. Characteristic of synchronous motor at constant excitation and variable load.
9. Determination of performance of three phase induction motor by direct load test.
10. Determination of performance of three phase induction motor by no load, blocked rotor test and construction of circle diagram.
11. No load and blocked rotor tests on capacitor start single phase induction motor and determination of parameters of equivalent circuit.
12. Load test on single phase induction motor.
13. Speed control of three phase Slip Ring Induction Motor.

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student may be asked to perform any one practical. Evaluation will be based on paper work , performance and oral in the practical examination.

Course Title	Short Title	Course Code
Power System – II Lab	**PS – II Lab**	

Course Description:
Power System-II explores the knowledge of parameter, characteristic and performances of transmission line. The subject emphasis on different faults calculation and concept of load flow analysis.

Practical	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	**15**	**28**	**1**

Prerequisite Course(s): Knowledge of Power System-I at second year Engineering.

General Objectives: The approach has always been to develop the thinking process of students in reaching a sound understanding of broad range of topic in power system area of electrical engineering. The object is to promote the students' interest in learning more about the electric power industry. The object is not great depth, but presentation through enough to give theory at a level that can be understood by under graduate. With this beginning, the students will have the foundation to continue his education and able to do better in professional duties in the field of power system.

Course Outcomes:
After successful completion of this lab students will be able to:

1. Apply basic knowledge of science and engineering to understand practical behavior of power system.
2. Describe the role of Power System Engineer and necessity of power system analysis to provide good quality, uninterruptable service to the consumer.
3. Evaluate the performance of long and medium transmission line using ABCD parameter, and effect of Var compensation on voltage profile.
4. Evaluate reactance of synchronous machine on no load and loaded condition.
5. Analyze the power system in terms of symmetrical and unsymmetrical components to calculate the effect of symmetrical and unsymmetrical faults on power system.
6. Understand the concept of load flow analysis for continuous monitoring of power system by using modern computing tools.
7. Do higher studies in the field of power system analysis and discharge the professional duties as Power System Engineer for economical development through modern technology.

Power System-II Lab

(Lab Course Contents)

Semester-V **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**

Practical : 2 Hrs/Week **(ESE) End Semester Examination(PR): 25 Marks**

Teacher should facilitate learning following lab experiments:

1. Measurement of ABCD parameters of a medium transmission line.
2. Measurement of ABCD parameters of a long transmission line.
3. Plotting of receiving end circle diagram to evaluate performance of medium transmission line.
4. Study of the effect of VAR compensation on the profile of receiving end voltage using capacitor bank.
5. Static measurement of sub-transient reactance of a salient-pole alternator.
6. Measurement of sequence reactance of a synchronous machine.
7. Determination of steady state power limit of a transmission line.
8. Unsymmetrical fault analysis for LL,LG, LLG FAULT ON A.C / D.C network analyzer
9. Formulation and calculation of Y- bus matrix of a system using software.
10. Solution of a load flow problem using Gauss-Seidal method using asoftware.
11. Solution of a load flow problem using Newton-Raphson method using software.
12. Unsymmetrical fault analysis of a 3-bus system using a software.
13. Calculation of inductance and capacitance for symmetrical and unsymmetrical configuration of transmission line using software.

Note: Lab file should consist of minimum **Eight** experiments out of eight experiments any two experiments using professional software such as MALAB, Matpower,PSIPCE etc.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student may be asked to perform any one practical. Evaluation will be based on paper work , performance and oral in the practical examination.

Course Title	Short Title	Course Code
Power Electronics Lab	**PE Lab**	

Course Description:

The greater efficiency and tighter control features of power electronics are becoming attractive for applications in motion control by replacing the earlier electro-mechanical and electronic systems. Applications in power transmission include high-voltage dc (HVDC) converter stations, flexible ac transmission system (FACTS), and static-var compensators. In power distribution these include dc-to-ac conversion, dynamic filters, frequency conversion, and Custom Power System.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Practical	**2**	**15**	**28**	**1**

Prerequisite Course(s) : Knowledge first year subject Elements of Electrical & Electronics Engineering and second year subject Analog and Digital Electronic .

General Objectives:

Power Electronics is the art of converting electrical energy from one form to another in an efficient, clean, compact, and robust manner for convenient utilization. The objectives of Power electronic is to create an awareness about the general nature of Power electronic devices, key features of the principal Power Electronic Devices, operational analysis of single phase uncontrolled half wave and full wave rectifiers supplying resistive, inductive, capacitive and back emf type loads. The objectives intended to understand the different configurations of inverters , coppers and cycloconverters.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Understand the behavior of semiconductor devices operated as power switches.
2. Learn the basic concepts of operation of dc-dc converters in steady state in continuous and discontinuous modes and be able to analyze basic converter topologies by conducting practical.
3. Ability to analyze the performance of ac-to-dc circuits and dc-to-ac inverters.
4. Understand and design single-phase and three-phase thyristor converters.
5. Ability to design, set up, and test power electronic circuits in the laboratory
6. Learn the role of Power Electronics in utility-related applications which are becoming extremely important.

Power Electronics - Lab

(Lab Course Contents)

Semester-V **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**

Practical : 2 Hrs/Week **(ESE) End Semester Examination(OR): 25 Marks**

Teacher should facilitate learning following lab experiments:

1. Triggering Circuit of SCR
2. Characteristics of SCR,MOSFET,
3. Commutation circuit class C, class D
4. Single phase full wave controlled rectifiers R, R-L characteristics
5. Single phase semi-converter
6. Three phase full wave controlled rectifiers
7. Step up chopper
8. Step down chopper
9. Series and parallel inverter
10. Three phase inverter

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student may be asked questions on practical. Evaluation will be based on answers given by student in oral examination.

Course Title	Short Title	Course Code
Electrical and Electronic Workshop	**EEW Lab**	

Course Description:

This course provides the basic practical knowledge about the electrical electronics engineering. The course includes the study of different electrical symbols, electrical shocks and safety precautions, equipments used for the measurement and testing of electrical and electronics devices, different types of electronic circuits, The course may includes visit to the electrical industries or power plant for the enhancement of practical knowledge.

	Hours per Week	No. of Weeks	Total Hours	Semester
Practical	**2**	**15**	**28**	**1**

Prerequisite Course(s) : knowledge of H.S.C. and first year subject Elements of Electrical & Electronics Engineering .

General Objectives:

The objective of the course is to provide knowledge about practical practices used in electrical engineering. This course will help students to use various tools for measurement and testing of electrical apparatus. The subject provides scope for practical applications of electrical engineering. The course will also help students to use and implement efficient and techno commercial aspect of maintenance and installation.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Understand various electrical symbols and their use in electrical electronics drawing.
2. Familiar with the safety precautions and practices while working in industrial and domestic premises.
3. Understand various maintenance schemes such as preventive, breakdown maintenance.
4. Select correct size and type of cables and wires for different applications.
5. Use different types of measuring instrument and instrumentation and testing equipments.
6. Select correct rating of fuse and MCB for protection scheme and safety.
7. Discharge the professional duties in technical field of maintenance and installation.

Electrical and Electronics Workshop

(Lab Course contents)

Semester: V **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25Marks**

Practical: 2 Hrs/Week

Teacher should facilitate learning following lab experiments:

1. Details and Layout of DC Armature Windings.
2. Details and Layout of AC Armature Windings.
3. Study of substation equipment:
   a. Classification and use of Lightening arrester
   b. Different type of isolators.
   c. Substation earthing
4. Transformer
   a. Standard rating, vector group of power transformer.
   b. Standard rating of instrument transformer
   c. Class of accuracy for instrument transformer.
5. Study of Starters:
   a. Three phase induction motor starter.
   b. Study of three phase induction motor reverse forward starter.
6. Study of different contactor ,relay and timer with switching demonstration.
7. Study of automatic star delta and soft starter for three phase induction motor.
8. Study and Testing of:
   a. Diode
   b. BJT
   c. MOSFET
   d. IGBT
9. Study of Electronic ballast and fan regulator:
10. Fabrication of single phase capacitor filter rectifier circuit. Or fabrication of any small electronic circuit for domestic and commercial application.

Note: The term work should include a minimum **eight** experiments. Workshop practical practices should be based on above mentioned topics.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Reference Books:

1. A. K .Sawhney, Electric Machine Design Tenth Edition, Danpat Ray and Sons.
2. L Umanand, " Power Electrical Essential and Application", Willey Publication.
3. S L Uppal, "Electrical Wiring, Estimation and Costing"
4. Surjit Singh, "Electrical wiring, Estimation and Costing"
5. S K Bhattacharya, "Electrical wiring, Estimation and Costing"
6. B R Gupta, "Electrical Wiring, Estimation and Costing"

Course Title	Short Title	Course Code
Software Application-I	**SA-I**	

Course Description:
The objective of this course is to introduce the students to the fundamental concepts of MATLAB and enable them to apply these concepts for solving real world problems. This course includes the basic structure and statements required for simple mathematical problems in MATLAB. This course provides the basic concepts of plot and other useful tools required to solve the problems.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**1**	**15**	**14**	**2**
Practical	**2**	**15**	**28**	

Prerequisite Course(s): Knowledge of mathematics and subject computer programming at first year engineering.

General Objectives: The objective of the course is to provide students with the essential knowledge of C language and MATLAB programming. This course will help students to use various modern tools for solving the problems of electrical engineering. The subject provides scope for practical applications of electrical engineering. The course will help students to analyze the electrical systems using the software. The course provides the effective approach for the higher studies in the efficient system design.

Course Outcomes:
Upon successful completion of this course the students will be able to:

1. Know use of the appropriate statements available in the C and C++ language and MATLAB.
2. Implement small and medium programs of varying complexity using the most commonly used features of the language.
3. Employ good programming style, standards and practices during program development.
4. Solve the different numerical techniques and perform Matrix operations.
5. Understand and use of MATLAB for solving simple mathematical problems.
6. Plot simple, 2-D and 3-D plots using MATLAB.
7. Use modern engineering tools in MATLAB which are useful for analyzing and designing of electrical power system.

Software Application-I

(Course Contents)

Semester-V **Examination Scheme:**

Teaching Scheme:

Lectures : 1 Hrs/Week

Unit-I Introduction to Matlab **03 Hours**

1. Standard Matlab windows
2. Operations with variables : naming ,checking existence, clearing and operations
3. Arrays : columns and rows: creation and indexing , size & length , multiplication, division, power and operations

Unit-II Writing script **02 Hours**

1. Writing script files : logical variables and operators , flow control and loop operators
2. Writing functions : input/output arguments , function visibility, path and Matlab startup.
3. Simple graphics : 2D plots and figures and subplots

Unit-III Data and data flow in Matlab **02 Hours**

1. Data types: Matrix, string, cell and structure, creating, accessing elements and manipulating of data of different types.
2. File Input-Output: Matlab files , text files , binary files , mixed text-binary files

Unit-IV Function minimization and parameters search. **02 Hours**

Polynomial fit : 1D and 2D fits , Data windowing , Error bounds

Unit-V Handle graphics and user interface **03 Hours**

Pre-defined dialogs: handle graphics : graphics objects , properties of objects and modifying properties of graphics objects

Reference Books:

1. Rudra Pratap, "Getting Started With Matlab: A Quick Introduction For Scientists And Engineers" Oxford University Press.
2. Dr. Shailendra Jain, "Modeling & Simulation using MATLAB-Simulink", Wiley India.
3. Yashavant Kanetkar, "Let Us C", BPB Publications, 10/E, 2010.
4. Stephen G Kochan "Programming in C", Pearson Education, 3/E, 2004.
5. Using MATLAB, Version 6, The Math Works, Inc., 2000.
6. MATLAB function reference, The Math Works, Inc., 2000.
7. Using MATLAB Graphics, Version 6, The Math Works, Inc., 2000.
8. MATLAB Release Notes for Release 12, The Math Works, Inc., 2000.

Software Application-I
(Lab Course Contents)

Semester-V **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 50 Marks**

Practical : 2 Hrs/Week

Teacher should facilitate learning following lab experiments:

1. A. Simple Arithmetic Calculation: Perform simple arithmetic calculations: Addition, subtraction, multiplication, division and exponentiation.
   B. Assign values to variables.
   C. Suppress screen output.
   D. Control the appearance of floating point numbers on the screen.
2. A. Compute the Y-Coordinates of line with given slope m and the intercept c at the x coordinates.
   B. Create a vector t with 10 elements: 1, 2, 3,……., 10 and compute the following quantities: X= t sin(t), Y=(t-1)/(t+1), Z=$\sin(t^2)/ t^2$
   C. Create Matrices, Vectors for finding the size of matrices and perform the addition, subtraction, multiplication, transpose and inverse operation.
3. Create : Simple sine plot, line plot, an exponentially decaying sine plot, space curve, log scale plot, Overlay plot and Fancy plots.
4. Create Polynomial curve fit and compare different fits.
5. A. Create a line along with an explicit handle and then use set command to change the line style, its thickness, and values of some y-coordinates.
   B. Write some text at a specified position, create its handle, and then use the set command to change the font size, font, and string of the text.
6. Study of different types of errors.
7. Write program to find voltage and power in voltage divider circuit.
8. Write a program to calculate voltage across any resistance in a circuit.
9. Write a program to find transient response in RC circuit.
10. Write a program to find transient response in RL circuit.
11. Write a program to plot voltage and current in resistive circuit.
12. Write a program to plot voltage and current in inductive and capacitive circuit.

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and assignment submitted by the student in the form of journal.

Course Title | Short Title | Course Code

Industrial Training/EDP/Special Study | IT/EDP/SS

Course Description:

Industrial training and special study is very essential for understanding the latest advancement in electrical engineering. It makes bridge between theoretical knowledge and its implementation. The industrial training provides platform to understand general organization and its functions.

	Semester Credits
Two week Industrial Training/One week EDP/ Special Study	**2**

Course Objectives:

The objective of industrial training is to prepare students to work on multidisciplinary team. Student will be able to understand the use of modern tools and technique for testing and maintenance in electrical utilities.

Course outcomes:

Upon successful completion of industrial training/special study students will be able to:

1. Understand basic organizational structure of industry.
2. Work on multidisciplinary teams and understand the impact of engineering solutions in a global, economic, environmental, and societal context.
3. To analyze the different types of Case studies and Estimate the financial feasibility of project.
4. To develop Innovative ideas and implement the theoretical concepts in practical fields.
5. Use latest testing and measuring instrument and safety precaution at work place.
6. Communicate effectively and able to write detailed project report.

Industrial Training/EDP/Special Study

(Course Content)

Semester: V **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25Marks**

Industrial Training

- Student shall undergo industrial training for a minimum period of **two weeks** during summer vacations between fourth semester and fifth semester.
- The industry in which industrial training is taken should be a medium or large scale industry
- The paper bound report on training must be submitted by the student in the beginning of Fifth semester along with a certificate from the company where the student took training.
- Every student should write the report separately.
- Institute / Department/T&P Cell have to assist the students for finding Industries for the training.
- Students must take prior permission from Department before joining for Industrial Training.

OR

EDP (Entrepreneurship Development Program)

- Student has to participate in Entrepreneurship Development Program for a minimum period of **One week** during summer vacations between fourth semester and fifth semester.
- Every student must submit the paper bound report based on the program in the beginning of Fifth semester along with a certificate (Course / Program completion) from the program organizers.
- Every student should write the report separately.
- Institute / Department may arrange Entrepreneurship Development Program at their campus.
- Students must take prior permission from Department before attending any Entrepreneurship Development Program.

OR

Special Study

- Student has to submit name of three topics of his interest to the department.
- Special study in a group shall not be allowed.
- The three-member committee appointed by Head of Department shall allot one topic out of the three topics submitted by the student.
- Every student must submit the paper bound report based on special study at the end of Firth semester.
- Department should allot guide to all such students, for monitoring their progress

and guide them for literature survey / report writing etc.

- Evaluation of special study shall be done based on presentation made by student, followed by brief question answer session.

Evaluation of Industrial Training / EDP / Special Study

ICA: The Internal Continuous Assessment shall be based on the active participation of the students in the training / EDP / Special study and based on knowledge / skill acquired by the student. The three-member committee appointed by Head of Department shall assess the reports and award marks based on following:

(a) Report	10 marks.
(b) Presentation	10 marks.
(c) Viva-voce at the time of presentation	05 marks.
Total:	**25 marks.**

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Syllabus for

Third Year Electrical Engineering

Faculty of Engineering and Technology

COURSE OUTLINE

SEMESTER –VI

W.E.F 2014 – 2015

Course Title	Short Title	Course Code
Control System-I	**CS-I**	

Course Description:

The study of Control System Engineering is essential for the students of Electrical, Electronics, Mechanical, Aerospace & Chemical Engineering. It has applications ranges from Electrical Power System to process Control System. The course explores the knowledge of basic control systems, control system components, mathematical modeling, time response & frequency response analysis. The course also deals in concept of design & its preliminary consideration.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**3**	**15**	**42**	**3**

Prerequisite Course(s): Mathematics and electrical engineering subject

General Objectives:

Control system engineering is an exciting field in which to apply engineering talents. The object of course to derive mathematical modeling , transfer –functions, time response and frequency response. The objectives are to find transient response and steady state error in given system.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Apply basic mathematical for modeling of control system and responses of first and second order system.
2. Describe the role of control system as an enabling technology in various applications such as in power systems, automation, renewable energy, etc.
3. Understand the response of control system subjected to different input signals, design, set up, and test control system in the laboratory.
4. Analyze and design open and closed control system.
5. Design dc servo motor and stepper motor to meet the characteristics of control system application.
6. Become proficient with computer skills (e.g., PSPICE and MATLAB) for the simulated analysis and design of control system and able to use control system in utility-related applications .

Control System -I

(Course Contents)

Semester-VI **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

Unit –I **09 Hours, 16 Marks**

The Control System:

Open loop & closed control; servomechanism, Physical examples. Transfer functions, Block diagram algebra, Signal flow graph, Mason's gain formula Reduction of parameter variation and effects of disturbance by using negative feedback

Unit –II **09 Hours, 16 Marks**

Time Response analysis:

Standard test signals, time response of first and second order systems, time response specifications, steady state errors and error constants. Design specifications of second order systems: Derivative error, derivative output, integral error and PID compensations, design considerations for higher order systems, performance indices

Unit –III **08 Hours, 16 Marks**

Control System Components:

Constructional and working concept of ac servomotor, synchros and stepper motor. Stability and Algebraic Criteria concept of stability and necessary conditions, Routh-Hurwitz criteria and limitations. Root Locus Technique: The root locus concepts, construction of root loci

Unit –IV **08 Hours, 16 Marks**

Frequency response Analysis:

Frequency response, correlation between time and frequency responses, polar and inverse polar plots, Bode plots

Stability in Frequency Domain: Nyquist stability criterion, assessment of relative stability: gain margin and phase margin, constant M&N circles.

Unit –V **08 Hours, 16 Marks**

Introduction to Design:

The design problem and preliminary considerations lead, lag and lead-lag networks, design of closed loop systems using compensation techniques in time domain and frequency domain. Review of state variable technique: Review of state variable technique, conversion of state variable model to transfer function model and vice-versa, diagonalization, Controllability and observability and their testing.

Reference Books:

1. Nagrath & Gopal, “Control System Engineering”, 4th Edition, New age International.
2. K. Ogata, “Modern Control Engineering”, Prentice Hall of India.
3. B.C. Kuo & Farid Golnaraghi, “Automatic Control System” Wiley India Ltd, 2008.
4. Norman s Nise, “Control System Engineering” Wiley India Pvt Ltd
5. Dr. Rajeev Gupta, “NISE’s Control System Engineering” Wiley India Pvt Ltd
6. D.Roy Choudhary, “Modern Control Engineering”, Prentice Hall of India.
7. Ajit K Mandal, “Introduction to Control Engineering” New Age International,2006.
8. R.T. Stefani, B.Shahian, C.J.Savant and G.H. Hostetter, “ Design of Feedback Control Systems”.
9. Narendra Singh Beniwal and Beniwal,”Automatic control system with Matlab Programming “University Science Press.
10. Eugene Xavier S.P. and Joseph Cyril Babu,J.,”Principles of control systems “S.Chand
11. S.Sivangaraju,L.Devi ,”Control Systems Engineering “New Age International Publishers.
12. http://nptel.iitm.ac.in

Course Title	Short Title	Course Code
Electrical Measurement-II	**EM-II**	

Course Description:

This course provides a brief introduction to transducers and its response. This course also explores the knowledge of measurement of pressure, temperature and displacement by transducers. Construction, principle of working, characteristics, error and adjustment of different types measuring instruments.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**3**	**15**	**42**	**3**

Prerequisite Course(s) : Knowledge of second year subject Electrical Measurement-I.

General Objectives:

To expose the students to a broad knowledge of experimental methods and measurement techniques. To train the students in the skill of operation of instruments in the electrical & electronic engineering applications. To understand the basic working of instruments. To understand the errors in measurements and their rectification. To gain proficiency in the use of common measuring instruments. To compare theoretical predictions with experimental results and to resolve any apparent differences.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Understand the basic concepts in measurement and measuring instruments.
2. Understand the need and process of standardization, calibration of instruments, their significance in process and manufacturing industries for international acceptance.
3. Select instruments on basis of accuracy, sensitivity and response time in generation, transmission, manufacturing, power system, testing and energy auditing purposes.
4. Perform technical and professional duties in any type of industries.
5. Do higher studies and use of modern instruments for automation, process control for sustainable developments.

Electrical Measurement-II

(Course Contents)

Semester-VI **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures: 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

End Semester Exam duration: 03 Hours

Unit-I: **09 Hours, 16 Marks**

Introduction to instrumentation:

Definition, purpose, measurement – definitions, types and Classification of instruments, generalized measurement system, standards, and calibrations

Instrument Response :Instrument Response to step, ramp, sinusoidal i/p up to second order system. Errors – types – gross, systematic, random, limiting, sources of errors, techniques to minimize them.

Unit-II: **09 Hours, 16 Marks**

Introduction to transducers:

Definition, classification, selection of transducer**.** Measurement of temperature**:** using R T D, thermocouple, bimetallic, thermocouple. Pressure thermometers, pyrometers**.** Pressure Measurement: Bourdon Tubes, bellows, diaphragms. Vacuum Measurement**:** McLeod gauge, pirani gauge.

Unit-III: **08 Hours, 16 Marks**

Flow measurement-:

Rota meter, electromagnetic flow meter, hot wire anemometer, ultrasonic flow meter.

Displacement measurement : LVDT, strain gauge, -types, working principles, measurement circuitry Level measurement :mechanical, pneumatic methods , electrical methods- capacitance level gauge, hot wire / carbon resistance method nucleonic level gauge, ultrasonic method.

Unit-IV: **08 Hours, 16 Marks**

A .C. Bridges:

Classification, Maxwell, Anderson, hay, Schering, Campbell, and Wein Bridge , Special measuring instruments- construction and principles of 1 Ø & 3 Ø p.f.meters ,frequency meters ,synchronoscope, trivector meter , max. Demand Indicators, C.R.O.

Unit-V: **08 Hours, 16 Marks**

Recorders:

Necessity, construction, working, types- strip chart, circular chart, self balance potentiometric, X-Y recorder, ultraviolet recorder. Electronic technique : for measurement of voltage, current, power, energy, phase angle and rms values.

Reference Books:

1. E. W. Golding. , "Electrical Measurements and Measuring instruments", Reem Publication.
2. C. T. Baldwin. , "Fundamentals of Electrical Measurements", Kalyani Publication
3. Cooper and Derfllick, "Electronic Instrumentation and Measurements Techniques", 3rd edition, Prentice-Hall of India.
4. A. K. Sawney. "Electrical & Electronic Measurement and Instrumentation" Danpant Rai & Co.
5. J.B. Gupta, "Electrical & Electronic Measurement and Instrumentation", S K Kataria & Son.
6. R K Rajput, "Electrical & Electronic Measurement and Instrumentation", S Chand.
7. http://nptel.iitm.ac.in

Course Title	Short Title	Course Code
Electrical Machine Design	**EMD**	

Course Description:
The course consists of general factor of machine design, material classification, temperature rise and rating of machines. It explores the design concept of transformer core, winding overall dimension performance and cooling design of transformer. The course also provides sound understanding and basic concepts of rotating machine design.

	Hours per Week	No. of Weeks	Total Hours	Semester Credit
Lecture	**3**	**15**	**42**	**3**

Prerequisite Course(s) : Knowledge of Electrical Machines-I and Electrical Machines-II
General Objectives: The approach has always been to develop the thinking process of students in reaching a sound understanding of broad range of topic in electrical machine design. The object is to promote the students' interest in learning more about latest trend in electrical machine design. The object is not great depth, but presentation through enough to give theory at a level that can be understood by undergraduate. With this beginning, the students will have the foundation to continue his education and able to do better in professional duties in the field of design and manufacturing industries.

Course Outcomes:
Upon successful completion of this course the students will be able to:

1. Apply knowledge of mathematics, science, and engineering for design of electrical machines.
2. Understand the electrical engineering material characteristic for designing an energy efficient electrical machine.
3. Understand the temperature rise in electrical machines and impact on rating and duty of machines.
4. Ability to design an electrical machines and components to meet desired needs within realistic constraints such as economic, environmental, social, safety, manufacturability, and sustainability.
5. Function on multidisciplinary teams with professional and ethical responsibility.
6. Discharge duties in the field of design and manufacturing industries and able to do higher studies in optimal design and use latest software and engineering tools.

Electrical Machine Design
(Course Contents)

Semester-VI **Examination Scheme:**
Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**
Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**
(ESE) End Semester Exam duration: 03 Hours

Unit-I **09 Hours, 16 Marks**

Introduction- principles of design and design factors, rating, specifications, standards, brief study of magnetic, electric, insulating and other material. Theory of solid body heating, heating and cooling time curve, rating of machines, and type of duty.
Design of Starters-Shunt Motors, Series Motor, Slip ring induction motor.

Unit – II: **09 Hours, 16 Marks**

Design of Transformer- Design of distribution and power Transformer,-types, classifications, specifications, core construction, transformer winding, design of transformer, output equation of single phase and three phase transformer ,overall dimension, design of core, winding, estimation of leakage reactance for H.V. and L.V. winding, resistance of winding, calculation of losses, determination of voltage regulation.

Unit III: **08 Hours, 16 Marks**

Design Performances of Transformer-

No Load Current of –single phase, Three phase, Magnetizing Volt-ampere, change of parameters with change of frequency, Temperature rise of transformers , transformer oil as a cooling medium, temperature rise in plain walled tanks, design of tank with tubes ,air blast cooling, forced oil circulation , thermal rating , heating time constant of transformers.

Unit –IV: **08 Hours, 16 Marks**

Induction motors:

Relation between rating and dimensions of rotating Machines-symbols, Main dimensions , total loading, specific loading , output equation , factor affecting size of rotating machines , choice of specific magnetic loading , choice of specific electric loading , variation of output & losses with Linear dimensions , separation of D and L- d.c. Machines, Induction Motors , Synchronous Machines, standard Frames.
Design of three phase Induction Motors-design output equation, choice of average flux density in air gap, choice of ampere conductors per metre, efficiency & power factor, main dimensions.

Unit –V: **08 Hours, 16 Marks**

D.C.Machine Windings- types of D.C. Windings, choice and design of simplex and duplex lap and wave Windings, equalizer connections, dummy coils, concept of multiplex Windings, reason for choosing them.

A.C. Machine Windings- single and double layer, single phase ac Windings with integral and fraction slots, three phase Windings.

Reference Books:

1. A. K .Sawhney, Electric Machine Design Tenth Edition, Danpat ray and sons.
2. A. E .Clayton, Performance and Design Of DC Machine, Third Edition, ELBS, ISAAC Pitman Sons.
3. A. E. Clayton Performance and Design Of AC Machine, Third Edition, ELBS, ISAAC Pitman Sons.
4. N. Vinogradov, Electric Machine Winder, MIR Publication.
5. Say and Taylor, D.C. Electric Machine, ELBS, Pitman Sons.
6. Feinberg,Macmillan,Modern Power Transformer Design Practices.First Edition, Feinberg, Macmillan,
7. Transformers BHEL.
8. http://nptel.iitm.ac.in

Course Title	Short Title	Course Code
Microprocessor and Microcontroller	**MPMC**	

Course Description:
The course explores knowledge of microprocessor and microcontroller. The course comprises of architecture, assemble language programming and interfacing of peripherals and their applications.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**3**	**15**	**42**	**3**

Prerequisite Course(s) : Analog and digital electronic and software application at second year engineering.

General Objectives:
To meet the challenges of growing technology , student will be conversant with the programmable aspect of microprocessor and microcontroller. Programming is a process of problem solving and communication in language of mnemonics. The object of course is to understand microprocessor and microcontroller demand, concept and develop skill in two discipline hardware and programming.

Course Outcomes:
Upon successful completion of this course the students will be able to:
1. Apply basic electronic subject and software algorithm application for understanding architectures assemble language of microcontroller and microprocessor.
2. Know the pin configuration and memory organization of a typical microprocessor and microcontroller.
3. Develop assemble language programming and interfacing peripherals for wide application in electrical engineering.
4. Develop assembly language source code for applications that use I/O ports, timer and single/multiple interrupts
5. Apply techniques for measurement of electrical quantities by microprocessor.
6. Apply the knowledge of microprocessor and microcontroller in application of microprocessor and microcontroller based electrical protection system.
7. Do higher study in the field of automation, operation and control of power system by microprocessor and microcontroller.

Microprocessor and Microcontroller

(Course Contents)

Semester-VI **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

Unit – I: **09 Hours, 16 Marks**

8085 Microprocessor: Organization, architecture, Generation of control signal, Addressing modes, Instruction format classification of instructions, Instruction set, interrupt.- interrupt structure . Serial data transfer program using RIM and SIM

Unit-II **09 Hours, 16 Marks**

Programming Memory Interfacing: Introduction to assembly language programming , stack , subroutine, types of subroutine , I/O Mapped I/O and memory mapped I/O, Memory module chip capacity, address space,. Memory specification, Types of memory-ROM, RAM: static & dynamic, PROM, EPROM, EEPR0OM, memory organization & interfacing of RAM and ROM.

Unit-III **08Hours, 16 Marks**

Interfacing Peripherals and Applications: Study of common peripheral devices, their architecture ,control words and control register & different modes of operation 8155: static RAM, I/O ports, timers, 8255 PPI, 8279 keyboard display interface.

Unit-IV **08 Hours, 16 Marks**

Data Conversion and Applications :D to A – types, Ladder, R-2R , A to D converters, SAR type, dual slope. ADC 0808 architecture, interfacing with 8085 microprocessor.

Microprocessor Applications: Frequency measurement, phase angle and power factor measurement , current voltage measurement, KVA , KW and Maximum demand measurement**.**

Unit-V **08 Hours, 16 Marks**

Microcontroller:

8051microcontroller:architecure:, registers, SFRs pins, memory organization, I/O port structure, interrupts, timer and counter circuit, serial port.

8051Instruction set classification, addressing mode, simple assembly language programs. Programming related to Timer/Counter

Reference:

1. R.S. Gaonkar ."Microproccer Architecture, Programming, & Applications with 8085", Third edition, Penram International Publication (India) Pvt. Ltd.
2. Leventhal, "8085 Assembly Languages Programming" Tata McGraw Hill.
3. B. Ram ,"Fundamentals of Microprocessors & Microcontrollers" Dhanpat Rai Publication.
4. Muhammad Ali Mazidi, Janice Gillispie Mazidi andRolin D. McKinlay, "The 8051 Microcontroller and Embedded SystemsUsing Assembly and C", Second Edition.
5. Kenneth J.Ayala "The 8051 Micro Controller :Architecture, Programming,", Penram International, Mumbai.
6. http://nptel.iitm.ac.in

Course Title	Short Title	Course Code
Entrepreneurship Development	**ED**	

Course Description: Last few decades have seen the advent of various new disciplines in the area of management. One such discipline, Entrepreneurship has emerged quite recently. The syllabus explore the concept of entrepreneurship, financial requirements of a new enterprise, Expansion strategies of an enterprise, challenges for small enterprises and Institutional Support for small enterprises

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**3**	**15**	**42**	**3**

Prerequisite Course(s) : knowledge of subject Industrial Organization And Management.

General Objectives:

The economic objectives of country, such as industrial development, regional growth, employment generation and development of small scale industries entirely depend on the growth of entrepreneurship. As concept, Entrepreneurship poses a challenge for entrepreneurs to select and implement business strategies to tread the glorious path of success and growth. Successful entrepreneurship requires passion of an entrepreneur and thus, it is more than the money and luck. In the contemporary world, the study of this discipline become of umpteen importance to understand the complexities of business environment at national and international levels.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Understand the various new disciplines in the area of management.
2. Understand concept of entrepreneurship and learn the procedure of setting up an enterprise.
3. Understand the concepts of human resource management, marketing management, financial management, production and operation management in a new enterprise.
4. Function on multidisciplinary teams and understand the impact of engineering solutions in a global, economic, environmental, and societal context.
5. Estimate the financial feasibility of business and identify the various sources of financing.
6. Understand the role of small scale enterprises in economic development of a country and understand the linkage between small and large scale enterprises.
7. Develop skills to become an entrepreneurs in view of economic objectives of country, such as industrial development, regional growth, employment generation and development of small scale industries through technological developments.

Entrepreneurship Development

(Course Contents)

Semester-VI **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures: 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

Unit I **09 Hours, 16 Marks**

Introduction to Entrepreneurship

Introduction, Concept of entrepreneurship: Significance of entrepreneurship, Theories of entrepreneurship, Models of entrepreneurship development

Definition of entrepreneur: Traits and characteristics of successful entrepreneur , Functions of an entrepreneur , Types of entrepreneurs, Factors influencing entrepreneur, Professional vs. family entrepreneurs, Entrepreneurial leaders vs. managers,

Entrepreneurial process: Entrepreneurial motivation, Entrepreneurial barriers, Women as entrepreneur , Role of woman entrepreneurs in society, Barriers to women entrepreneurs , Myths of entrepreneurship, Problems faced by entrepreneurs and capacity building for entrepreneurship, Profiles of successful entrepreneurs.

Unit –II **09 Hours, 16 Marks**

Financial requirements of a new Enterprise: Estimating financial requirements, Estimation of fix capital requirements, Estimation of working capital requirements

Identifying the sources of finance –sources of long-term financing: Sources of medium-term financing , Sources of short-term financing

Institutions providing financial assistance: Venture capital funding- venture capital funding in the Indian scenario, Venture capital funding process, Importance of financial management, Working capital management, Accounting and book keeping, Financial statement, Financial ration analysis

Unit –III **08 Hours, 16 Marks**

Expansion strategies of an Enterprise

Expanding and enterprise: Expansion through concentration, Expansion through integration, Expansion through diversification , Expansion through cooperation, Expansion through internationalization, Expansion through digitalization , Organization life cycle, Strategic management, The essence of business ethics

Unit –IV **08 Hours, 16 Marks**

Challenges for small Enterprises

Problem faced by small enterprises: Managerial problems, Marketing management, Human resource, Production management, Technological problems

Role of central and state governments in promoting small enterprises: Fiscal and tax concessions for small enterprises, Industrial policies for small enterprises, Importance of marketing, Customer relationship management (CRM), Marketing services

Unit- V **08 Hours, 16 Marks**

Institutional Support for small enterprises and decision support system

Institutions supporting small scale enterprises: Small scale industries (SSI) board, Khadi and village industries commission (KVIC), Micro, small and medium enterprises development organization (MSME-DO), National small industries corporation limited (NSIC), National institute for entrepreneurship and small business development (NIESBUD)' Indian institute of entrepreneurship (IIE), State industrial development / Investment Corporation (SIDCs/SIICs), State directorate of Industries (SDIs), District industry centers (DICs) ,Industry associations , Non-Governmental organization

Institutions providing financial association: Small industries development bank of India (SIDBI), State financial corporation (SFCs)

Technological up gradation and moderation of small enterprises: ISO 9000/14001 certification fee reimbursement scheme,

Reference Books:

1. Alpana Trehan, "Entrepreneurship" Published –Dreamtech Press.
2. Jack M. Kaplan, "Patterns of Entrepreneurship" Published -WILEY.
3. Poornima M. Charantimath, "Entrepreneurship Development –Small Business Enterprises" Publisher –Pearson.
4. Thomas W. Zimmerer & Norman M. Scarborough, "Essential Of Entrepreneurship and Small Business Management" 4th Edition , Publisher –Pearson.

Course Title	Short Title	Course Code
Control System-I Lab	**CS-I**	

Course Description:

The study of Control System Engineering is essential for the students of Electrical, Electronics, Mechanical, Aerospace & Chemical Engineering. It has applications ranges from Electrical Power System to process Control System. The course explores the knowledge of basic control systems, control system components, mathematical modeling, time response & frequency response analysis. The course also deals in concept of design & its preliminary consideration.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Practical	**2**	**15**	**28**	**1**

Prerequisite Course(s): Mathematics and subjects of electrical engineering

General Objectives: Control system engineering is an exciting field in which to apply engineering talents. The object of practical to derive mathematical modeling, transfer – functions, time response and frequency response. The objectives are to find transient response and steady state error in given system.

Course Outcomes:

Upon successful completion of this practical course the students will be able to:

1. Apply basic of mathematical modeling of control system and responses of first and second order system.
2. Describe the role of Control system as an enabling technology in various applications such as in power systems, energy conservation, renewable energy, transportation etc.
3. Understand the response of control system subjected to different input signals, design, set up, and test control system in the laboratory.
4. Analyze and design open and closed control system.
5. Design dc servo motor and stepper motor to meet the characteristics of control system application.
6. Become proficient with computer skills (e.g., PSPICE and MATLAB) for the simulated analysis and design of control system and able to use control system in utility-related applications.

Control System-I Lab

(Lab contents)

Semester-V I **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**

Practical : 2 Hrs/Week **(ESE) End Semester Examination(OR): 25 Marks**

Teacher should facilitate learning following lab experiments:

1. To determine speed-torque characteristics of an ac servomotor.
2. To study potentiometer as an error detector.
3. To study DC position control system
4. To determine time response of second order control system
5. To determine speed-torque characteristics of dc servomotor.
6. To study PID Controller.
7. To study synchro-transmitter and receiver and obtain output V/S input characteristics.
8. To Study Stepper Motor.
9. To determine time domain response of a second order system for step input and obtain performance parameters by using software .
10. To convert transfer function of a system into state space form and vice-versa, by using software .
11. To plot root locus diagram of an open loop transfer function and determine range of gain 'k' for stability by using software.
12. To plot a Bode diagram of an open loop transfer function by using software.
13. To draw a Nyquist plot of an open loop transfer functions and examine the stability of the closed loop system by using software

Note: The minimum eight experiments are to be performed from the following list of experiments. Any Six experiments compulsorily to be performed from no 1 to 8 and any two from 09 to 15.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student may be asked questions on practical. Evaluation will be based answers given by student in oral examination.

Course Title	Short Title	Course Code
Electrical Measurement– II Lab	**EM- II Lab**	

Course Description:

In this laboratory, course emphasis on imparting the practical knowledge and understanding of basic principles, characteristic, performance of different measuring instruments and measurement of different electrical quantities. It also gives the platform to understand need and importance of calibration and standardization.

Practical	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	**15**	**28**	**1**

Prerequisite Course(s): Knowledge of Electrical Measurement-I

General Objectives:

The objective of the laboratory is to impart the fundamental knowledge of measuring instruments. Students develop their ability to select the specific instrument in reference of ranges and resolution of instruments for proper and correct analysis. The students will able to understand the characteristic of measuring instruments. In this lab course, students will be familiar with the use of different equipments, safety precautions on work place. This makes bridge on theoretical knowledge and practical practices.

Course Outcomes:

Upon successful completion of this lab students will be able to:

1. Conduct practical and able to analyze the practical data for various purposes.
2. Measure various electrical quantities and circuit parameters
3. Able to select the measuring instrument with proper range and type for practical uses.
4. Calibrate various types of instruments as per IS .
5. Do professional duties in technical field and able to use advance measuring instruments.

Electrical Measurement-II LAB

(Lab Course Contents)

Semester: VI **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25Marks**

Practical: 2 Hrs/Week **(ESE) End Semester Examination Practical (PR) : 25Marks**

Teacher should facilitate learning following lab experiments:

1. Strain Measurement using strain gauge .
2. Study of CRO of it's different types and Applications.
3. Measurement of temperature by RTD/Thermocouple.
4. Study of pressure transducers.
5. Study of recorders.
6. Study of LVDT.
7. Measurement of inductance by Andersons Bridge.
8. Measurement of capacitance and loss angle of capacitor by Schering bridge.
9. Step response of meters.
10. Measurement of systematic errors of wattmeter.

Note: The term work should include a minimum **eight** experiments from the above list

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student may be asked to perform any one practical. Evaluation will be based on paper work , performance and oral in the practical examination.

Course Title | Short Title | Course Code

Microprocessor and Microcontroller Lab | **MPMC- Lab**

Course Description:

The practical course explores knowledge of microprocessor and microcontroller. The course comprises of architecture, assemble language programming and interfacing of peripherals and their applications.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Practical	**2**	**15**	**28**	**1**

Prerequisite Course(s) : Analog and digital electronic and software application at second year engineering.

General Objective:

To meet the challenges of growing technology, student will be conversant with the programmable aspect of microprocessor and microcontroller. Programming is a process of problem solving and communication in language of mnemonics. The object of practical course is to understand microprocessor and microcontroller demand, concept and develop skill in two discipline hardware and programming.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Know the pin configuration and memory organization of a typical microprocessor and microcontroller.
2. Develop assemble language programming and interfacing peripherals for wide application in electrical engineering.
3. Develop assembly language source code for applications that use I/O ports, timer and single/multiple interrupts
4. Apply techniques for measurement of electrical quantities by microprocessor.
5. Apply the knowledge of microprocessor and microcontroller in application of microprocessor and microcontroller based electrical protection system.
6. Do higher study in the field of automation, operation and control of power system by microprocessor and microcontroller.

Microprocessor and Microcontroller LAB

(Lab Course Contents)

Semester: VI **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25Marks**

Practical: 2 Hrs/Week **(ESE) End Semester Examination Practical (PR) : 25Marks**

Teacher should facilitate learning following lab experiments:

1. Study of architecture and instructions of 8085 along with opcodes.
2. Study of architecture and instructions of 8051..
3. 8255 interfacing
4. Memory interfacing
5. Microprocessor 8085 assembly language programs based on data transfer instruction
6. Microprocessor 8085 assembly language programs based on arithmetic instruction
7. Microprocessor 8085 assembly language programs based on logical instruction
8. Applications of microprocessor 8085 in measurement of electrical quantity.
9. Applications of microprocessor 8085 in Electrical drives and speed control for stepper motor.
10. Microcontroller 8051 assembly language programs based on data transfer instruction.
11. Microcontroller 8051 assembly language programs based on arithmetic and logical instructions.
12. Generation of delay using Timers of 8051 in mode 0, 1 and 2.

Note: The term work should include a minimum **eight** experiments on hardware kits and simulation.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student may be asked to perform any one practical . Evaluation will be based on paper work, performance and oral in the practical examination.

Course Title	Short Title	Course Code
Software Application-II	**SA-II**	

Course Description:
The objective of this course is to introduce the students to the fundamental concepts of MATLAB and enable them to apply these concepts for solving real world problems. This course includes the basic structure and statements required for simple mathematical problems in MATLAB. This course provides the basic concepts of plot and other useful tools required to solve electrical the problems.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Practical	**2**	**15**	**28**	**1**

Prerequisite Course(s): Knowledge of mathematics and subject computer programming at first year engineering.

General Objectives: The objective of the course is to provide students with the essential knowledge of C language and MATLAB programming. This course will help students to use various modern tools for solving the problems of electrical engineering. The subject provides scope for practical applications of electrical engineering. The course will help students to analyze the electrical systems using the software. The course provides the effective approach for the higher studies in the efficient system design.

Course Outcomes:
Upon successful completion of this course the students will be able to:

1. Know use of the appropriate statements available in the C and C++ language and MATLAB.
2. Implement small and medium programs of varying complexity using the most commonly used features of the language.
3. Employ good programming style, standards and practices during program development.
4. Solve the different numerical techniques and perform Matrix operations.
5. Understand and use of MATLAB for solving simple mathematical problems.
6. Plot simple, 2-D and 3-D plots using MATLAB.
7. Use modern engineering tools in MATLAB which are useful for analyzing and designing of electrical power system.

Software Application-II

(Lab Course Contents)

Semester-VI **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**

Practical : 2 Hrs/Week

Teacher should facilitate learning following lab experiments:

1. Build a simple circuit with Power System blocks and connect it to other Simulink blocks
2. Use the Powergui block and analyze static and frequency-domain response.
3. Create an electrical subsystem, simulate transients, and discretize simple circuits.
4. Single phase fully controlled converter using R and RL load using MATLAB / SIMULINK
5. Single phase AC voltage regulator using MATLAB / SIMULINK
6. Formation of Y bus matrix by inspection / analytical method using MATLAB Software
7. Formation of Z bus using building algorithm using MATLAB Software
8. Gauss Seidal load flow analysis using MATLAB Software
9. Newton Raphson method of load flow analysis using MATLAB Software
10. Fast decoupled load flow analysis using MATLAB Software
11. Fault analysis using MATLAB Software

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and assignment submitted by the student in the form of journal.

Reference Books:

1. Rudra Pratap, "Getting Started With Matlab: A Quick Introduction For Scientists And Engineers" Oxford University Press.
2. Dr. Shailendra Jain, "Modeling & Simulation using MATLAB-Simulink", Wiley India.
3. Yashavant Kanetkar, "Let Us C", BPB Publications, 10/E, 2010.
4. Stephen G Kochan "Programming in C", Pearson Education, 3/E, 2004.
5. Using MATLAB, Version 6, The Math Works, Inc., 2000.
6. MATLAB function reference, The Math Works, Inc., 2000.
7. Using MATLAB Graphics, Version 6, The Math Works, Inc., 2000.
8. MATLAB Release Notes for Release 12, The Math Works, Inc., 2000.

Course Title	Short Title	Course Code
Minor Project	**MP**	

Course Description:
The course explores the knowledge of design, experiment and analysis of data. The course develops ability to work on multidisciplinary teams, Identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**15**	**28**	**2**

Prerequisite Course(s): Knowledge of science, mathematics, computer programming and core subject of engineering.
General Objectives: The objectives of project are to develop ability to work in group. The scope of work is design and conduct experiments, as well as to analyze and interpret data within realistic constrain such as economic, environmental, social, safety and manufacturability. The project work provides plate form for planning, material procurement, preparing specification and execution of work. The project also develop to work on multidisciplinary teams, communicate effectively and Knowledge of contemporary issues.
Course Outcomes:
Upon successful completion of this course the students will be able to:

1. Apply knowledge of mathematics, science, and engineering for innovative ideas.
2. Design and conduct experiments, as well as to analyze and interpret data.
3. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. Function on multidisciplinary teams, communicate effectively and Knowledge of contemporary issues.
5. Identify, formulate, and solve engineering problems by understanding professional and ethical responsibility.
6. Understand the impact of engineering solutions in a global, economic, environmental, and societal context.
7. Recognition of the need for, and an ability to engage in life-long learning.
8. Use the techniques, skills, modern engineering tools and software necessary for engineering practice.

Minor Project

(Lab Course Contents)

Semester-VI **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 50 Marks**

Practical : 2 Hrs/Week

- Every student shall undertake the Minor Project in semester VI. It is expected that the broad area of major project shall be finalized by the student in the beginning of the VI semester and Minor project undertaken may be a part of Major Project.
- Each student shall work on an approved project, a group of **05 students (maximum)** shall be allotted for the each minor project and same group may be continued for major project.
- Minor project may involve fabrication, design or investigation of a technical problem that may take design, experimental or analytical character or combine element of these areas. The project work shall involve sufficient work so that students get acquainted with different aspects of fabrication, design or analysis.
- Each student is required to maintain separate log book for documenting various activities of minor project.
- The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of minor project. Maximum four minor project groups shall be assigned to one teaching staff.

Guide lines for ICA : Assessment of the project for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-A.**

Assessment of Minor Project

Name of the Project: _____

Name of the Guide: _____

Table-A

SN	Exam Seat No	Name of Student	Project Selection	Documentation	Design /Simulation/Logic	PCB/hardware/programming	Result Verification	Presentation	Total
			5	10	10	10	10	5	50

Course Title | Short Title | Course Code

Seminar-I

Course Description: The course explores the knowledge of design, experiment and analysis of data. The course develops ability to work on multidisciplinary teams, Identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Practical	**2**	**14**	**28**	**2**

Prerequisite Course(s): Knowledge of science, mathematics, computer programming and core subject of engineering.

General Objectives: The objectives of project are to develop ability to work in group. The scope of work is design and conduct experiments, as well as to analyze and interpret data within realistic constrain such as economic, environmental, social, safety and manufacturability. The project work provides plate form for planning, material procurement, preparing specification and execution of work. The project also develop to work on multidisciplinary teams, communicate effectively and Knowledge of contemporary issues.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Apply knowledge of mathematics, science, and engineering.
2. Design and conduct experiments, as well as to analyze and interpret data.
3. Function on multidisciplinary teams, communicate effectively and Knowledge of contemporary issues.
4. Identify, formulate, and solve engineering problems by understanding professional and ethical responsibility.
5. Understand the impact of engineering solutions in a global, economic, environmental, and societal context.
6. Use the techniques, skills, modern engineering tools and software necessary for engineering practice.
7. Practice the use of various resources to locate and extract information using offline & online tools, journals.
8. Practice the preparation and presentation of scientific papers and seminars in an exhaustive manner.

Seminar-I

(Course Contents)

Semester-VI **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**

Practical : 2 Hrs/Week

1. For Seminar-I every student will individually study a topic assigned to him / her and submit a report and shall deliver a short lecture / Seminar on the topic during the term.
2. The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Seminar-I. Seminar shall be related state of the art topic of his choice approved by the committee.
3. Seminar topic should not be repeated and registration of the same shall be done on first come first serve basis.
4. Topic of Seminar shall be registered within a two week from commencement of VI Semester and shall be approved by the committee.
5. Maximum six seminar supervision shall be allotted to each teacher.
6. At the end of semester, student should submit the seminar report (paper bound copy)in following format:
    a. Size of report shall be of minimum 25 pages.
    b. Student should preferably refer minimum five reference books / magazines/standard research papers.
    c. Format of report
        i. Introduction.
        ii. Literature survey.
        iii. Theory 1) Implementation 2) Methodology
            3) Application 4) Advantages, Disadvantages.
        iv. Future scope.
        v. Conclusion.

ASSESSMENT OF SEMINAR-I

Guide lines for ICA : Assessment of the Seminar-I for award of ICA marks shall be done by the guide and a departmental committee jointly, as per the guidelines given in **Table-B**

Title of Seminar: _____

Name of Guide: _____

Table-B

SN	Exam Seat No	Name of Student	Topic Selection	Literature survey	Report writing	Depth of understanding	Presentation	Total
			5	5	5	5	5	25

NORTH MAHARASHTRA UNIVERSITY, JALGAON
STRUCTURE OF TEACHING AND EVALUATION
B.E. (ELECTRICAL ENGINEERING)

FIRST TERM

W.E.F. 2008-09

Sr. No.	Subject	Teaching Scheme Hours/week			Examination Scheme				
		Lectures	Tutorial	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Power System operation and Control	4	--	--	3	100	25	--	--
2	Industrial Electrical Engineering	4	--	2	3	100	25	25	--
3	Energy Audit and Conservation	4	--	--	3	100	25	--	--
4	High Voltage Engineering	4	--	2	3	100	25	--	25
5	Elective-I	4	--	--	3	100	25	--	--
6	Seminar	--	--	2	--	--	25	--	--
7	Project – I	--	--	4	--	--	25	--	25
	Total	**20**	**--**	**10**	**--**	**500**	**175**	**25**	**50**
	Grand Total	**30**			**750**				

SECOND TERM

Sr. No.	Subject	Teaching Scheme Hours/week			Examination Scheme				
		Lectures	Tutorial	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Switchgear and Protection	4	--	2	3	100	25	--	25
2	Power System Stability	4	--	2	3	100	25	--	25
3	Industrial Drive and Control	4	--	2	3	100	25	--	25
4	Elective-II	4	2	--	3	100	25	--	--
5	Project – II	--	--	4	--	--	100	--	50
6	Industrial Visit / Case Study	--	--	--	--	--	25	--	--
7	Entrepreneurship Development Skills	--	--	2	--	--	--	--	--
	Total	**16**	**02**	**12**	**--**	**400**	**225**	**--**	**125**
	Grand Total	**30**			**750**				

Elective-I
1. Control System-II
2. Computer Methods on Power System
3. Electromechanical Energy Conservation
4. Optimization Techniques
5. Power System Dynamics

Elective-II
1. Flexible AC Transmission
2. Power System Design Practice
3. Electric Traction Engineering
4. Generation Planning and Load Dispatch
5. Extra High Voltage Transmission

NORTH MAHARASHTRA UNIVERSITY, JALGAON
B.E. (ELECTRICAL) W.E.F : 2008- 09
Term I

1) Power System Operation & Control

Teaching Scheme
Lectures : 4 hrs/week

Examination Scheme
Paper : 100 marks
Duration: 3 Hrs.
Term work:25 Marks

UNIT I: ECONOMIC LOAD DISPATCH & OPTIMAL OPERATION OF POWER SYSTEM

Input Output characteristics, Heat-rate characteristics, Incremental fuel rate and cost, Incremental production cost, , optimum scheduling of generation between different units. (Neglecting transmission losses), Transmission loss as a function of plant generation (A simple system connection two generating plants to load) and incremental transmission loss for optimum economy, Calculation of loss coefficients (Two plants system), Optimum scheduling of generation between different plants considering transmission loss concept and significance of penalty factor, Automatic load dispatch, function and applications

(10 Hrs., 20 Marks)

UNIT II: GENERATOR VOLTAGE CONTROL

Automatic voltage control, generator controllers, Cross coupling between P–f and Q–V control channel, automatic voltage regulator, types of exciters and excitation systems, exciter modeling, transfer function modeling for control static performance and dynamic response of AVR loops.

(10 Hrs., 20 Marks)

UNIT III: LOAD FREQUECNY CONTROL

Automatic load frequency control, speed governing system and hydraulic valve actuator for individual generator, Turbine modeling, generator and load modeling transfer function representation of power control mechanism of generator.

(10 Hrs., 20 Marks)

UNIT IV: ELECTRIC POWER CONTROL

Concept of control area, division of power system into control areas, Load frequency of single areas, two area and multi area (control) power system with and without integral controls. Advantage of pool operation, tie line bias control area exchange.

(10 Hrs., 20 Marks)

UNIT V: VOLTAGE STABILITY AND COMPENSATION

Power system security, Operating stage (State transition diagram), Voltage stability, Comparison of angle and voltage stability, Reactive power flow and voltage collapse, voltage stability analysis and prevention of voltage collapse.

Compensation in power system: Load compensation, load ability of compensated and uncompensated over head transmission line, compensation of transmission line (Shunt& Series). Introduction of FACTS

(10 Hrs., 20 Marks)

Reference:

1) Electrical Energy system theory & Introduction Olle L. Elgerd, TMH.
2) Modern Power system analysis : I. J. Nagrath & D. P. Kothari, TMH.
3) Elements of Power system analysis : Willium D. Stevenson Jr., TMH.
4) Electric Power control : Dr. C.S. Indulkar.
5) Economic Control of power system : L.K. Kirchmayer
6) Electrical Power System Analysis : C L Wadhwa, New Age International Publication

NORTH MAHARASHTRA UNIVERSITY, JALGAON

B.E. (ELECTRICAL) W.E.F : 2008- 09

TERM I

2) Industrial Electrical Engineering

Teaching Scheme
Lectures: 4Hrs/week
Practical: 2Hrs/week

Examination scheme
Paper :100 Marks
Duration : 3 Hrs.
Term work : 25 Marks
Practical : 25 Marks

UNIT I :- ELECTRIC DRIVES

Industrial group and collective drives, types of motors, their running characteristics , characteristics of load, starting , speed control and reversing of d.c. and 3 phase induction motors, electric braking, plugging, rheostatic braking, regenerative braking. Types of Enclosures.

(10 Hrs., 20 Marks)

UNIT II: - TYPES OF DUTIES

Continuous, intermittent and short time rating , temperature rise and rating calculations for these duties mechanical features , features of load diagram construction, load equalization & use of flywheel.

(10 Hrs., 20 Marks)

UNIT III:- TRACTION SYSTEMS

Requirements of ideal traction system, Systems of track electrification and their comparison, speed time curve, energy consumption calculation, calculation of tractive effort.

(10 Hrs., 20 Marks)

UNIT IV: - TRACTION MOTORS:

General features and types, characteristic and control of locomotive motor coaches, series parallel control .Electric breaking including regenerative breaking, overhead equipment control gear for overhead equipment.

(10 Hrs., 20 Marks)

UNIT V: - NATURE OF LIGHT

Units, luminous efficiency, glare production of light Types & applications of electric lamps polar curves, control of light by reflection , refraction and diffusion, Design of factory lighting, flood lighting, street lighting .

Methods of electric heating & its advantages, transfer of heat, resistance oven, induction heating electric welding.

(10 Hrs., 20 Marks)

Reference Books:

1) J.B.Gupta -- A course in Electrical power
2) S.K. Bhattacharya - Electrical Machines (2nd edition) - Tata Mc Graw Hill
3) V.V.L.Rao - Utilization of electrical energy -TMH
4) O.E.Taylor - Utilization of electrical energy -TMH
5) S.K.Pillai - A course in electrical energy TMH
6) H. Partab - Art & Science of Utilization of electrical energy.

List of experiments:-

1) To perform load test on single phase induction motor &plot its performance characteristics.
2) To perform load test on DC series motor& plot its performance characteristics.
3) Speed control of DC series motor.
4) Rheostatic breaking of three phase induction motor.
5) To perform load test on three phase induction motor & plot its performance characteristics.
6) Rheostatic breaking of DC shunt motor.
7) Speed control of three-phase slip ring induction motor by rotor resistance method.
8) To perform the load test on DC shunt motors and plots its performance characteristics.
9) Study of illumination system.
10) Study of induction heating &Welding.
11) Study of different types of enclosures.

The term work should include a minimum **eight** experiments from above list.

3) Energy Audit and Conservation

Teaching Scheme
Lectures: 4 Hrs/Week

Examination Scheme
Paper : 100 Marks
Duration : 3 Hrs.
Term Work : 25 Marks .

UNIT I: - ENERGY AUDIT

Energy audit, pre-requisite of energy conservation, principles of energy audit, preliminary energy audit and detailed energy audit, procedures of carrying out energy audit. Energy production relationship, specific energy consumption, least square methods consume technique, data energy flow diagram, sankey diagram. Instruments used for energy audit. Policy of government to promote renewable energy.

(10 Hrs., 20 Marks)

UNIT II: - ECONOMICS OF ENERGY CONSERVATION:

Simple payback period analysis, advantages &limitations of payback period, time value of money, net present value method, internal rate of return method, and profitability index for benefit cost ratio. Study and selection of proper tariff for particular application, fixed &variable components in tariff, impact of tariff on energy management.

(10 Hrs., 20 Marks)

UNIT III: - ENERGY MANAGEMENT:

concept of energy management –energy inputs in industrial ,residential, commercial, agricultural and public sector-comparison of different energy inputs on the basis of availability , storage feasibility, cost (per unit output)etc. electrical energy management-energy accounting and management of power factor, voltage profile, current energy requirement ,power demand monitoring target setting etc.

Concept of supply side management and demand side management (DSM), load management, voltage profile management from receiving end .methods of implementing DSM. Advantages of DSM to consumers, utility and society.

(10 Hrs., 20 Marks)

UNIT IV: - ENERGY CONSERVATION

Objectives of energy conservation, planning for energy conservation

i) Motive power: potential for saving electrical energy in motors - oversizing or under loading, speed, improving, efficiency of an existing motor, energy efficient motors, use of soft starters, variable or adjustable speed drives for energy conservation selection of cost effective drive.
ii) Lighting: level of illumination for different areas. Use of right source of lamp for different applications, energy efficient lamps, fixtures and types of illumination controllers.
iii) Heating processes: most efficient space, furnace water heating and welding processes.
iv) Cooling systems: energy saving in air coolers air conditioners, ventilating systems and refrigeration.

(10 Hrs., 20 Marks)

UNIT V: - SCOPE OF CONSERVATION

Energy conservation in industrial, agricultural, commercial, domestic and municipal sectors.

i) Energy conservation in generation, Co-generation, Tri-generation, transmission and distribution, effective measures to reduce the T and D losses.
ii) Energy Efficient motors:- Features of energy efficient motors, high efficiency motor design, European agreement on low voltage electric motor efficiency, NEMA, high efficiency motors,
iii) Determination of cost effectiveness, implementation of motor management program.

(10 Hrs., 20 Marks)

Reference books

1. S. C. Tripathy-Electrical Energy Utilization and conservation – THM Publication.
2. S.Rao-Energy Technology-Khanna Pub.
3. Dr. S.P. Sukhtme-Solar energy.
4. Preceding of the Seminar on " Energy Audit & Demand Side Management" held at Govt. College of Engineering, Pune-5 organized by M.S.E.B.(SEA) ON 16.09.1998
5. Hand Book on energy efficient motors , International Cooper proposition council , B.E. Kushare.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

B.E. (ELECTRICAL) W.E.F: 2008- 09

TERM I

4) High Voltage Enggineering

Teaching Scheme
Lectures: 4Hrs/week
Practical: 2Hrs/week

Examination scheme
Paper : 100 Marks
Duration : 3 Hrs.
Term work : 25 Marks
Oral : 25 Marks

UNIT I: - BREAKDOWN IN GASES, LIQUIDS & SOLIDS

Classification of insulating material, gases as insulating media, Ionization and decay process, breakdown in gases, Townsend's law. The streamer mechanism of spark, Paschen's law, corona discharge, electronegative gases. Breakdown in pure and commercial liquids, solid dielectric and composite dielectric, high voltage bushing guarding, shielding and field plotting.

(10 Hrs., 20 Marks)

UNIT II: - LIGHTING AND SWITCHING OVER VOLTAGE PROTECTION

Lighting strokes to lines and towers mechanism & characteristics. Protection of transmission lines from lighting, lighting arrestors, insulation co-ordination of HV and EHV power system and substation.

(10 Hrs., 20 Marks)

UNIT III: - GENERATION OF HIGH VOLTAGE & CURRENTS

Generations of high dc, ac and impulse voltages, standard impulse wave shapes, generation of weitching surges and high impulse generator

HVDC Power transmission

Kinds of dc links, limitations and advantages of ac & dc transmission. Principle application of dc, ground return advantages & application.

(10 Hrs., 20 Marks)

UNIT IV: - MEASUREMENT OF HIGH VOLTAGE AND CURRENTS

Methods of measurement of peak voltage, impulse voltage and high direct current, non destructive measurement and testing, high voltage dielectric loss and capacitance measurements, ratio frequency & partial discharge measurements.

(10 Hrs., 20 Marks)

UNIT V :-TTESTING AND EHV LINE INSULATION

Basic technology , testing of insulators bushing , cables , transformer, surge diverters & threshold current , capacitance of long objects, Electromagnetic interference, E.H.V line insulation design based upon transient over voltages.

(10 Hrs., 20 Marks)

Reference Books:-

1) M.S. Naidu & V.Kamaraju - High voltage Engg - Tata McGraw Hill
2) E.Kuffel and W.S Zaenglo -High voltage Engg - PERgamon Press
3) EHV, Rakash Das - Begamudre
4) C.L. Wadhawa - H.V Engg Wley Eastern
5) K.R. Padiyar; HDVC power transmission systems technology & system interaction -New Age International
6) H.V. Engg - R.S.Jha

List of Experiments:-

1) Measurement of insulation resistance of 600/250 V.P.T by megger.
2) Power frequency withstand test on 11KV, 10/5 amp CT
3) Study of corona discharge
4) Determination of insulating break-down strength of solid, liquid and gaseous dielectric media.
5) Power frequency high voltage withstand test on cable
6) Study of impulse generator.
7) Dry & Wet power frequency withstand test in insulator
8) Flash over test on insulator.
9) Double voltage double frequency withstand test on insulator.
10) Study of calibration of sphere gap.
11) Study of 100KV high voltage testing set.

The term work should include a minimum **eight** experiments, from the above list.

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B.E. (ELECTRICAL) W.E.F : 2008- 09

TERM I

5) Elective-I

I) CONTROL SYSTEM – II

Teaching Scheme	**Examination scheme**
Lectures: 4Hrs/week	**Paper : 100 Marks**
	Duration : 3 Hrs.
	Term work : 25 Marks

UNIT I: - **STATE SPACE TECHNIQUES**

State, state space and state variables. States variable models of SISO/MIMO linear systems, from differential equations, transfer function and block diagrams, state diagram (Signal flow graphs)

Decomposition of transfer functions in phase variable forms, canonical forms, Jordan canonical form, transfer function from the state model, transfer matrix.

Solutions of state equations, state transition matrix (STM) various methods to obtain STM, Resolvent matrix time response of SISO system.

Controllability and observability of linear systems. Gilibert's method and kalman's test to test the controllability and observability of SISO/MIMO system.

System design using pole placement technique for close loop system via state variable feedback for SISO controllable system.

(10 Hrs., 20 Marks)

UNIT II: - **SAMPLE DATA CONTROL SYSTEM**

Representation of sample data (Discrete system) review of Z transforms, sample and hold zero order hold. Sampling theorem Z-transform analysis of sampling data control system. (Open loop and closed loop), Z transfer function of systems. Solutions of different equation by Z transfer methods. Response of discrete system.

Pulse transfer functions of open loop and closed loop system with different sample locations.

Digital controller and its transfer functions. Stability analysis, relation between S and Z domain, stability by Jury's test and bi-linear transformation and root locus method.

(10 Hrs., 20 Marks)

UNIT III: - **NON LINEAR SYSTEM ANALYSIS I**

Behavior of non linear system, various general non linear ties and their characteristics.

Stability analysis by describing function method. Existence and stability of limit cycles.

Limitation of describing function method.

(10 Hrs., 20 Marks)

UNIT IV: - NON LINEAR ANALYSIS II

Liberalization in a small region operating point. Singular point and their nature. Phase plane method of analysis of nonlinear system, construction of phase trajectories by isoclines method. Limit cycle behavior stability analysis, limitation of phase plane method.

(10 Hrs., 20 Marks)

UNIT V: - STABILITY ANALYSIS BY LIAPUNOV METHOD

Concept of stability, asymptotic stability in the large, instability, the sense of a Lipunov, Positive of a scale function, quadratic forms. Second method of Lipnov, stability theorems, Lipunov fuctions stability of linear time invariant systems, Lipunov equations.

Krasowakii's method for time examining the stability of non-linear time invariant system.

(10 Hrs., 20 Marks)

Reference Books :

1) Nagrath & Gopal : Control system engineering - Wiley Eastern
2) OgataK : Modern controll theory - Prentice Hall Of India
3) Naresh Sinha - control system - Wiley Eastern
4) Kuo B.C: Automatic control system - Prentice Hall Of India.

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B.E. (ELECTRICAL) W.E.F: 2008- 09

TERM I

5) Elective-I

II) COMPUTER METHODS ON POWER SYSTEM

Teaching Scheme
Lectures: 4Hrs/week

Examination scheme
Paper : 100 Marks
Duration : 3 Hrs.
Term work : 25 Marks

UNIT – I NETWORK TOPOLOGY

Topology of Electric power system-Network Graphs, Incidence matrices, fundamental loop and cutset matrix, primitive impedance and admittance matrix, singular transformation of network matrix.

(10 Hrs., 20 Marks)

UNIT – II INCIDENCE MATRIX

Formation of bus impedance and admittance matrices by algorithm – Modification of bus impedance and admittance matrix to account for change in networks. Derivation of loop impedance matrix.
Algorithm for formulation of 3- phase bus impedance matrix.

(10 Hrs., 20 Marks)

UNIT – III SHORT CIRCUIT STUDIES

Three phase network, Symmetrical components. Thevenin's theorem and short circuit analysis of multimode power system using bus impedance matrix. Short circuit calculations for balanced and unbalanced short circuit bus impedance and loop impedance matrices.

(10 Hrs., 20 Marks)

UNIT – IV LOAD FLOW STUDIES

: Slack bus, loop buses, voltage control buses, Load flow equations, power flow model using bus admittance matrix, Power flow solution through Gauss-Seidal and N-R methods sensitivity analysis, Second order N-R method, fast decoupled load flow method, Sparsity of matrix.

(10 Hrs., 20 Marks)

UNIT – V FAULT ANALYSIS

Simultaneous faults, Simultaneous Faults by two port network Theory (Z, Y and H-type Faults), Simultaneous faults by matrix Transformations, Analytical simplifications of series and shunt fault.

(10 Hrs., 20 Marks)

References:-

1. J. J. Gringer/W.D. Stevenson, power System Analysis, McGraw Hill. 1994
2. G.W.Stagg and A.H.EI-biad,Computer Methods in Power System Analysis, Mc Graw Hill, 1968.
3. I.J.Nagrath and D.P.Kothari, Modern Power System Analysis, Tata McGraw Hill,1980.
4. G.L.Kusic, Computer Aided Power System Analysis, Prentice Hall, 1986.
5. Hadi Sadaf, Power System Analysis, Tata McGraw Hill.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

B.E. (ELECTRICAL) W.E.F: 2008- 09

TERM I

5) Elective-I

III) Electromechanical Energy Conservation

Teaching Scheme	**Examination scheme**
Lectures: 4Hrs/week	**Paper : 100 Marks**
	Duration : 3 Hrs.
	Term work : 25 Marks

UNIT I: - MAGNETICALLY COUPLED CIRCUITS AND TRANSFORMER:

Self and mutual flux linkages and inductances. Voltage
Equation of coupled circuits. Coefficients of coupling and leakage coefficient.
Two winding transformers:
Steady state and transient analysis using mutual and self inductances. Variable frequency transformers.
Energy flow considerations.

(10 Hrs., 20 Marks)

UNIT II: - ELECTROCHEMICAL ENERGY CONVERSION PRINCIPLES:

Electrochemical System, Energy process in electromagnetic systems.
Law of conversation of energy as applied to electromechanical system. Linear and non-linear, singly and doubly excited magnetic systems;
Energy and co-energy, various expressions for forces and torques; Energy, forces and torque in a system of rigid currents. Application to various magnetic field transducers.

(10 Hrs., 20 Marks)

UINT III: -ELECTRIC FIELD AND TRANSDUCERS

Quasi-static electric fields as coupling medium, Energy forces and torques in a system of charged conductors, Application of electric field transducers. Incremental motion transducers (detailed analysis of few cases).

(10 Hrs., 20 Marks)

UNIT IV: - BASIC ROTATING MACHINES:

Common structural features of rotating machines. Machine windings and their basic properties.
Distributed bindings as current sheets.
Equivalence between concentrated and distributed windings M.M.F. and flux distributation and various windings. Rotating magnetic field.

(10 Hrs., 20 Marks)

UNIT V: - TYPES OF ROTATING MACHINES:

Commutator, Synchronous and asynchronous machines
Induced e.m.f.s and electromagnetic torque in non salient pole machines**.**

(10 Hrs., 20 Marks)

Reference Books:

1. Rakosh Das, Begamudre- Electromachinical Energy Conversion- Wiley Eastern Publication.
2. Gourishankar- Electromechnical Energy Conversion.
3. Fitzgerald, Kingsley & Kusko- Eletric Machinary- McGraw Hill Kogo Kusha Ltd.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

B.E. (ELECTRICAL) W.E.F: 2008- 09

TERM I

5) Elective-I

IV) OPTIMIZATION TECHNIQUES

Teaching Scheme
Lectures: 4Hrs/week

Examination scheme
Paper : 100 Marks
Duration : 3 Hrs.
Term work : 25 Marks

UNIT I:- LINEAR PROGRAMMING

Linear Programming, Simplex Method, Revised Simplex Method, Duality, Sensitivity Analysis.

(10 Hrs., 20 Marks)

UNIT II:-NON LINEAR PROGRAMMING

Non Linear Programming, One-Dimensional Minimization, Elimination Methods. Fibonacci Method, Golden Method, Interpolation method, Qadratic and Cubic Interpolation methods.

(10 Hrs., 20 Marks)

UNIT III:-UNCONSTRAINED OPTIMIZATION METHODS

Unconstrained Optimization Methods, Univariate and Pattern Search Methods, Rosenbrock's Method of Coordinates,

(10 Hrs., 20 Marks)

UNIT IV:-OPTIMIZATION METHODS

Simplex method. Descent Methods, Steepest descent Method, Conjugate Gradient Method Reevs Method, Davidon, Fletcher-Powell Method.

(10 Hrs., 20 Marks)

UNIT V:-CONSTRAINED OPTIMIZATION

Constrained Optimization, Complex method, Cutting Plane Method, Method of Feasible Directions. Integer Programming, Dynamic programming.

(10 Hrs., 20 Marks)

References,

1. S.S.Rao, Optimization Theory and Applications, Willey Eastern Limited.
2. H.A.Taha, Optimization Research.
3. R.L.Fox, Optimization methods for engineering design.
4. Hummel Blau, Non-linear Programming.

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B.E. (ELECTRICAL) W.E.F: 2008- 09

TERM I

5) Elective-I

V) POWER SYSTEM DYNAMICS

Teaching Scheme
Lectures: 4Hrs/week

Examination scheme
Paper : 100 Marks
Duration : 3 Hrs.
Term work : 25 Marks

UNIT I: - INTRODUCTION

Reliable electrical power services, Stability of Synchronous machine, Tie-line oscillation, Method of simulation.

Synchronous machine:

Review of synchronous machine equations, parameters, Equation in a-b-c phase co-ordinates and Park's co-ordinates, Representation of external system Phasor diagram p.u. reactances.

(10 Hrs., 20 Marks)

UNIT II: - SYSTEM RESPONSE TO LARGE DISTURBANCES

System of one machine against infinite bus, Classical model, Mechanical and electrical torques, Critical clearing angle and time, Automatic reclosing, Precalculated swing curves and their use.

(10 Hrs., 20 Marks)

UNIT III: - SYSTEM RESPONSE TO SMALL DISTURBANCES

Two machine system with negligible losses, Clarke diagram for two machine series reactance system, Extension of Clarke diagram to cover any reactance network, Equation for steady state stability limit, Two Machine system with losses, Effect of inertia, Effect of governor action, Conservative Criterion for stability, Effect of saliency, saturation and short circuit ratio on steady state power limits.

(10 Hrs., 20 Marks)

UNIT IV: - REGULATED SYNCHRONOUS MACHINES

Demagnetizing effect of armature reaction and effect of small speed changes, Modes of oscillations of unregulated multimachine system, Voltage regulator and governor coach with delay Distribution of power impacts.

(10 Hrs., 20 Marks)

UNIT V: - EFFECT OF EXCITATION ON STABILITY

Effect of excitation on generator power limits, transient and dynamic stability, Examination of dynamic stability by Routh's criterion, Root locus analysis of a regulated machine connected to an infinite bus. Approximate System representation, Supplementary Stabilizing Signals, Linear analysis of stabilized generator.

(10 Hrs., 20 Marks)

REFERENCES:-

1. Synchronous Machines by C.Concordia, John Wiley& Sons.
2. Power System Stability by E.w..Kimbark,Vol.-3,John Wiley & Sons, New York.
3. Power System Control & Stability by P.A. Anderson, Galgotia Publ.
4. Power System Stability by S.B.Crary, John Wiley&Sons.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
B.E. (ELECTRICAL) W.E.F: 2008- 09
TERM I
SEMINAR

Teaching scheme **Examination scheme**
Practical: 2 hrs/ week **Term Work :25** .

1. For seminar every student will individually study a topic in depth assigned to him / her and submit a report and shall deliver Seminar on the topic at the end of term.
2. Selection of topic should be done by students in consultation with concerned guide
    a. Topic should be related to branch but it should be extended part of the branch (latest and advance topic), preferably outside the syllabus.
    b. The topic should be such that the student can gain latest knowledge. Student should preferably refer at least one research paper
3. Seminar topic should not be repeated in the department and registration of the same should be done on first come first served basis
4. Seminar report should be submitted in paper bound copy prepared with computer typing
    a. Size of report depends on advancement of topic.
    b. Student should preferably refer minimum 5 reference books / magazines / proceedings / journals.
    c. Format of content
        i. Introduction.
        ii. Literature survey.
        iii. Theory 1) Implementation 2) Methodology
        3) Application 4) Advantages, Disadvantages.
        iv. Future scope.
        v. Conclusion.

5 FORMAT FOR ASSESSMENT OF SEMINAR for TERM WORK
Title of seminar: _____
Name of guide : _____

Sr. No.	Exam Seat No.	Name of Student	Assessment by examiners					Grand Total
			Topic Selection 5	Literature Survey 5	Report Writing 5	Depth of understanding 5	Presentation 5	25

6 . Assessment of Literature survey will be based on
    a. Collection of material regarding history of the topic.
    b. Implementation.
    c. Recent applications.

7. Assessment of Depth of understanding will be based on
    a. Questioning by examiners.
    b. Questioning by students.
    c. What the student understands i.e. conclusion regarding seminar.

8. Assessment of presentation will be based on;
    a. Presentation time (15 minutes)
    b. Presentation covered (full or partial)
    c. Way of presentation
    d. Questioning and answering (5 minutes)

9. Examiners should be a panel of two one of them must be guide. Examiner must have experience at least 3 years.
   Examiners will be appointed by HOD in consultation with Principal.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

B.E. (ELECTRICAL) W.E.F: 2008- 09

TERM I

PROJECT-I

Teaching Scheme	**Examination Scheme**
PRACTICAL:	**Term Work: 25(Term I)**
4Hrs. /Week (For Term-I)	**Oral : 25 Marks (Term I)**

1. Every student individually or in a group (of appropriate group size) shall take a project in the beginning of the B.E. First Term in consultation with the guide or sponsored by the industry and the project must be completed in the B.E. Second Term.
2. The project proposal must be submitted in the institute in the beginning of the B.E. first Term. While submitting project proposal care is to be taken that project will be completed within the available time of two terms. The final title of the project work should be submitted at the beginning of the B.E. Second Term.
3. Project title should be precise and clear.
4. Selection and approval of topic:
   Topic should be related to real life application in the field of electrical engineering.
   .OR Manufacturing / Fabrication of a prototype unit include selection, concept, design, material manufacturing of the component, testing and performance evaluation.
   OR Computer aided design and analysis of system/electrical equipments.
   OR Problems related to material handling system.
   OR Energy audit of organization / use of renewable energy source.
   OR Low cost automation, electric / microprocessor control of electrical machines, control system, power systems etc.
   OR Software development for solution of problems in control / power systems.
   Interdisciplinary projects should be encouraged. The examination will be conducted independently in respective departments.
5. The group should maintain a logbook of activities. It should have entries related to the work done, problems faced, solutions evolved etc., duly signed by guide.
6. The group is expected to complete detailed system design, layout etc. in B.E. first Term as a part of term work in the form of a joint report. Project report must be submitted in the prescribed format only.
7. The guides should regularly monitor the progress of the project work.
8. Assessment of the project for award of TW marks shall be done by the guide and a departmental committee (consisting of minimum two teachers with experience more than three years) as per the guidelines given in the following table.

A) ASSESSMENT OF PROJECT- I TERMWORK at B.E. FIRST TERM

NAME OF THE PROJECT _____

NAME OF THE GUIDE: _____

Sr No	Exam Seat No	Name Of Student Marks	Assessment by guide (70%)					Assessment by Departmental committee (30%)			Grand Total	Out of 25 Marks
			Liter-ature survey	Topic Se le-tion	Docu m-Entati on	Atte-nden-ce	To-tal	Eval-uation (10%)	Pres-ntaion (20 %)	Total		
			10	05	15	05	35	05	10	15	50	25

Sign of Guide Sign. of Committee Members Sign. of H. O. D.

9. The guide should be internal examiner for oral examination .

10. The external examiner should be from the related area of the concerned project. He should have minimum of five years of experience at degree level / industry.

11. The evaluation at final oral examination should be done jointly by the internal and external examiners.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
B.E. (ELECTRICAL) W.E.F: 2008- 09
TERM - II

1) SWITCH GEAR & PROTECTION

Teaching Scheme
Lectures: 4Hrs /Week
Practical: 2Hrs/Week

Examination Scheme
Paper : 100 Marks
Duration : 3 Hrs.
Term work : 25 Marks
Oral : 25 Marks

UNIT – I:- ARC PHENOMEN AND INTERRUPTION

Arc phenomenon, maintenance of arc, properties of arc, interruption theories, transient recovery Voltage, transient analysis, RRRV, Interruption of capacitive current, CB rating, current chopping, construction & Operation of air blast & bulk oil CB.

(10 Hrs., 20 Marks)

UNIT – II:-CIRCUIT BREAKERS AND FUSES

Construction & Operation minimum oil C.B, SF6 & vacuum Ckt. C.B., Earth leakage & moulded case C.B, Testing installation & maintenance Of CBs Rewirable Fuses , HRC fuses Characteristics & application.

(10 Hrs., 20 Marks)

UNIT – III:-PRINCIPLES OF RELAYING

Basic Principle of relaying essential features & characteristics , relaying schemes, terminology ,CT's & PTs, electromagnetic relays constructional features, principle of operation , characteristics and application of attraction type and induction type over current, directional distance and differential relays**.**

(10 Hrs., 20 Marks)

UNIT –IV: PROTECTION SCHEMES

Protection of transmission lines, Relaying practice using over current, earth fault, directional distance and differential relays, parallel feeders and ring mains,

Protection of electrical equipments and machines like transformer, motors, generators and buses. Static relaying basic concepts, equipments and protection schemes.

(10 Hrs., 20 Marks)

UNIT –V:-MICROPROCESSOR AND MICROCONTROLLER BASED PROTECTION

Evolution of microprocessor, advantages of digital, use of microprocessor & microcontroller in protection, configuration of microprocessor based control for overcurrent, overvoltage, undervoltage, overfrequency, under frequency, DSP & it's use in power system.

(10 Hrs., 20 Marks)

Reference Books :-

1) T.S. Madharao - Power system protection (static rElay), Tata MacGraw Hill
2) C.R.Mason - The art and science of protective relaying.
3) B.Ram &Vishwakarma D.N - Power system protection & switch gear -TMH
4) Sunil S.Rao - Switchgear & Protection - Khurana Pun
5) Geosonoviz - High voltage circuit beakers
6) B.Ravindranath & M. Chandar, Power system protection & switch gear, New age International.
7) A.R.Warrington-Protective relay.
8) A.G. Phadke & Thorpe- Power system protection their theory & practice Chapman & Hall.

List of experiments:

1) Study of relaying components and control circuit developments.
2) To plot operating characteristics of Inverse time over current relay
3) To study the through fault stability of differential relay.
4) Study of MHO distance relay to plot.
    a) R- X diagram
    b) Relay voltage Vs Admittance characteristic
5) Study of combined over current & earth fault protection scheme of alternator.
6) Protection 3 phase transformer using differential relay (Merz- Price protection scheme)
7) To plot the characteristic of rewirable fuses and MCB
8) Study oil Arc extinction phenomenon.
9)Demonstration of microprocessor base protection of 3 phase IM using MM-30 L & T k make
10)Study of different types fuses.

The term should include a minimum of eight experiments from the above list.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
B.E. (ELECTRICAL) W.E.F: 2008- 09
TERM - II

2) Power System Stability

Teaching Scheme	Examination scheme
Lectures: 4Hrs/week	Paper : 100 Marks
Practical: 2Hrs/week	Duration : 3 Hrs.
	Term work : 25 Marks
	Oral : 25 Marks

UNIT I: - BASIC CONCEPT

Meaning of stability, steady state transient & dynamic stability limits, Park's transformation equations, Analysis of transient and subtransient state operation of salient and non salient pole machines, phasor diagrams, voltage behind the transient and subtransient impedances, time constants. Determination of parameters and time constants.

(10 Hrs., 20 Marks)

UNIT II: - STEADY STATE STABILITY

SSSL of short transmission lines, Analytical and graphical methods of solutions, loosy lines effect of inertia conservative criterion, synchronizing co efficient multi machine system.

(10 Hrs., 20 Marks)

UNIT III: - FACTORS AFFECTING STEADY STATE STABILITY

Effect of saturation, saturated reactance, equivalent reactance, graphical method to find equivalent effect of short circuit ration effect of governor action, effect of automatic voltage regulator.

(10 Hrs., 20 Marks)

UNIT IV: - TRANSIENT STATE STABILITY

Review of basic concept, TTS and equal area criterion, swing equation, point by point solution, critical cleaning angle and critical angle and critical clearing time.

(10 Hrs., 20 Marks)

UNIT V: - FACTORS AFFECTING TRANSIENT STATE STABILITY

Effects of types of fault, effect of grounding, effect of high speed reclosing Precalculated swing curves and their use, effects of fault clearing time, effects of excitation and governing action, Methods of improving stability, multi-machine problem .

(10 Hrs., 20 Marks)

Reference Books:

1) E .W. Kimbark - Power system stability, Vol- 1 & 3 - John Wiley
2) S. B.Cray - Power system stability vol- 1 & 2 - John Wiley
3) Nagrath & Kothari - Modern power system analysi -TMH

List of Experiment:

1) Parameters and time constants of synchronous machines
2) Synchronous machine of infinite bus
3) Effect of saturation and & determination of equivalent reactance's of synchronous machines.
4) Retardation test on synchronous machines to find moment of inertia of rotating part and angular momentum.
5) To obtain power angle characteristics of lossy & lossless lines.
6) To study steady state stability by point by point method.
7) To determine the steady state stability limit of short transmission line.
8) To determine SSSL of long transmission line.
9) Study of clerk's diagram.
10) Study of different types of automatic voltage regulator.

The term work should include a minimum **eight** experiments, from the above list.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
B.E. (ELECTRICAL) W.E.F: 2008- 09
TERM - II
3) INDUSTRIAL DRIVES AND CONTROL

Teaching Scheme	**Examination scheme**
Lectures: 4Hrs/week	**Paper : 100 Marks**
Practical: 2Hrs/week	**Duration : 3 Hrs.**
	Term work : 25 Marks
	Oral : 25 Marks

Unit – I: - ELECTRICAL DRIVES

Concept, classification, advantages, parts of drives, choice of electric drives, fundamental torque equation, types of practical mechanical loads, dynamics of electrical drive- stability of an electrical drive, constant torque drive, constant power drive, selection of a D.C and A.C drive, modes of operation.

(10 Hrs., 20 Marks)

Unit - II: - SPEED-TORQUE CHARACTERISTICS AND CONTROL OF ELECTRICAL DRIVES

Characteristics and equivalent circuits; Dc motor; separately excited, series, shunt, compound.
Induction motors, Synchronous motors.
Basic principles of Speed control; closed loop control, current & speed sensing, Phase locked loop, closed loop position control.

(10 Hrs., 20 Marks)

Unit – III: - SOLID STATE CONTROLLERS:

Dc motor: Using thyristors, Phase control, chopper fed, Dual converters.
Single phase Induction motor: Using triac, Inverter circuit, Using cycloconverters, Speed control of universal motor.
Three phase induction motor: Basic schemes using chopper.
Synchronous motor: Self commutation circuits for three phase Synchronous motor.

(10 Hrs., 20 Marks)

Unit – IV: - AC DRIVES AND SYNCHRONOUS MOTOR CONTROL

Stator voltage control using Ac voltage controller, Inverter fed induction motor (VSI / CSI fed), chopper control in rotor circuit. Slip Energy recovery scheme,
CLC for Induction motor.
open loop control, Self Control Strategy, variable frequency operation, margin angle control.

(10 Hrs., 20 Marks)

Unit – V:- DC DRIVES

Single phase DC Drives for separately & self excited Dc motor (continuous & Discontinuous armature current operation), CLC & TRC Controller, chopper fed Dc Drives. Three phase drives for Dc motors, Full converter & semi- converter operation of Series connected converter.

Micro-processor based control for Drives: Micro-processor based chopper fed Dc motor, Micro-computer based control of Dc drives, using dual converter, Micro-processor based speed control of three phase Induction motor, Synchronous motor control.

(10 Hrs., 20 Marks)

Reference Books :

1) Thyristerised control of Electric Drives – V. Subramanyam, Tata McGraw Hill, New Dehli.
2) Thyristor Power Control- Dubey, Joshi, Sinha, Willey Eastern Publication.
3) Power Electronics Circuit Devices & Applications –M. Rashid, Prentice Hall of India.
4) Fundamentals of Electrical Drives – G. K. Dubey , Narosa Publishing House.
5) Fundamentals of Electrical Drives - Mohammad A. EL-sarkawi, vikas Publishing House.

List of experiments:-

1) Control of d.c motor using single phase half controlled rectifier.
2) Control of d.c motor using single phase fully controlled rectifier.
3) One quadrant chopper control of d.c motor.
4) Two quadrant chopper control of d.c motor.
5) Speed control of single phase induction motor using ac voltage regulator
6) Study of stepper motor drive circuit.
7) Speed control of universal motor.
8) Study of Micro-computer based control of Dc drives,
9) Study of vector control method for induction motor.
10) Study of reversible drives

The term work should include a minimum of eight experiments from above list.

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B.E. (ELECTRICAL) W.E.F: 2008- 09

TERM - II

ELECTIVE-II

I) FLEXIBLE A.C.TRANSMISSION

Teaching Scheme	**Examination scheme**
Lectures: 4Hrs/Week	**Paper : 100 Marks**
Tutorial : 2Hrs/Week	**Duration : 3 Hrs.**
	Term work : 25Marks

UNIT I:- DEVICES AND CONVERTERS

Advanced Power Semiconductor Devices, Voltage Source Converter, Single Phase Full Wave Bridge Converter Operation. Three Phase, Full Wave Bridge Converter. Three Level Voltage source Converter, PWM Converter. Generalized technique of harmonic elimination and voltage control, current sourced converter, and current source verses voltage sourced converters.

(10 Hrs., 20 Marks)

UNIT II:-FACTS CONCEPTS

FACTS Concepts, Flow of Powers in AC System, Dynamic stability consideration of transmission interconnection. Relative importance of controllable parameters, facts controllers.

(10 Hrs., 20 Marks)

UNIT III:-SHUNT COMPENSATORS

STATIC Shunt Compensator, Methods of Controllable VAR Generation, Static VAR Compensators, Static VAR System.

(10 Hrs., 20 Marks)

UNIT IV:-SERIES COMPENSATORS

STATIC Series, compensator, Variable Impedance Type Series Compensators, Switching Converter, Types and Compensators, External Control for series Reactive Compensators.

(10 Hrs., 20 Marks)

UNIT V:-COMBINED COMPENSATORS

Combined Compensator, Unified Power Flow Controller, Interline Power Flow Controller, Generalized Multifunctional FACTS Controllers.

(10 Hrs., 20 Marks)

References,

1. N.G.Hingorani,' Understandig FACTS', IEEE Press, 1999
2. Yang hue Song,'Flexible AC Transmission Systems (FACTS), IEEE Press, 1999

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B.E. (ELECTRICAL) W.E.F: 2008- 09

TERM - II

ELECTIVE-II

II) POWER SYSTEM DESIGN PRACTICE

Teaching Scheme	**Examination scheme**
Lectures: 4Hrs/Week	**Paper : 100 Marks**
Tutorial : 2Hrs/Week	**Duration : 3 Hrs.**
	Term work : 25Marks

UNIT I:- DESIGN FUNDAMENTALS

Electrical & mechanical design of transmission line. Design of EHV transmission lines.

(10 Hrs., 20 Marks)

UNIT II: - DESIGN OF DISTRIBUTION SYSTEMS

Improvement and expansion of power system. Bus bar arrangements, isolating switches.

(10 Hrs., 20 Marks)

UNIT III:- CIRCUIT BREAKERS

Circuit breakers: operating mechanism, rating and selection, operating under special conditions, specification and technical details for deranged tender preparations.

(10 Hrs., 20 Marks)

UNIT IV: - LIGHTING ARRESTORS

Rating characteristics, testing technical defects, standards followed for details insulation co ordination. Power transformers different types, tapping , fittings, cooling, drying rating, cost comparison, testing technical details for ordering and tender preparations.

(10 Hrs., 20 Marks)

UNIT V: - SHUNT CAPACITORS

Need, construction, location, connections, protection, analysis, special types, testing, technical details. Earthing: Earthing systems, step potential, touch potential and transfer potential.

(10 Hrs., 20 Marks)

REFERANCES:-

1) Pratapsingh Satnam & P.V. Gupta. – Substation Designed equipments, Dhanpat Rai & Sons.
2) M. V. Deshpande: - Electrical Power system Design.

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B.E. (ELECTRICAL) W.E.F: 2008- 09

TERM - II

ELECTIVE-II

III) ELECTRIC TRACTION ENGG.

Teaching Scheme	**Examination scheme**
Lectures: 4Hrs/Week	**Paper : 100 Marks**
Tutorial : 2Hrs/Week	**Duration : 3 Hrs.**
	Term work : 25Marks

UNIT I: - TRAIN MOVEMENT AND PERFORMANCE

Speed time curve, its analysis and construction, schedule speed and factors affecting it, train resistance and its components. Tractive effort calculations, average acceleration and speed, energy output and consumption.

(10 Hrs., 20 Marks)

UNIT II: - POWER TRANSMISSION AND WEIGHT TRANSFERENCE

Methods of transmission of power from motor to wheels .Idea about riding quantities of an electric loco motive, grouping of motor and weight transference, adhesive weight factors affecting slip.

(10 Hrs., 20 Marks)

UNIT III: - TRACTION MOTORS

Performance of (i) d.c. motors (ii) a.c. single phase series motors at low frequencies and at commercial frequency and (iii) poly phase induction motors, under traction service conditions, specific problems and method of overcoming them, special features of construction effect of differences in driving wheel diameters and speed time curves on division of load, traction motor ratings, speed factor, track and overhead equipments.

(10 Hrs., 20 Marks)

UNIT IV: - POWER SUPPLY FOR TRACTION

Overhead and conductor rail system, third rail construction, Bonding of conductor and track rails, overhead construction for trolley, buses and railways, quaternary's construction, temperature effects, current collectors, out times of feeding and distributing system for d.c low frequency, a.c and commercial frequency, a.c. traction voltage drop control, Electrolytic and inductive coordination, power loading curves, Positions of substations and load - sharing .

(10 Hrs., 20 Marks)

UNIT V :- BRAKING ON ELECTRIFIED RAILWAYS

Mechanical versus electric breaking, rheostatic braking, Regenerative braking, method and energy saved in the process, Magnetic track brakes.

Traction control: Duty cycle, Methods of traction motor control, series-Parallel and other types of controllers, use of interlocks, run back prevented, multiple unit control, Master controllers, Reverses, Dead man's handle, use of Metadyne and Megavolt.

(10 Hrs., 20 Marks)

Reference Books:-

H. Partab: Modern Electric traction, Dhanpat Rai & sons.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

B.E. (ELECTRICAL) W.E.F: 2008- 09

TERM - II

ELECTIVE-II

IV) GENERATION PLANNING AND LOAD DISPATCH

Teaching Scheme	**Examination scheme**
Lectures: 4Hrs/Week	**Paper : 100 Marks**
Tutorial : 2Hrs/Week	**Duration : 3 Hrs.**
	Term work : 25Marks

UNIT-I: - GENERATION

Hydropower, fossil fuels nuclear power generation system. Chronological Load curves, power duration curve, integrated duration curve hydrography, flow duration curve, mass duration curve or hydro power generation stations.

Co-ordination of steam, hydro & nuclear power stations. Optimum generation allocation- line losses neglected & including the effect of transmission losses for thermal power generations.

Low range& short range hydro thermal scheduling of generation the short term and long term hydro thermal scheduling of generation.

(10 Hrs., 20 Marks)

UNIT-II:-PLANNING

Objectives of generation system planning, long term and short term planning. Stages in planning. Policy studies.

(10 Hrs., 20 Marks)

UNIT-III:- LOAD ENERGY FORECASTING

Classification of loads, load forecasting methodology.

peak demand forecasting- non whether sensitive forecast- weather sensitive forecast-total forecast- annual and monthly peak demand forecast.

(10 Hrs., 20 Marks)

UNIT-IV: - GENERATION SYSTEM COST ANALYSIS

Capacity cost, production cost, tuning of addition production analysis- production analysis involving nuclear unit production analysis involving hydro unit. Fuel inventories, energy transition off peak energy utilization.

(10 Hrs., 20 Marks)

UNIT-V:-GENERATION SYSTEM RELIABILITY ANALYSIS

Probabilistic generation unit- model &load model effective load- reliability analysis for isolated system- interconnected system- reliability of interconnected system.

(10 Hrs., 20 Marks)

Reference Books:-

1) Generation of Electric Energy – B.R. Gupta,
   Euresia Publishing House Pvt. Ltd., New Dehli.
2) Power System Planning – R.L.Sullivan, McGraw Hill.
3) Economic Control of Interconnected System – Kirchmayers L.K.,
   John Wiley & Sons, New York.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

B.E. (ELECTRICAL) W.E.F: 2008- 09

TERM - II

ELECTIVE-II

V) EXTRA HIGH VOLTAGE TRANSMISSION

Teaching Scheme	**Examination scheme**
Lectures: 4Hrs/Week	**Paper : 100 Marks**
Tutorial : 2Hrs/Week	**Duration : 3 Hrs.**
	Term work : 25Marks

UNIT I:-AC POWER TRANSMISSION

Basic aspects of A.C. Power transmission, power-handling capacity and line loss, surface voltage and conductors, electrostatic field of EHV lines. Measurement of electrostatic fields. Electromagnetic interference. Traveling waves and standing waves, Line energization with trapped-charge voltage. Reflection and refraction traveling waves. Transient response of system with series and shunt lumped parameters. Principles of traveling protection.

(10 Hrs., 20 Marks)

UNIT II:-LIGHTNING AND PROTECTION

Lightning & lightning Protection, Insulation coordination based lightning.

(10 Hrs., 20 Marks)

UNIT III:-OVERVOLTAGES IN EHV SYSTEM

Over Voltage in EHV system caused by switching operation, Origin of over voltage and their types caused by interruption of inductive and capacitive currents, Ferro-response over voltage, calculation surges, Power frequency voltage control and over voltages, Power circle diagram.

(10 Hrs., 20 Marks)

UNIT IV:-STABILITY CONSIDERATIONS

Reactive power flow and stability in power systems. Steady-state static real power and reactive power stability, transient stability. Basic principles of system voltage control. Effects of transformer tap changing in the post disturbance effect of generator excitation adjustment, Voltage collapse in EHV lines, reactive power requirement for voltage in long line. Voltage stability

(10 Hrs., 20 Marks)

UNIT V:-MAXIMUM POWER TRANSFER AND STABILITY LIMIT

Power Transfer at voltage stability limit of EHV lines, Magnitude of receiving end voltage, Voltage Magnitude of receiving end voltage during maximum power transfer. Magnitude of Maximum power and stability limit. Optimal reactive power at voltage stability limit

(10 Hrs., 20 Marks)

References,

1. A.Chakrabarti, D.P.Kothari, A.K. Mukhopdadhyay, Performance, operational & control of EHV power system, Wheeler publications.
2. Rakosh Das Begamudre,'Extra high-voltage A.C. transmission Engineering' New Age International.
3. S.Rao, EHVAC & HVDC transmission Engineering & practice' - Khanna publications.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
B.E. (ELECTRICAL) W.E.F: 2008- 09
TERM - II

PROJECT -II

Teaching Scheme	**Examination Scheme**
PRACTICAL:	
4Hrs. /Week (For Term-II)	**Term Work: 100(Term II)**
	Oral : 50 Marks (Term II)

1. The Project group in, BE. first Term will continue the project work in B.E. Second Term, and complete project in all respect (assembly, testing, fabrication, tabulation, test result etc.)
2. The group should maintain a logbook of activities. It should have entries related to the work done, problems faced, solution evolved etc., duly signed by guide.
3. The guides should regularly monitor the progress of the project work.
4. The project work along with project report should be submitted as part of term work in B.E. Second Term on or before the last day of the term
5. Project report must be submitted in the prescribed format only..

Submission of project report:

The student shall submit a detailed report base on his/her project work to his/her institutional guide. It shall include relevant circuit diagrams, graphs, photographs, specification sheets etc.

Format for the project report shall be as follows:

a) The report shall be neatly typed on white paper .The typing shall be of normal spacing and only on one side of the "A4 "size paper.

b) The report shall be submitted with front and back cover card paper, neatly cut and bound together.

c) Front cover shall have the following details in block capitals in the following sequence.

Title at the top, followed by the name of the candidate with roll no and exam seat no in the next line. Name of the guide with designation below the details of the candidate. The name of the institute and year of submission on separate lines at the end.

d) Project work approval sheet in the form of a certificate duly signed, shall be included.

e) The format of the text of the project report:

The synopsis shall be followed by literature survey. The report of analytical or experimental work done, if any shall then follow. The discussion and conclusion shall form the next part of the text. It shall be followed by nomenclature and symbols used and then acknowledgement .The bibliography shall form the last section.

The total number of typed pages, excluding cover, shall be about 50 to100.All the pages shall be serially numbered.

Number of copies of the project report submitted to the department shall be equal to number of students in a group plus three.The oral examination will be base on the project report.

6. Assessment of the project for award of TW marks shall be done by the guide and a departmental committee (consisting of minimum two teachers with experience more than three years) as per the guidelines given in the following table.

B) ASSESSMENT OF PROJECT II TERMWORK (B.E. SECOND TERM)

NAME OF THE PROJECT: _____

NAME OF THE GUIDE: _____

Sr. No	Exam. Seat No	Name Of Students	Assessment by guide (70%)						Assessment by department (30%)			Grand Total
			Fabrication /software / actual work	Execution of project	Project report	Scope/ Cost / Utility	Attende-nece	Total	Evaluation (10%)	Prese-ntaion (20%)	Total	
		Marks	20	10	20	10	10	70	10	20	30	100

Sign of Guide. Sign of Committee Members Sign. of H. O. D.

7. The guide should be internal examiner for oral examination .

8. The external examiner should be from the related area of the concerned project. He should have minimum of five
years of experience at degree level / industry.

9. The evaluation at final oral examination should be done jointly by the internal and external examiners.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
B.E. (ELECTRICAL) W.E.F: 2008- 09
TERM - II
INDUSTRIAL VISIT

Term work:25 Marks.

EDUCATION TOUR / TECHNICAL VISITS / CASE STUDY AND ITS EVALUATION

1. During B.E. First Term / Second Term or during vacation between B.E. First Term / Second Term every student; shall visit minimum two industries, factories arranged by colleges and accompanied by teachers. There shall be at least one teacher for a group of 20 students and at least one non-teaching staff accompanied with the students.

2. The colleges should obtain appropriate certificates of visit from the concerned organizations just after the visits.

3. Students should submit written report about the visits individually at the end of B.E. Second Term .

4. The report should contain information about the following points:

   (a) The organization - activities of organization and administrative setup technical personnel and their main duties.
   (b) The project *I* industry brief description with sketches and salient technical information.
   (c) The work *I* processes observed with specification of materials, products, equipments etc. and role of engineers in that organization.
   (d) Suggestions (if any) for improvement in the working of those organizations.

5. The evaluation of the report of technical visits will be made by panel of two teachers appointed by principal based on following points:

   (a) Coverage aspect: All above points should be covered.
   (b) Detailed observations: System *I* Process / Product explained with data, diagram specifications.
   (c) Quality of presentation: Report should be very objective and should consist of clear and systematic organization of topics and information.
   (d) Viva - voce: A viva -voce shall be conducted on the technical visit report by the teachers to assess the specific knowledge gained by the students for technical applications.

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NORTH MAHARASHTRA UNIVERSITY, JALGAON

B.E. (ELECTRICAL) W.E.F: 2008- 09

TERM - II

ENTREPRENEURSHIP DEVELOPMENT SKILLS

Practical: 2 hours/week.

1. Entrepreneurship:

Aim alternative to seeking jobs- promote self- employment end accelerate industrialization. Entrepreneurship development program in India and Maharashtra an overview. Institutions promoting entrepreneurship, their objectives and mode of functioning.

2. Motivation, requirement and constraints:

Affiliation, power, achievement, GOAL SETTING, FINCIAL AND CARRER RISK AND Rewards. Sources of information- "where to go and for what?" Entrepreneurial personality, creavity and qualities.

3 Selecting the right entrepreneurship field

Search and scanning: Small scale/ medium scale industries/ manufacturing/ transporting/ consultancy. Criteria for selecting product for elopements/ manufacturing.

4 feasibility report: Market survey, selecting right infrastructure, location and government subsidies, sources of technology, recruiting right people, identifying customers, finding out competitors, preparation of feasibility report, project report.

5 Organizational set-ups: advantages and limitations of proprietorship, partnership, co- operatives, private limited and public limited

COLLEGE OF ENGINEERING AND TECHNOLOGY,
BAMBHORI POST BOX NO. 94, JALGAON – 425001. (M.S.)

(With NBA Accredited Programmes)

Website : www.sscoetjalgaon.ac.in Email : sscoetjal@gmail.com

Mandatory Disclosure

Part-III

August 2016

Shram Sadhana Bombay Trust's
COLLEGE OF ENGINEERING AND TECHNOLOGY
BAMBHORI, POST BOX NO. 94, JALGAON – 425001. (M.S.)
Included under section 2 (f) & 12 (B) of the UGC Act, 1956
ISO 9001: 2008 certified

BAMBHORI,JALGAON
ISO 9001:2008

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Principal: Dr. K.S.Wani
M. Tech, DBM, Ph.D.

Phone No. (0257) 2258393
Fax No. (0257) 2258392

Ref. No. COET/ AICTE/MD/ / 16 **Date: 20/08/2016**

C E R T I F I C A T E

Certified that all enclosures contained in PART-I, PART-II & PART-III bearing page no. **01** to page no. **2035** are pertaining to our institution which are being submitted in two separate above mentioned bound booklets/box file of Mandatory Disclosure. All xerox copies may be treated as original.

PRINCIPAL

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Second Year Engineering (E&TC/E&C/Elex/IE)

Faculty of Engineering and Technology

COURSE OUTLINE

Semester – III

W.E.F 2013 – 2014

SE Semester - III

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory			Practical	Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Solid State Devices & Circuits-I (TH)	D	3	1	---	4	20	80	---	---	100	4
Electrical Circuits and Machines (TH)	B	3	---	---	3	20	80	---	---	100	3
Digital Techniques & Applications (TH)	D	3	1	---	4	20	80	---	---	100	4
Component Devices & Instrumentation Technology (TH)	D	3	---	---	3	20	80	---	---	100	3
Communication Systems-I (TH)	D	3	---	---	3	20	80	---	---	100	3
Soft Skills – III	C	1	---	2	3	---	---	50	---	50	2
Electrical Circuits and Machines (LAB)	B	---	---	2	2	---	---	50	---	50	1
Solid State Devices & Circuits-I (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Communication Systems-I (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Digital Techniques & Applications (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Total		**16**	**2**	**10**	**28**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE:** End Semester Examination **ICA:** Internal Continuous Assessment

SE Semester - IV

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Engineering Mathematics-III (TH)	A	3	1	---	4	20	80	---	---	100	4
Solid State Devices & Circuits-II (TH)	D	3	1	---	4	20	80	---	---	100	4
Microprocessors (TH)	D	3	---	---	3	20	80	---	---	100	3
Linear Integrated Circuits (TH)	D	3	---	---	3	20	80	---	---	100	3
Network Analysis & Synthesis (TH)	D	3	---	---	3	20	80	---	---	100	3
Computer Programming-II (LAB)	B	1	---	2	3	---	---	50	---	50	2
Linear Integrated Circuits (LAB)	D	---	---	2	2	---	---	50	---	50	1
Solid State Devices & Circuits-II (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Network Analysis & Synthesis (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Microprocessors (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Total		**16**	**2**	**10**	**28**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE:** End Semester Examination **ICA:** Internal Continuous Assessment

Solid State Devices & Circuits- I

COURSE OUTLINE

Course Title	Short Title	Course Code
Solid State Devices & Circuits- I	**SSDC-I**	

Course Description:

This course includes semiconductor-based devices such as diodes, bipolar transistors, FETs, and related components. This course is designed to introduce to the students to the basic principles and applications of semiconductor devices. It includes semiconductor physics and semiconductor diodes, fundamentals, BJT, FET, MOSFET (operation & characteristics), frequency response of BJT and FET. This course provides instruction in the theory and application of solid state devices in the electronics industry. Emphasis is placed on the physical characteristics and uses of solid state devices.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	14	42	04
Tutorial	01	14	14	

Prerequisite Course(s): Knowledge of Elements of Electronics Engineering

COURSE CONTENT

Solid state Devices and Circuits-I **Semester-I**

Teaching Scheme	**Examination Scheme**
Lecture: 3 hours / week	**End Semester Examination (ESE) : 80 Marks**
Tutorial: 1 hour / week	**Paper Duration (ESE) : 03 Hours**
	Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Introduction to Semiconductor **No of Lect. – 9, Marks: 16**

a) Intrinsic and Extrinsic Semiconductor - Concept of Doping, N type Semiconductor, P type semiconductor.
b) Conduction Mechanism - Drift and Diffusion Current, Carrier Concentration after doping (N and P type material).
c) Law of mass action.
d) Introduction to Diode application – Voltage Multiplier circuit, Analysis of half wave rectifier & full wave rectifier. Analysis of Full wave rectifier with capacitor filter.

Unit-II: Introduction to BJT Biasing **No of Lect. – 9, Marks: 16**

a) Concept of DC and AC Load line.
b) Introduction to biasing, Need of biasing, Different biasing circuit (Fixed bias, collector- base bias, Voltage divider bias), Stability factor.

c) Bias Compensation technique - Bias Compensation technique using Diode and Thermistor.
d) Small Signal model of BJT- Hybrid parameter model of BJT for Low frequency analysis, Derivation for Av, Ai, Ri, & Ro using Exact and Approximate analysis in terms of H parameter for CE amplifier.
e) Exact and Approximate analysis for all Configurations, Conversion formulae for CE, CC.
f) Millers Theorem and its Dual.

Unit-III: Introduction to FET **No of Lect. – 8, Marks: 16**

a) Symbol, Construction Principle of operation, V-I and Transfer Characteristics for N & P channel FET.
b) FET Parameter.
c) Biasing of FET, Different biasing methods.
d) Analysis of Voltage divider biasing method (Analytical and Graphical method).
e) Small Signal model of FET, CS, CG& CD amplifier.
f) FET as an amplifier CS (Bypass and Un bypassed excluding rd).

Unit-IV: Introduction to MOSFET **No of Lect. – 8, Marks: 16**

a) MOSFET - Symbol, Types of MOSFET - Depletion and Enhancement type MOSFET (N channel & P channel).
b) Construction, Operation, & V-I characteristics of MOSFET.
c) MOSFET biasing - Types of Depletion & enhancement MOSFET biasing.
d) MOSFET as amplifier.

Unit-V: Cascade Amplifier and Frequency response of BJT **No of Lect. – 8, Marks: 16**

a) Multistage amplifier - Need of multistage amplifier, multistage amplifier with combination of different configuration (CE-CE, CE-CB).
b) Concept of frequency response of BJT, B.W. of Single stage and cascaded amplifier.
c) Square wave Testing **-** Derivation for F_L & F_H of Square wave testing of an amplifier.
d) Concept of Capacitor in Frequency response - Effect of coupling, bypass capacitor and junction capacitor on frequency response of BJT.

Reference Books:

1. R. Boylestad, L. Nashelsky "Electronics Devices and Circuit Theory", 10th Edition, Pearson, 2009.
2. S. Salivahanan, N. Sureshkumar and A. Vallavaraj, "Electronics Devices and Circuits", Tata McGraw Hill, 3rd Edition, 2009.
3. S. C. Sarkar, "Electronics Devices and Circuits-I" Everest Publishing House, The Millennium 12th enlarged and revised Edition, 2001.
4. T. Floyd, "Electronics Devices" conventional current version, 7th Edition, Pearson, 2008.
5. D. Cheruku, B. Krishna, "Electronics Devices and Circuits", 2nd Edition, Pearson, 2012.
6. J. Miillman, C. Halkias, "Integrated Electronics", Tata McGraw Hill, 1st Edition, 1991.

Electrical Circuits and Machines

COURSE OUTLINE

Course Title	Short Title	Course Code
Electrical Circuits and Machines	**ECM**	

Course Description:

The course considers the basic principles of electrical machines. In this course we will introduce some of the basic concepts and terminology that are used in modern electrical engineering. The students can use this knowledge to analyze electrical networks, D.C. machines, A.C. machines & transformer etc.

Lecture	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): knowledge of Elements of Electrical and Electronics Engineering.

COURSE CONTENT

Electrical Circuits and Machines **Semester-III**

Teaching Scheme

Lecture: 3 hours / week

Examination Scheme

End Semester Examination (ESE): 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Three phase circuits & A.C. circuits **No of Lect. – 9, Marks: 16**

a) Thevenin's, Norton's theorem's application for A.C. network.
b) Three phase circuit power measurement (Star and Delta load).
c) Single watt meter, two Watt meter method.
d) Active, reactive, apparent power and power factor.

Unit-II: DC Machines **No of Lect. – 9, Marks: 16**

a) DC machine construction.
b) EMF equation of Generator, working principle (series & shunt).
c) Motor working principle; back EMF (series & shunt).
d) Torque equation and speed equation of motor.
e) Characteristics, losses and power stages of generator & motor.
f) Necessity of starter (3-point starter).

Unit-III: Single phase & three phase transformers **No of Lect. – 8, Marks: 16**

a) Transformers construction, EMF equation, working Principle: 1ϕ and 3ϕ.
b) Transformer phasor diagram no load & on load.
c) C.T, P.T. & Auto-transformer.
d) Open circuit and short circuit tests, Efficiency and regulation.

Unit-IV: Synchronous Machines **No of Lect. – 8, Marks: 16**

a) Alternator construction, principle of operation and EMF equation.
b) Principle of operation of synchronous motor.
c) Synchronous Motors on load with different excitation.
d) Explain hunting in synchronous motor.

Unit-V: Induction Motors **No of Lect. – 8, Marks: 16**

a) Three phase I.M. construction.
b) Principle of working of three-phase I.M.
c) Slip, torque equation (T_{st} & T_{max}) & torque - slip characteristics.
d) Types of starters (DOL, star-delta, auto-transformer).
e) Single phase Induction motors
f) Special machines (stepper motor, servo motor, universal motors) working, data analysis and application.

Reference Books:

1. B. Theraja, A. Theraja, "A Text book of Electrical Technology- Vol-I",S. Chand, 1st Edition, 2010.
2. B. Theraja, A. Theraja, "A Text book of Electrical Technology- Vol-II", S. Chand, 1st Edition, 2010.
3. V N Mittle/ Arvind Mittal, "Basic Electrical Engineering", McGraw Hill Companies, 2nd Edition.
4. H. Cotton, "Electrical Technology", CBS Publication, 7th Edition.

Digital Techniques and Applications

COURSE OUTLINE

Course Title	Short Title	Course Code
Digital Techniques and Applications	**DTA**	

Course Description:

This course provides an introduction to digital electronics & its applications covering different types of codes, Boolean laws, SOP and POS form, k-map technique, arithmetic circuits such as adder, substractor, Multiplexer, Demultiplexer and their applications, different types of flip-flops and their applications, sequential circuits such as ripple counter, synchronous counter, Mod-n counter, shift resister and its applications. Logic families TTL, MOS and its interfacing. This course is designed to give a broad understanding of the principles of Digital Techniques and its applications.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	14	42	04
Tutorial	01	14	14	

Prerequisite Course(s): Knowledge of Basic gates and semiconductor devices.

COURSE CONTENT

Digital Techniques and Applications **Semester-I**

Teaching Scheme	**Examination Scheme**	
Lecture: 3 hours / week	**End Semester Examination (ESE)**	**: 80 Marks**
Tutorial: 1 hour / week	**Paper Duration (ESE)**	**: 03 Hours**
	Internal Sessional Exam (ISE)	**: 20 Marks**

Unit-I: Codes and Boolean algebra **No of Lect. – 9, Marks: 16**

a) Introduction to Number Systems.
b) Representation of signed numbers.
c) Classification of Binary codes. BCD codes, Excess -3 codes, Gray codes, ASCII codes, Hamming code and pulsed operation of logic gates.
d) Boolean algebra, reducing Boolean expressions, SOP form, POS form, Minterm, Maxterm.
e) Simplification of Boolean function using K-map method and don't –care condition.

Unit-II: **Combinational Logic Circuits** **No of Lect. – 9, Marks: 16**

a) Half and Full adder/ Substractor Circuits**.**
b) IC 7483 parallel adder, BCD adder, 1bit / 2 bit's digital comparator.
c) Code converters: - binary to gray, BCD to Excess-3, BCD to 7 Segment
d) Multiplexer, De-multiplexer, decoder and their Applications.

Unit-III: **Sequential Circuits and Shift Register.** **No of Lect. –9, Marks: 16**

a) Classification of Sequential Circuits.
b) Latches and Edge triggered Flip-Flops:- SR, JK, T, D, Master Slave JK flip-flop and their application.
c) Excitation table, conversion of Flip- Flops.
d) Shift Register: - Definition, different types and their operation.
e) 4-bit bidirectional Shift register, 4-bit universal shift Register.
f) Application of shift Register: - ring counter, twisted ring counter.

Unit-IV: **Counters and Clocked sequential circuits.** **No of Lect. – 9, Marks: 16**

a) Design Ripple and MOD-N counters using Flip- Flops.
b) Design 4 bit UP/DOWN Ripple counter.
c) Design synchronous and MOD- N counters using Flip- Flops.
d) Synchronous sequential Machine.
e) Design Synchronous sequential circuits.

Unit- V: **Logic Families** **No of Lect. – 9, Marks: 16**

a) Characteristics of digital ICs.
b) Operation of TTL NAND gate, totem – pole, open collector output, wired AND, unconnected inputs.
c) CMOS inverter, NAND, NOR gate, unconnected inputs, wired logic, open drain output.
d) Interfacing of CMOS to TTL and TTL to CMOS.
e) Tri-State logic.
f) Comparison of different logic families.

Reference Books:

1. A. Kumar, "Fundamentals of Digital Circuits", PHI, 2nd Edition, 2011.
2. R. Jain, "Modern Digital Electronics", Tata McGraw Hill, 4th Edition, 2010.
3. Leach, Malvino, "Digital Principles and Applications", Tata McGraw Hill, 5th Edition, 2002.
4. J. Wakerly, "Digital Design Principles and Practices", Pearson 2nd Edition, 2009.
5. R. Tocci, "Digital Systems Principles and Applications", Pearson 2nd Edition, 2002.

Component Devices & Instrumentation Technology

COURSE OUTLINE

Course Title	Short Title	Course Code
Component Devices & Instrumentation Technology	**CDIT**	

Course Description:

This course provides an introduction to different devices used in instrumentation & electronics engineering covering types of errors in measurement, different analog and digital instruments such as voltmeter, current meter, ohm meter, recorders, instrumentation amplifier and function generator, AC and DC bridges, study of different transducers like temperature, humidity, flow, pyrometer, piezoelectric and phototransistor and basic of printed circuit board designing.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Knowledge of Physics and Elements of Electrical & Electronics Engineering.

COURSE CONTENT

Component Devices & Instrumentation Technology **Semester-III**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Measurement, Error and Display device **No of Lect. – 8, Marks: 16**

a) Definition of different term: Accuracy, precision, sensitivity, resolution, Significant figures.
b) Errors: gross error, systematic error, random error, limiting errors.
c) Statistical Analysis.
d) Permanent magnet moving coil mechanism (PMMC).
e) DC ammeter and DC volt meter.
f) Series and shunt type of ohmmeter.

Unit-II: Electronic instruments **No of Lect. – 8, Marks: 16**

a) Digital multi-meter.
b) Types of DVM: Linear Ramp type, Integration, Dual slope integration and successive approximation.
c) Recorders: Galvanometric, potentiometer, magnetic recorder.

d) Designing of Instrumentation amplifier.
e) Basic Standard Sine Wave Generator, Function generator block diagram.

Unit-III: Bridges and their applications **No of Lect. – 9, Marks: 16**

a) Wheatstone bridge.
b) Kelvin Bridge and Kelvin's double bridge.
c) General form of AC Bridge.
d) Maxwell Bridge, Hay Bridge.
e) Schering Bridge.
f) Wien Bridge & Wagner ground connection.

Unit-IV: Transducers and application **No of Lect. – 8, Marks: 16**

a) Thermometer and Thermocouple.
b) Integrated Circuit Temperature Transducers.
c) Measurement of Humidity by Hygrometer.
d) Flow transducer: - Turbine and Electromagnetic flow meter.
e) Pyrometer.
f) Piezoelectric Transducer, Phototransistor.

Unit-V: Printed Circuit Boards **No of Lect. – 9, Marks: 16**

a) Classification of PCBs, Manufacturing of basic printed circuit boards.
b) Artwork generation: Basic approach, general design guideline, Artwork generation guideline, film master preparations.
c) Copper clad laminates: properties and types.
d) Etching techniques, mass-soldering techniques.
e) Multilayered Boards.
f) Overview of Passive Components.

Reference Books:

1. H. Kalsi, "Electronic Instrumentation", TMH, 2nd Edition, 2007.
2. A. Helfric and W. Cooper, "Modern Electronics Instrumentation and Measurement Technique", Pearson LPE, 2005.
3. A. Sawhney, "Electrical and Electronics measurement and Instrumentation", Dhanpat Rai and company, 18th Edition, 2007.
4. K. Kishore, "Electronic Measurement and Instrumentation", Pearson 4th, Edition, 2012.
5. R. Khandpur, "Printed Circuit Boards Design Fabrication, Assembly and Testing", TMH, 1st Edition 2005.
6. A. Kalavar, "Electronic Materials Components and Devices Technology", Everest Publishing House, 10th Edition, 2004.

Communication Systems-I

COURSE OUTLINE

Course Title	Short Title	Course Code
Communication Systems-I	**CS-I**	

Course Description:

The course considers analog communication systems. In this course we will introduce some of the basic mathematical concepts that will allow us to think in the two "domains" of communications, the time domain and the frequency domain. We will cover the basic types of analog modulation (AM, FM, and phase modulation) from both a mathematical description and from a block-diagram system approach.

	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	03	14	42	03

Prerequisite Course(s): Analog signal and fundamentals.

COURSE CONTENT

Communication Systems-I **Semester-III**

Teaching Scheme	**Examination Scheme**
Lecture: 3 hours / week	**End Semester Examination (ESE): 80 Marks** **Paper Duration (ESE) : 03 Hours** **Internal Sessional Exam (ISE) : 20 Marks**

Unit-I: Introduction to Communications System & Noise No of Lect. – 8, Marks: 16

a) Communications Systems and need of modulation.
b) Introduction, External noise, internal noise.
c) Noise Calculations.
d) Noise Figure and noise Temperature.

Unit-II: Amplitude modulation & SSB Techniques No of Lect. – 8, Marks: 16

a) Amplitude Modulation Theory.
b) Generation of Amplitude Modulation.
c) Evolution and Description of Single Side Band Techniques (SSB).
d) Suppression of Carrier and Unwanted Side Band.
e) Extensions of SSB.

Unit-III: Frequency and Phase modulation concept **No of Lect. –8, Marks: 16**

a) Theory of Frequency and Phase Modulation.
b) Noise and Frequency Modulation.
c) Generation of Frequency Modulation.

Unit-IV: AM / FM receiver **No of Lect. – 8, Marks: 16**

a) Receiver Types.
b) A.M. Receivers.
c) F.M. Receivers.
d) Single and Independent Sideband Receivers.

Unit-V: Pulse Modulation

No of Lect. – 8, Marks: 16

a) Fourier Transform and properties.
b) Statement of Sampling theorem and types of Sampling.
c) Pulse amplitude Modulation and concept of TDM, FDM.
d) Pulse Width Modulation and Pulse Position Modulation.
e) PWM and PPM generation block diagram and wave form description.

Reference Books:

1. G. Kennedy, B. Davis, "Electronic Communication Systems", Tata McGraw Hill Edition, 4th Edition, 1999.
2. H. Taub, D. L. Schilling and G. Saha, "Principles of Communication Systems", Tata McGraw-Hill Edition, 3 rd Edition, 2012.
3. S. Kundu, "Analog and Digital Communication", Pearson, ISBN 978-81-317-3187-1.
4. D. Roddy, J. Coolen, "Electronic Communications", Pearson, 4th Edition, 2011.

Soft Skills – III

COURSE OUTLINE

Course Title	Short Title	Course Code
Soft Skills – III	**SK-III**	

Course Description: Through this course we have tried to prepare the students for the industry. Most companies test mathematical and logical ability through an aptitude test. This subject aims at working on these skills of a student through strategies formulae and practice exercises.

Lecture	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
	1	14	14	2

Prerequisite Course(s): Fundamental knowledge of High School Mathematics.

COURSE CONTENT

Soft Skills – III **Semester-III**

Teaching Scheme **Examination Scheme**

Lecture: 1 hour / week **Internal Continuous Assessment (ICA): 50 Marks**

Unit-I: Arithmetic-1 **No. of Lect. – 3, Marks: 10**

a. Basic Formulae

i. Divisibility Rules.
ii. Speed Maths.
iii. Remainder Theorem.
iv. Different Types of Numbers.
v. Applications.

b. HCF, LCM and Linear Equations

i. HCF – Successive Division and Prime Factorization Methods.
ii. LCM – Successive Division and Prime Factorization Methods.
iii. Applications.
iv. Linear Equations – Elimination Method.
v. Substitution Method.
vi. Applications.

c. Averages and Mixtures

i. Concept of Average.

ii. Faster Ways of Finding It.
iii. The Allegation Method.
iv. Applications.

Unit-II: Arithmetic–II **No of Lect. – 3, Marks: 10**

a. Percentages

i. Concept of Percentage.
ii. Working with Percentages.
iii. Applications.

b. Profit and Loss

i. Difference between Cost and Selling Price.
ii. Concept of Profit Percentage and Loss Percentage.
iii. Applications.

c. Time and Work

i. Basic Time and Work Formula.
ii. Relation between Time and Work.
iii. Applications.

Unit-III: Arithmetic–III **No of Lect. –3, Marks: 10**

a. Permutations and Combinations

i. Sum Rule of Disjoint Counting.
ii. Product Rule of Counting.
iii. Concept of Factorial.
iv. Permutations.
v. Linear Permutations.
vi. Combinations.
vii. Circular Permutations.
viii. Applications.

b. Probability

i. Definition and Laws of Probability.
ii. Mutually Exclusive Events.
iii. Independent Events.
iv. Equally Likely Events.
v. Exhaustive Events.
vi. Cards.
vii. Dice.
viii. Applications.

c. Time and Distance

i. Speed.
ii. Conversion Factors for Speed.
iii. Average Speed.
iv. Moving Bodies – Passing, Crossing and Overtaking.
v. Relative Speed.
vi. Boats and Streams.
vii. Applications.

Unit-IV: Non-Verbal Reasoning **No of Lect. 2, Marks: 10**

a. Analogies

i. Examples.
ii. Applications.

b. Classification

i. Examples.
ii. Applications.

c. Sequences

i. Examples.
ii. Applications.

Unit-V: Analytical Reasoning **No of Lect. – 3, Marks: 10**

a. Analytical Puzzles

i. Classification Puzzles.
ii. Ordering Puzzles.
iii. Assignment Puzzles.
iv. Applications.

b. Letter and Number Series

i. Different Types of Letter Series.
ii. Different Types of Number Series.
iii. Mixed Series.

c. Coding and Decoding

i. Letter Coding.
ii. Number Coding.
iii. Mixed Coding.
iv. Odd Man Out.
v. Applications.

Guide lines for ICA:
ICA will be based on credit tests and assignments submitted by the student in the form of journal.

Reference Books:

1. R. S. Aggarwal, "Quantitative Aptitude", S. Chand Publication, New Delhi, 2012.
2. R. S. Aggarwal, "A Modern Approach to Verbal Reasoning", S. Chand Publication, New Delhi, 2012.
3. R. S. Aggarwal, "A Modern Approach to Non-Verbal Reasoning", S. Chand Publication, New Delhi, 2012.

Electrical Circuits and Machines

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Electrical Circuits and Machines	**ECM**	

Course Description:

In this laboratory course emphasis is on the understanding need of electrical engineering and their application.

	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Total Semester Credits: 1

Prerequisite Course(s): Elements of Electrical & Electronics Engineering

LAB COURSE CONTENT

(Note: Minimum FOUR Experiments from each group.)

Group A

1. **Two Wattmeter method of power measurement in three phase balanced load.**

    a. Measure the line Voltage for star / delta inductive load.
    b. Measure the line current for star / delta inductive load.
    c. Measure the power of watt-meters.
    d. Draw the phasor diagram for the star / delta inductive load.
    e. Calculate total power.

2. **Speed control of D.C. shunt motor by armature voltage and flux control method**.

    a. Measure armature voltages of D.C. shunt motor.
    b. Measure the field current of D.C. shunt motor.
    c. Plot graph for measure values voltages and field current.
    d. Verification of characteristics of motor.

3. **Load test on three phase induction motor.**

    a. Measure input Voltage and current of motor.
    b. Measure output speed of motor.
    c. Measure output torque of motor.
    d. Calculate the input power of motor.

e. Calculate the output power of motor.
f. Calculate the efficiency of motor.
g. Verification of performance characteristics of motor.

4. O.C. and S.C. test of single phase transformer to determine regulation and efficiency.

a. Measure the reading of ammeter.
b. Measure the reading of voltmeter.
c. Measure the reading of wattmeter.
d. Calculate no load resistance & reactance.
e. Calculate equivalent resistance, reactance and impedance.

5. Load test on D.C. series motor

a. Measure load current I_L.
b. Measure armature current I_a.
c. Verification of performance characteristics of motor.

Group B

1. Study of specification & application single phase motors.

a. Describe working and construction.
b. Selection criteria for application.
c. Use of datasheet for same.
d. Assembly & dissembling.

2. Study of specification & application of stepper motor.

a. Describe working and construction.
b. Selection criteria for application.
c. Use of datasheet for same.
d. Assembly & dissembling.

3. Study of specification & application of servo motor.

a. Describe working and construction.
b. Selection criteria for application.
c. Use of datasheet for same.
d. Assembly & dissembling.

4. Study of specification & application of universal motors.

a. Describe working and construction.
b. Selection criteria for application.
c. Use of datasheet for same.
d. Assembly & dissembling.

5. **Study of starter of three-point starter.**

    a. Identify and explain different parts of starter.
    b. Assembly & dissembling of starter.
    c. Connection of starter according to wiring diagram.

6. **Study of starter of star-delta starter.**

    a. Identify and explain different parts of starter.
    b. Assembly & dissembling of starter.
    c. Connection of starter according to wiring diagram.

7. **Study of starter of DOL starter.**

    a. Identify and explain different parts of starter.
    b. Assembly & dissembling of starter.
    c. Connection of starter according to wiring diagram.

Reference Books:

1. B. Theraja, A. Theraja, "A Text book of Electrical Technology- Vol-I",S. Chand, 1st Edition, 2010.
2. B. Theraja, A. Theraja, "A Text book of Electrical Technology- Vol-II", S. Chand, 1st Edition, 2010.
3. V N Mittle/ Arvind Mittal, "Basic Electrical Engineering", McGraw Hill Companies, 2nd Edition.
4. H. Cotton, "Electrical Technology", CBS Publication, 7th Edition.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Solid State Devices & Circuits-I

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Solid State Devices & Circuits-I	**SSDC-I**	

Course Description:

In this laboratory course emphasis is on the understanding of semiconductor diodes, Transistor, Field effect transistor and other devices.

	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Total Semester Credits: 1

Prerequisite Course(s): Basics of Elements of Electronics engineering.

LAB COURSE CONTENT

Outline of Content:

(Note: Minimum FOUR Experiments from each group.)

Group A

1. **To find load regulation of full wave Bridge wave rectifier circuit with capacitor filter.**

   a.Calculate load regulation of full wave bridge rectifier circuit.

2. **Plot I/P and O/P characteristics of BJT.**

   a. Determine input & output resistance from the characteristics.

3. **To Plot DC Load Line for BJT (Voltage Divider biasing circuit).**

   a. D.C. analysis of Circuit (Theoretical Calculation of ICq , VCEq i.e. Q point)
   b. Calculation of ICq, VCEq i.e Q Point Practically.

4. **To plot regulation characteristics of Voltage doubler circuit**

   a. Calculation of Load regulation.
   b. Plot characteristics of Doubler circuit.

5. Plot frequency response of CE-CE Cascade amplifier.

h. Find voltage gain and bandwidth.
i. Plot frequency response.
j. Calculate Ri, Ro.

6. Study the effect of bypass capacitor on frequency response of single stage CE amplifier

a. Calculate Voltage gain and Bandwidth without bypass capacitor.
b. Calculate Voltage gain and Bandwidth with bypass capacitor.
c. Compare "a" and "b".

Group B

1. To Plot DC Load Line for FET (Voltage Divider biasing circuit).

a. D.C. analysis of Circuit (Theoretical calculation of Idq , Vdsq i.e. Q point)
b. Calculation of Idq, Vdsq i.e. Q Point Practically.

2. Plot characteristics of CSFET.

a. Determine amplification factor, trans-conductance, and dynamic resistance.

3. Study the frequency response of CSFET.

a. Calculate Voltage gain and Bandwidth. Plot frequency response
b. Calculate of Ri, Ro.

4. Square wave testing of an amplifier.

a. Calculate Lower cutoff frequency and higher cutoff frequency.
b. Calculate bandwidth.

5. Plot frequency response of CE-CC Cascade amplifier.

a. Find voltage gain and bandwidth
b. Plot frequency response.
c. Calculate Ri, Ro

6. **To determine A_V, R_i, R_o of Darlington amplifier.**

a. Calculate A_v.
b. Calculate R_i, R_o.

Reference Books:

1. R. Boylestad, L. Nashelsky "Electronics Devices and Circuit Theory", 10th Edition, Pearson, 2009.
2. S. Salivahanan, N. Sureshkumar and A. Vallavaraj, "Electronics Devices and Circuits", Tata McGraw Hill, 3rd Edition, 2009.
3. S. C. Sarkar, "Electronics Devices and Circuits - I" Everest Publishing House, The Millennium 12th enlarged and revised Edition, 2001.
4. Thomas L. Floyd, "Electronics Devices" conventional current version, 7th Edition, Pearson, 2008.
5. D. Cheruku, B. Krishna, "Electronics Devices and Circuits", 2nd Edition, Pearson, 2012.
6. J. Miillman and C. Halkias, "Integrated Electronics", Tata McGraw Hill Edition, 1st Edition, 1991.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

Communication Systems-I

LAB COURSE OUTLINE

Course Title	Short Title & Course Code
Communication Systems-I	**CS-I**

Course Description:

In this laboratory course emphasis is on the understanding of need of modulation and demodulation and their uses.

	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Total Semester Credits: 1

Prerequisite Course(s): Analog signal and its fundamentals.

LAB COURSE CONTENT

(Note: Minimum FOUR Experiments from each group.)

Group A

1. **Study of AM transmitter and calculate of modulation index of AM wave by envelope method.**

   a. Sketch and recognize the resulting waveforms for a sinusoidal carrier being amplitude modulated by a single frequency audio signal.
   b. Draw and analyze graphs to show the resulting waveform, and frequency spectrum for a sinusoidal carrier amplitude modulated by an audio signal, to a given depth of modulation, m;
   c. Select and use the formula:

$$m = \frac{(V_{max} - V_{min})}{(V_{max} + V_{min})}$$

   To calculate the depth of modulation for given amplitude modulated RF signal.

2. **Analyze and generate A.M. Demodulation signal by diode detector.**

   a. Generate AM modulated wave form.
   b. Apply Modulated AM signal to demodulator.
   c. Observe clipping effect.
   d. Compare original modulating signal with demodulated output.

3. **Study of FM and calculate of modulation index of FM wave.**

   a. Generate FM waveform.
   b. Calculate Modulation Index.
   c. Compare over with A.M. modulation.

4. **F.M. Demodulation (Phase discriminator/Ratio detector method.)**

   a. Generate FM modulated wave form.
   b. Apply Modulated FM signal to demodulator.
   c. Compare original output with demodulated output.
   d. Plot S-curve

5. **To Construct and Verify Pre-emphasis and De-emphasis and Plot the Waveforms.**

   a. Apply the sinusoidal signal as input signal to pre emphasis circuit.
   b. By increasing the input signal frequency observe the output voltage and calculate gain.
   c. Plot the graph between gain Vs frequency.
   d. Repeat same procedure for de-emphasis circuit.

6. **Study of Amplitude limiter circuit.**

   a. Apply sinusoidal signal.
   b. Find out limiting range of applied input signal.
   c. Draw the graph for same and discussed about result.

Group B

1. **Calculate gain for RF / IF stage with AGC and without AGC.**

   a. Explain concept regarding with and without AGC.
   b. Calculate gain of RF/IF stages with AGC.
   c. Calculate gain of RF/IF stages without AGC

2. **DSB-SC signal generation using balanced modulator.**
   a. Observe that the output is double side band suppressed carrier.
3. **Analyze voltage and waveform at various stages/points in A.M. radio receiver (i.e. Super-heterodyne Radio Receiver).**

   a. Identify the different stages and write down the information about the individual stage.
   b. Observation may be any available information such as number, value, type or any other indication.
   c. Observed and draw waveform of various stages.
   d. Analyze signal each points.

4. PAM modulator & demodulator.

a. Generate pulse amplitude modulated waveform.
b. Observed waveform and made calculation.
c. Detection of modulated waveform.
d. Observed demodulated PAM waveform compute information.

5. PWM modulator & demodulator.

a. Generate pulse width modulated waveform.
b. Observed waveform and made calculation.
c. Detection of modulated waveform.
d. Observed demodulated PWM waveform compute information.

6. PPM modulator & demodulator.

a. Generate pulse position modulated waveform.
b. Observed waveform and made calculation.
c. Detection of modulated waveform.
d. Observed demodulated PPM waveform compute information.

Reference Books:

1. G. Kennedy, B. Davis, "Electronic Communication Systems", Tata McGraw Hill Edition, 4th Edition, 1999.
2. H. Taub, D. L. Schilling and G. Saha, "Principles of Communication Systems", Tata McGraw Hill Edition, 3 rd Edition, 2012.
3. S. Kundu, "Analog and Digital Communication", Pearson, ISBN 978-81-317-3187-1.
4. D. Roddy, J. Coolen, "Electronic Communications", Pearson, 4th Edition, 2011.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

Digital Techniques and Applications

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Digital Techniques and Applications	**DTA**	

Course Description:
In this laboratory course emphasis is on the understanding of combinational and sequential circuit design.

	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Total Semester Credits: 1

Prerequisite Course(s): Knowledge of Basic gates and semiconductor devices.

LAB COURSE CONTENT

(Note: Minimum FOUR Experiments from each group)

Group A

1. **Realization of logic gates OR, AND, NOT, NOR, NAND gates using discrete components and verify their truth tables.**

    a. Apply different combinations of inputs and observe the outputs.
    b. Compare the outputs with the truth tables.

2. **Design of 4 bit Gray to binary Code Converter.**

    a. Prepare the truth table of Gray to binary code.
    b. All the 16 combinations of inputs are given at respective pins
    c. Verify the truth tables of Gray to binary code.

3. **Realization of IC7483 as parallel adder and substractor.**

    a. Apply the inputs toA3 to A0 and B0 to B3.
    b. Check the output sum S3 to S0 and also C4.
    c. For Subtraction, Apply B input through NOT gate, which gives compliment of B.
    d. Verify the truth table of adder/substractor.

4. **Verification of Ex-3 to BCD code conversion using NAND gates.**

    a. Apply the logic inputs to A3 - A0 and B3- B0.
    b. Check the output sum S3 to S0 and also C4.
    c. For Subtraction, Apply B input through NOT gate, which gives compliment of B.
    d. Verify the truth table of adder/substractor.

5. **Verification of 4-Bit Magnitude Comparator using IC7485.**

    a. Feed the 4-bit binary input to A3-A0 and B3-B0.
    b. Observe the output A>B, A=B, and A<B on logic indicators for different combinational input. The outputs must be 1 or 0 respectively.
    c. Verify the truth table of 4-bit comparator.

6. **Design and Implement BCD to 7 Segment display decoder using IC 447/7448.**

    a. Apply BCD Number to Decoder IC.
    b. Observe the output on 7- segment display.

Group B

1. **Verify the truth table of multiplexer and de-multiplexer using ICs.**
    a. Prepare the truth table of multiplexer.
    b. Based on the select line one of the input will be selected at the output.
    c. Observe the output of multiplexer and verify the truth table.

2. **Verify the truth table of J-K, T, and D Flip-flops using ICs.**

    a. Prepare the truth table of flip-flops.
    b. Examine the output of flip-flops and validate the truth table.
    c. Check out the output for J-K flip-flops, when J and k both inputs are at logic “1”.

3. **Design ring and Johnson counter using flip-flops.**

    a. Organize the truth table of ring and Johnson counters.
    b. Apply clock pulses and note the outputs after each clock pulse
    c. Verify the truth table of ring and Johnson counters.

4. **Design decade ripple counter using flip-flops.**

    a. Prepare circuit diagram and make connection as per diagram.
    b. Apply clock pulse.
    c. Monitor the output after each clock pulse and note down the outputs Q_3, Q_2, Q_1, and Q_0.

5. **Realization of Decade counter using IC.**

    a. Apply clock pulse at the clock input
    b. Observe the output at Q_A, Q_B, Q_C, and Q_D.

6. **Design 4-bit UP/DOWN synchronous counter using IC.**

    a. Apply clock pulse at the clock input
    c. Observe the output at Q_A, Q_B, Q_C, and Q_D.

Reference Books:

1. A. Kumar, "Fundamentals of Digital Circuits", PHI, 2nd Edition, 2011.
2. R. Jain, "Modern Digital Electronics", TMH. 4th Edition, 2010.
3. Leach, Malvino, "Digital Principles and Applications", TMH 5th Edition, 2002.
4. J. Wakerly, "Digital Design Principles and Practices", Pearson 2nd Edition, 2009.
5. R. Tocci, "Digital Systems Principles and Applications", Pearson 2nd Edition, 2002.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Second Year Engineering

(E&TC/E&C/Elex/IE)

Faculty of Engineering and Technology

Semester – IV

W.E.F 2013 – 2014

Engineering Mathematics-III

COURSE OUTLINE

Course Title	Short Title	Course Code
Engineering Mathematics-III	**EM-III**	

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	04
Tutorial	01	14	14	

Course Description:
This course provides the elementary level knowledge of n^{th} order Linear Differential Equations, Transforms, Complex Analysis and Vector Calculus. Course includes solution of n^{th} order linear differential equations, Laplace transform, Fourier Transforms, Z-Transform, and Vector Calculus.

Prerequisite Course(s): Engineering Mathematics-I, Engineering Mathematics-II

COURSE CONTENT

Engineering Mathematics-III **Semester-IV**

Teaching Scheme	Examination Scheme
Lecture: 3 hours / week	**End Semester Examination (ESE): 80 Marks**
Tutorial: 1 hour / week	**Paper Duration (ESE) : 03 Hours**
	Internal Sessional Exam (ISE) : 20 Marks

UNIT-I: Linear Differential Equations: No of Lect. – 8, Marks: 16

a. Solution of LDE of order n with constant coefficients.
b. Method of variation of parameters (Only second order).
c. Cauchy's linear equation.
d. Legendre's linear equation.
e. Applications of Linear differential equations to electrical circuits.

UNIT-II: Function of Complex Variable No of Lect. – 8, Marks: 16

a. Analytic functions, Cauchy-Riemann equations.
b. Cauchy's Residue theorem(Without proof)
c. Cauchy's Integral theorem and Cauchy's Integral formula (without proof).
d. Conformal mapping, bilinear transformations.

UNIT-III: Laplace Transform **No of Lect. – 8, Marks: 16**

a. Definition and Existence of Laplace transforms.
b. Laplace Transform of elementary/standard functions.
c. LT of some special functions viz, error, Periodic, Unit Step, Unit Impulse.
d. Theorems & Properties of Laplace Transform (without proof).
e. Inverse Laplace Transform.
f. Applications of LT for Network Analysis.
g. Applications of LT to solution of linear differential equation.

UNIT-IV: Fourier Transform and Z-Transform **No of Lect. – 8, Marks: 16**

A. Fourier Transform:

a. Introduction to Fourier Integral theorem.
b. Fourier Transforms, Fourier Cosine Transforms, Fourier Sine Transform and their inverse.

B. Z- Transform:

a. Definition and standard properties (without proof)
b. Region of Convergence.
c. Z-Transform of standard / elementary sequences.
d. Inverse Z-transform.

UNIT-V: Vector Differentiation **No of Lect. – 8, Marks: 16**

a. Definition, physical Meaning of vector differentiation.
b. Tangential and normal components of acceleration, Radial and transverse components of velocity and acceleration.
c. Vector differential operator (∇)
d. Gradient of Scalar point function.
e. Directional Derivatives of Scalar point function.
f. Divergence and Curl vector field.
g. Solenoidal and Irrotational vector fields.

Reference Books:

1. H. Dass, "Advanced Engineering Mathematics",S. Chand Publication, New Delhi, 2008.
2. E. Kreyszig, "Advanced Engineering Mathematics",Wiley Eastern Ltd, 10th Edition.
3. B. Grewal, "Higher Engineering Mathematics", Khanna Publication, Delhi, 42nd Edition, 2012.
4. C. Wylie, Barrett, "Advanced Engineering Mathematics", McGraw Hill, 6th revised Edition, 1995.
5. B. Raman, "Engineering Mathematics", Tata McGraw Hill, 2007.
6. N. Bali, "A Text Book of Engineering Mathematics", Laxmi Publication, 2004.

Solid State Devices & circuits- II

COURSE OUTLINE

Course Title	Short Title	Course Code
Solid State Devices & circuits- II	**SSDC-II**	

Course Description:

This is an introductory graduate-level course on the various applications of Electronics Circuit. Basic Electronics is an interdisciplinary branch of Engineering and mathematics that deals with the behavior of Various Devices. The goals of the course are to understand the basic principle of various Devices and its application in different area.

Lecture	**Hours / Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	14	42	04
Tutorial	01	14	14	

Prerequisite Course(s): Knowledge of Elements of Electronics Engineering and Solid state devices and circuit I.

COURSE CONTENT

Solid state devices and circuits-II **Semester-IV**

Teaching Scheme	**Examination Scheme**	
Lecture: 3 hours / week	**End Semester Examination (ESE)**	**: 80 Marks**
Tutorial: 1 hour / week	**Paper Duration (ESE)**	**: 03 Hours**
	Internal Sessional Exam (ISE)	**: 20 Marks**

Unit-I: **Waveshaping Circuit** **No of Lect. – 9, Marks: 16**

a) Different Types of Waveshaping circuit- Astable multivibrator, Bistable multivibrator and monostable multivibrator.
b) Analysis of different Time Base circuits – Miller integrator, Bootstraps sweep circuit.
c) Introduction of Differential amplifier, Different modes of Differential amplifier.
d) DC Analysis of Differential amplifier with Re, AC analysis of Differential amplifier.
e) Calculation of CMRR for Balanced & Unbalanced operation, Techniques to improve CMRR of Differential amplifier.
f) Schmitt trigger circuit.

Unit-II: **High frequency model of BJT** **No of Lect. – 8, Marks: 16**

a) Introduction High frequency model of BJT.
b) Behaviour of transistor at high frequency, high frequency CE amplifier π model
c) CE short circuit current gain for π model, Definition and derivation of Fα, Fβ & F_T
d) Introduction to Tuned Circuit, Classification of Tuned amplifier.
e) Circuit diagram, Operation & characteristics of Single Tuned amplifier.
f) Circuit diagram, Operation & characteristics of Doubled Tuned amplifier and Stagger Tuned amplifier.

Unit-III: **Large signal amplifier** **No of Lect. – 8, Marks: 16**

a) Introduction of power amplifier.
b) Need of Power amplifier, Concept of Load Line, Performance parameter of Power amplifier.
c) Classification of power amplifier. DC and AC Analysis of Class A power amplifier with Resistive Load and efficiency calculation.
d) DC and AC Analysis of Transformer coupled Class A power amplifier and efficiency calculation.
e) DC and AC Analysis of Class B Push Pull power amplifier and efficiency calculation, calculation of Maximum output power, Maximum Power Dissipation
f) Working of Class B Complementary power amplifier, efficiency calculation
g) Concept of Crossover distortion, Elimination of Crossover distortion.
h) Analysis of Harmonic distortion (Five point method).

Unit-IV: **Feedback amplifier** **No of Lect. –9, Marks: 16**

a) Introduction of Feedback amplifier.
b) Concept of feedback amplifier, Types of feedback (Positive & Negative feedback), Basic amplifier types.
c) Derivation of gain with feedback. Topology used in feedback amplifier, Classification of Feedback amplifier.
d) Analysis of Voltage series and Current series Negative feedback amplifier with derivations of Ri and Ro.
e) Analysis of Voltage shunt and Current shunt Negative feedback amplifier with derivations of Ri and Ro.

Unit-V: **Voltage Regulator and Oscillator** **No of Lect. – 8, Marks: 16**

a) Introduction of voltage regulator.
b) Block diagram of Regulated power supply, concept of Line and Load regulation, Types of Voltage regulator.
c) Emitter Follower series voltage regulator, Transistorized series voltage regulator.
d) Short circuit protection circuit (Using Transistor and Diode), Fold back protection circuit.
e) Concept of Oscillator, classification of oscillator, Construction, working and Derivation of frequency and hfe of Phase shift, Wien Bridge oscillator.

f) Circuit diagram, working and Derivation of frequency and hfe of Hartley, Colpitts oscillator, Clap oscillator.
g) Crystal oscillator.

Reference Books:

1. R. Boylestad, L. Nashelsky, "Electronics Devices and Circuit Theory", Pearson, 10th Edition, 2009.
2. S. Salivahanan, N Sureshkumar, "Electronics Devices and Circuits" Tata McGraw-Hill, 3rd Edition 2008.
3. B. Singh, R. singh, "Electronics Devices and Circuits", Pearson, 2nd Edition.
4. D. Cheruku, B. Krishna, "Electronics Devices and Circuits", 2nd Edition, Pearson, 2012.
5. Jacob Millman, "Electronis devices and circuits", McGraw-Hill, 1967.
6. S. C. Sarkar, "Electronics Devices and Circuits-I" Everest Publishing House, The Millennium 12th enlarged and revised Edition, 2001.

Microprocessors

COURSE OUTLINE

Course Title	Short Title	Course Code
Microprocessors	**MP**	

Course Description:

Introduction to the basic concepts of microprocessor, assembly language programming and peripheral interface. Course includes instruction set, Machine cycles, assembly language programming, interrupts, sub-routine, stack, call and return for 8085 microprocessor and interfacing of memory Programmable Peripheral Interface, and Programmable Timer/Counter. This course is designed to give a broad understanding of the microprocessor, assembly language programming and peripheral interfaces.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	14	42	03

Prerequisite Course(s): Digital Electronics.

COURSE CONTENT

Microprocessors **Semester-IV**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE): 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: **8085 microprocessor.** **No of Lect. – 8, Marks: 16**

a) Block diagram and operation of microcomputer system.
b) 8085 Microprocessor architecture & operation.
c) Program Counter and Stack pointer and Pin diagram of 8085 microprocessor.
d) De-multiplexing of lower order address bus and generation of control signals.
e) Memory classification, Basic of memory interfacing and Address decoding techniques.
f) Interfacing of memory with 8085 microprocessor. (With interfacing Numerical).

Unit-II: **Instruction set of 8085 microprocessor.** **No of Lect. – 8, Marks: 16**

a) Instruction structure and classification (One/two/three Byte).
b) Machine cycles & Bus Timing: Opcode Fetch, Memory Read, and Memory Write.
c) Instruction Set: Instruction for Data transfer operations and Arithmetic operations.
d) Instruction for Logic operations and Branch operations.
e) Concept of sub-routine.
f) Unconditional Call and Return instruction.
g) Conditional Call and return instructions.

Unit-III: **Assembly Language Programming.** **No of Lect. – 9, Marks: 16**

a) Addressing modes of 8085 microprocessor.
b) Ideal steps for writing assembly language programs and basic of flowchart symbols.
c) Assembly Language Programming on: Data Transfer operations and, Accessing I/O devices.
d) Assembly language programming on Arithmetic operations, Logical operations and Branch operations.
e) Concept and designing of counters and time delay and their assembly language programming.
f) Assembly language programming on subroutines.

Unit-IV: **Stack, Interrupts and Serial I/O of 8085 microprocessor.** **No of Lect. –8, Marks: 16**

a) Stack and stack related instructions.
b) Assembly language programming on string/array related operations.
c) Introduction to Memory mapped I/O and I/O mapped I/O. (Difference Only).
d) The 8085 Interrupt and 8085 vectored Interrupts.
e) Serial I/O lines SID &SOD. Data transfer through SID and SOD lines.

Unit-V: **General Purpose Peripheral Devices.** **No of Lect. – 8, Marks: 16**

a) Internal architecture of 8255-Programmable Peripheral Interface. I/O and BSR Mode of 8255.
b) Interfacing of I/O device using 8255 - Programmable Peripheral Interface.
c) Programmable Interval Timer/ Counter 8254, block diagram, control word register, Modes of 8254.
d) Programming on counter and mode 0-3 (only) of 8254.

References Books:

1. R. Gaonkar, "Microprocessor, Architecture, Programming and Applications with 8085", Penram International Publication, 5th Edition, 2004.
2. B. Ram, "Fundamentals of Microprocessors and Microcomputers", Dhanpat Rai Publication, 6th Edition, 2011(reprinted).
3. Gilmore, "Microprocessors- Principles and application", Tata McGraw Hill.
4. M. Rafiquzzaman, "Microprocessors- Theory and applications: INTEL and MOTOROLA", Revised Edition.

Linear Integrated Circuits

COURSE OUTLINE

Course Title	Short Title	Course Code
Linear Integrated Circuits	**LIC**	

Course Description:

Introduce the basic concepts of operational amplifier, linear & non-linear application of OP-AMP. Course includes basics and designing of various comparator and signal generators using OP-AMP, various data convertors, active filters, PLL and its use for communication applications. This course is designed to give a broad understanding of the operational amplifier, its application in various fields.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): EEEE, SSDC-I.

COURSE CONTENT

Linear Integrated Circuits **Semester-II**

Teaching Scheme

Lecture: 3 hours / week

Examination Scheme

End Semester Examination (ESE): 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: **Operational amplifier:** **No of Lect. – 9, Marks: 16**

a) Ideal op-amp characteristics; schematic development stages of op-amp.
b) Current sources and active loads.
c) Difference, intermediate and output stages including Miller capacitors for frequency computation.
d) Internal circuit of op-amp IC μA741, operational amplifier parameters, offset null techniques of op-amp features.
e) Data sheet interpretation and data sheet study of op-amp IC 741.
f) Measurement of op-amp parameters, effects of real operational amplifier parameters on circuit performance.
g) Frequency response and stability, frequency and phase compensation techniques.

Unit-II: **OP-AMP Applications** **No of Lect. – 9, Marks: 16**

a) Non-inverting amplifier and voltage follower, inverting amplifier.
b) Peak amplifier, ac amplifier, AF amplifier IC LM380.
c) Analog adder, averaging amplifier, integrator, differentiator.
d) Analog computation, basic building blocks, basic linear differential equation.
e) Differential and instrumentation amplifiers using one, two and three op-amps, instrumentation amplifier IC μA725, bridge amplifier.
f) Voltage-to-current and current-to-voltage converters, Analog multipliers, dividers.
g) Log/antilog amplifiers.

Unit-III: **Active filters and Voltage regulators** **No of Lect. – 8, Marks: 16**

a) Active filters: types and response.
b) Analysis and synthesis of first, second and higher order active filters.
c) Butterworth filters all pass filter.
d) Voltage regulators: Series op-amp regulator, IC voltage regulator.
e) Voltage regulator IC μA723 and its applications as positive/negative and fixed/adjustable voltage regulators.
f) Three terminal voltage regulators: positive/negative and fixed/adjustable voltage regulators.
g) Dual tracking regulators; switching regulator: concept and schematic, IC MC1723and its application.

Unit-IV: **Comparators and waveform generation.** **No of Lect. –8, Marks: 16**

a) Comparators: introduction, parameters; op-amp as comparator, comparator IC 710, peak detectors.
b) Waveform generation: Schmitt's trigger, square-triangle wave oscillators, relaxation oscillators and pulse generators.
c) Timer IC 555 and its use as timer circuit and multi-vibrators.
d) Analysis and design of R-C (phase shift, wien bridge) oscillators.
e) Voltage controlled oscillator IC SE/NE566, function generator IC LM 8038.
f) Clippers and clampers; precision rectifiers.

Unit-V: **A/D interface circuits and PLL** **No of Lect. – 8, Marks: 16**

a) A/D interface circuits: Analog to digital (A/D) and digital to analog (D/A) converters.
b) Sample and hold circuits; analog multiplexers.
c) Phase lock loop (PLL): operating principles, lock and capture range.
d) PLL as amplitude and frequency modulation detection, frequency shift keying (FSK) decoder, frequency synthesiser.
e) PLL IC SE/NE565.

Reference Books:

1. D. Choudhari, S. Jain, "Linear Integrated Circuits", New Age International (P) limited,4th Edition, 2010.
2. R. Gayakwad, "Op-amps and Linear Integrated Circuits", Prentice Hall of India, 4th Edition, 2008.
3. K. Botkar, "Integrated Circuits", Khanna Publishers, 10th Edition, 2010.
4. S. Franco, "Design with operational amplifiers and analog integrated circuits", Tata McGraw Hill, 3rd Edition, 2002.
5. J. Wait, L. Huelsman and G. Korn, "Introduction to Operational Amplifier Theory and Applications", McGraw Hill, 2nd Edition, 1991.
6. J. Fiore, "Op-amp and Linear Integrated Circuits Theory and Applications", Delmar Thompson Learning, 1st Edition, 2001.
7. R. Coughlin, F. Driscoll, "Operational Amplifiers and Linear Integrated Circuits", PHI, 6th Edition, 2001.

Network Analysis and Synthesis

COURSE OUTLINE

Course Title	Short Title	Course Code
Network Analysis and Synthesis	**NAS**	

Course Description:

This course introduces the student to Network Analysis & Synthesis. The student will learn to analyze & Synthesize Electric circuits either one port & two port networks. Student will study the different techniques to analyze, synthesize and design of network, analysis of standard signals and learn new synthesis tools also analysis of two port networks using Z, Y, h, ABCD parameters. Student will also learn types of network function. Theory as well as tools for classical & modern filter design. Emphasis have given to the following topics related to network analysis and synthesis, complex frequency, frequency domain concept, properties of LC, RC, and RLC. Pole-zero concepts, design of different types of filters and attenuators.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): knowledge of basic Electrical and Electronics engineering and their concept.

COURSE CONTENT

Network Analysis and Synthesis **Semester-IV**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: **System and Network Functions.** **No of Lect. – 9, Marks: 16**

a. Definition and types of network function with their Numerical.
b. Concept of complex frequency and characteristics of standard signals.
c. Concept of Laplace transform and Laplace transform of basic R, L, and C Component.
d. Network Analysis using Laplace transform with initial condition, Numericals.
e. Concept of Pole and Zero, time-domain behavior from pole-zero plot, concept of residues.

Unit-II: **Frequency Selective Networks.** **No of Lect. – 8, Marks: 16**

a. Concept of resonance, types of resonance, Q-factor and their significance.
b. Series resonance, resonance frequency with derivation, variation of impedance, current with frequency, bandwidth and selectivity, examples.
c. Parallel resonance, resonance frequency, bandwidth and selectivity, examples.

Unit-III: **Two Port Networks Parameters.** **No of Lect. – 8, Marks: 16**

a. Introduction of two port network and their different parameters such as Z, Y, h, ABCD parameter with equivalent circuit
b. Concept of reciprocity and symmetry condition for two port network parameters.
c. Inter connection of two port networks in series, parallel, cascade connection and series-parallel connection.
d. Inter conversion of the parameters, examples on finding the different two port network parameters.

Unit-IV: **Attenuators and Filters**. **No of Lect. – 8, Marks: 16**

a. Concept of Neper and Decibel (dB).
b. Introduction of attenuator, types of attenuator, design of symmetrical 'T' and '**π**' attenuator, examples.
c. Filters fundamentals & Design of different types of filters such as constant K-type Low pass and high pass filter, examples.
d. Design of m-derived low pass and high pass filter, examples. Concept of band pass, band stop filter, terminating half section and concept of composite filter

Unit-V: **Synthesis of Networks**. **No of Lect. – 9, Marks: 16**

a. Hurwitz polynomial and its properties, check Hurwitz criteria by Routh array or continued fraction expansion method, examples.
b. Positive real function and its properties, procedure for testing of positive real function, examples.
c. Synthesis of one port network such as LC, RC, RL with their properties.
d. Synthesis of L-C, R-C, and R-L networks using Foster and Cauer forms, examples.

Reference Books:

1. D. Choudhary, "Network and system", New Age international Publication, 1st Edition, Reprint 2005.
2. A. Sudhakar, S. Palli, "Circuit & Networks Analysis and Synthesis", Tata MH 3rd Edition, 2009.
3. A. Chakraborti, "Circuit Theory (Analysis and synthesis)", Dhanpat Rai Publication, 6th Edition, .2012.
4. B. R. Gupta, "Network Analysis and synthesis", S. Chand and company Ltd., 2010.
5. G. K. Mithal, "Network Analysis", Khanna Publishers, 2000.

Computer Programming-II

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Computer Programming-II	**CP-II**	

Course Description:

This laboratory course emphasis is on the understanding of C programming and open source operating system.

	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	2
Lecture	1	14	14	

Total Semester Credits: 2

Prerequisite Course(s): C Programming and its fundamentals.

LAB COURSE CONTENT

(Note: Group A is **mandatory** and Minimum **EIGHT** practical from B group.)

Group A

1. Installation of Linux (Ubuntu 10.04).with various essential packages
2. Study of basic commands in Linux terminal (Minimum 20 commands)

Group B

Note: Required software is Ubuntu 10.04, gcc

1. Program for sum of digits.
2. Program for reverse number.
3. Program for counting digits in a number.
4. Program for bubble sort.
5. Program for Matrix multiplication.
6. Program for stack operations using switch case.
7. Program for queue using arrays.
8. Program for string operations without using library functions.
9. Program to convert decimal to binary/hexadecimal.
10. Write a Program with Bit wise operations.
11. Write a Program with Right and left Shift Operation.
12. Program to swap two numbers using pointer.
13. Program for implementation of DOS copy/type command using FILE operations and command line arguments.

Reference Books:

1. E. Balagurusamy, "Programming in ANSIC C", Tata McGraw Hill Publications, 4th Edition, 2007.
2. E. Balagurusamy, "Object Oriented Programming with C++", Tata McGraw Hill Publications, 4th Edition, 2008.
3. Y. Kanetkar, "Let Us C", BPB publication, 10th Edition, 2010.

Guide lines for ICA:

The Internal Continuous Assessment shall be based on practical record and knowledge/skill acquired. The performance shall be assessed experiment wise using continuous assessment format A&B.

Linear Integrated Circuits

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Linear Integrated Circuits	**LIC**	

Course Description:

In this laboratory course emphasis is on the understanding of operational amplifier, and its application for various.

	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Total Semester Credits: 1

Prerequisite Course(s): EEEE, SSDC-I

LAB COURSE CONTENT

(Note: Minimum EIGHT Experiments from below list.)

1. **Op-amp parameter measurement: input bias current, input offset current, Input offset voltage, slew rate of op-amp 741).**

    a. Calculation of input bias current, input offset current, input offset voltage, slew rate of op-amp Practically.

2. **Design and test active integrator and differentiator circuits for given Frequency.**

    b. Apply different I/P signals & observe the O/P waveform.
    c. Plot the frequency response.

3. **Study the operation of half wave and full wave precision rectifier**

    a. Observe the I/P & O/P waveforms for both the circuits.

4. **Design and test positive and negative clamper.**

    a. Observe the I/P & O/P waveforms for both the circuits.

5. **Design and test Schmitt trigger circuit for given hysteresis.**

    a. Measure the hysteresis voltage.

6. **Design and test of square wave and triangular and saw tooth wave generator using Op-amp for given frequency.**

    a. Observe the O/P waveforms
    b. Measure the O/P frequency of the circuits.

7. **Design and test timer using IC 555 in monostable and astable mode.**

    a. Observe the o/p waveforms.
    b. Measure the o/p frequency of the circuits.

8. **Design and test function generator using IC 8038.**

    a. Observe the o/p waveforms
    b. Measure the o/p frequency of the different waveforms.

9. **Design and test PLL using IC 565 PLL for given lock and capture range.**

    a. Observe the o/p waveforms.
    b. Measure the lock & capture range.

10. **Design and test audio amplifier using IC LM380 with and without positive feedback.**

    a. Measure the gain of amplifier.

11. **Setup DAC circuit Using IC LM 741 and study its performance.**

    a. Apply the different i/p & measure the o/p voltage.

12. **Setup ADC circuit Using IC LM 741 and study its performance.**

    a. Apply different i/p voltages & observe its digital equivalents.

13. **Design and test second order Butterworth LP / HP filter.**

    a. Plot the frequency response.

14. **Design and test BP Butterworth filter.**

    a. Plot the frequency response.

15. Design and test BR Butterworth filter.

a. Plot the frequency response.

Reference Books:

1. D. Choudhari, S. Jain, "Linear Integrated Circuits", New Age International (P) limited, 4th Edition, 2010.
2. R. Gayakwad, "Op-amps and Linear Integrated Circuits", Prentice Hall of India, 4th Edition, 2008.
3. K. Botkar, "Integrated Circuits", Khanna Publishers, 10th Edition, 2010.
4. S. Franco, "Design with operational amplifiers and analog integrated circuits", Tata McGraw Hill, 3rd Edition, 2002.
5. J. Wait, L. Huelsman and G. Korn, "Introduction to Operational Amplifier Theory and Applications", Tata McGraw Hill, 2nd Edition, 1991.
6. J. Fiore, "Op-amp and Linear Integrated Circuits Theory and Applications", Delmar Thompson Learning, 1st Edition, 2001.
7. R. Coughlin, F. Driscoll, "Operational Amplifiers and Linear Integrated Circuits", PHI, 6th Edition, 2001.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Solid State Devices & circuits -II

LAB-COURSE OUTLINE

Course Title	Short Title & Course Code
Solid State Devices & circuits -II	**SSDC- II**

Course Description:
In this laboratory course emphasis is on the understanding of combinational and sequential circuit design.

	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Total Semester Credits: 1

Prerequisite Course(s): Solid State Devices

LAB COURSE CONTENT

(Note: Minimum FOUR Experiments from each group.)

Group A

1. **Calculation of CMRR of Emitter coupled differential amplifier using Emitter resistance and Compare it with Constant current source circuit.**

    a. Calculate Avd in differential mode operation.
    b. Calculate Avc in Common mode operation.
    c. Compare CMRR in above two methods.

2. **Observe the response of Miller integrator for given i/p.**

    a. Draw input and output waveform of miller integrator.

3. **Measure response of Schmitt trigger circuit for sine wave input.**

    a. Calculation of UTP and LTP.
    b. Observe Hysteresis characteristics.
    c. Draw input and output waveform.

4. **Determine the period and frequency of oscillation for Astable/Monostable Multivibrator**.

a. Draw output waveforms at base and collector of Q1 and Q2.

5. Class B Push Pull amplifier efficiency calculation.

a. Calculate A.C. output power Pac.
b. Calculate D.C. i/p Power Pdc.
c. Calculate efficiency.

6. Class B Complementary Symmetry efficiency calculation and elimination of crossover distortion.

a. Calculate A.C. output power Pac.
b. Calculate D.C. I/P Power Pdc.
c. Calculate efficiency.
d. Observe how to eliminate crossover distortion.

Group B

1. Plot regulation characteristics of Series voltage regulator circuit.

a. Calculate Line regulation.
b. Calculate Load regulation.

2 Plot frequency response of Voltage series/ Voltage shunt feedback amplifier.

a. Compare Voltage gain and Bandwidth for with and without feedback.

3. Calculate Voltage gain Av, input impedance Ri, and output impedance Ro for current series/ voltage series negative feedback amplifier

a. Compare Voltage gain Av, input impedance Ri, and output impedance Ro for current series/voltage series amplifier in with and without feedback.

4. Plot frequency response of Single tuned amplifier.

a. Calculate of resonant frequency and bandwidth.

5. Study of Phase shift, Wien Bridge, Hartley, Colpitts.(Any Two)

a. Calculate theoretical frequency of oscillator using formula.
b. Compare theoretical frequency with fundamental frequency.

6. **Determination of frequency and output voltage of Crystal Oscillator.**

    a. Calculate frequency of oscillator and compare with fundamental frequency of Crystal.

Reference Books:

1. R. Boylestad, L. Nashelsky, "Electronics Devices and Circuit Theory", Pearson, 10th Edition, 2009.
2. S Salivahanan, N Sureshkumar, "Electronics Devices and Circuits" Tata McGraw Hill, 3rd Edition 2008.
3. B.Singh, R. Singh, "Electronics Devices and Circuits", Pearson, 2nd Edition.
4. D. Cheruku, B. Krishna, "Electronics Devices and Circuits", 2nd Edition, Pearson, 2012.
5. Jacob Millman, "Electronis devices and circuits", McGraw-Hill, 1967.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

Network Analysis and synthesis Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Network Analysis and synthesis Lab	**NAS**	

Course Description:

In this laboratory course emphasis is on the understanding of basic electrical circuits. The students can use this knowledge to analyze and synthesize Electrical networks and Design of different filters and attenuators.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Total Semester Credits: 1

Prerequisite Course(s): Course on Basic Electrical and Electronics Engineering..

LAB COURSE CONTENT

(Note: Minimum EIGHT practical's are to be performed.)

1. **Determine transfer / driving point Impedance function of given two port reactive network.**

    a. Measure electrical quantity such as Voltages and currents at different ports of the two ports the network.
    b. Find the Driving point impedance or transfer impedance of given network.
    c. Compare analytical and the practical values.

2. **Determine Pole-Zero plot of given one port reactive network.**

    a. Measure the output current of the one port reactive network with frequency variation.
    b. Calculate impedance by taking ratio of input voltage and measured currents for each frequency value.
    c. Draw the graph of impedance and frequency and find practical values of poles and zeros
    d. Compare analytical and practical values of poles and zeros.

3. **Study of Series and parallel resonance, find BW and Q- factor.**

    a. Measure the current of Series RLC and Parallel RLC resonance circuit with varying frequency.

b. Draw the graph of frequency and currents and find out resonance frequency, bandwidth, and quality factor.
c. Compare the analytical and measured values of the Resonance frequency and Bandwidth.

4. Determine Z parameter of networks connected in series.

a. Determine the open circuit impedance parameters by connecting 2 two ports network in series combination.
b. Measure the voltage and current in network by taking any one port open circuited and take a ratio of voltage to current of different ports of the networks.
c. Compare the analytical and practical values of Open circuit impedance parameters i.e. Z_{11}, Z_{12}, Z_{21}, Z_{22}.

5. Determine Y parameter of networks connected in parallel.

a. Determine the short circuit admittance parameters by connecting 2 two ports networks in parallel combination.

b. Measure the voltage and current in network by taking any one port short circuited and take a ratio of current to voltage of different ports of the networks.
c. Compare the analytical and practical values of short circuit admittance parameters i.e. Y_{11}, Y_{12}, Y_{21}, Y_{22}.

6. Determine transmission parameter of networks connected in cascaded form.

a. Determine the ABCD / Transmission parameters by connecting 2 two ports networks in Cascade combination.
b. Measure the voltage and current in network by taking output one port open circuited and similarly measure the voltage and current by taking output port short circuited take a ratio of voltage to current and current to voltage of different condition i.e. short circuit and open circuit of the networks.
c. Compare the analytical and practical values of ABCD / transmission parameters i.e. $A= V_1/ V_2$, $B=V_1/ I_2$, $C=I_1/ V_2$, $D=I_1/ I_2$.

7. Frequency response of constant k- low pass filters and find out cut of frequency.

a. Design constant K-Low Pass filter with given cut off frequency and given design impedance.
b. Take different readings of V_0 for varying frequency from function generator.
c. Calculate attenuation (α) in dB for each frequency.

d. Plot the graph of attenuation in dB Vs Frequency and determine the cut-off frequency from graph. Compare this practical cut-off frequency with the design value.

8. Frequency response of constant k- high pass filters and find out cut of frequency.

a. Design constant K-High Pass filter with given cut off frequency and given design impedance.
b. Take different readings of V_0 for varying frequency from function generator.
c. Calculate attenuation (α) in db for each frequency.
d. Plot the graph of attenuation in db Vs Frequency and determine the cut-off frequency from graph. Compare this practical cut-off frequency with the design value.

9. Frequency response of m- derived filters and find out cut of frequency.

a. Design m- derived filter with given cut off frequency and given frequency of maximum attenuation, with given design impedance.
b. Take different readings of V_0 for varying frequency from function generator.
c. Calculate attenuation (α) in dB for each frequency.
d. Plot the graph of attenuation in dB Vs frequency and determine the cut-off frequency from graph. Compare this practical cut-off frequency with the design value.

10. Frequency response of band pass filter.

a. Take different readings of V_0 for varying frequency from function generator.
b. Calculate attenuation α in dB for each frequency.
c. Plot the graph of attenuation in dB Vs frequency and determine the cut-off frequency from graph. Compare this practical cut-off frequency with the design value.

11. Design build and test symmetrical T or Π attenuator (plot attenuation Vs RL).

a. Design a symmetrical 'T' attenuator to given attenuation (In dB) to work into a use of given impedance.
b. Apply variable DC input voltage at input with respect to ground, Measure voltage 'Vs' & Measure voltage 'V_R', and calculate value of $N= V_S/ V_R$.
c. Calculate attenuation in dB for each input voltage.
d. Compare measured values and Theoretical values of attenuation.

Reference Books:

1. D. Choudhary, “Network and system”, New Age international Publication.
2. A. Sudhakar, S. Palli, “Circuit & Networks Analysis and Synthesis”, Tata MH 3rd Edition, 2009.
3. A. Chakraborti, “Circuit Theory (Analysis and synthesis)”,Dhanpat Rai Publication,2012.
4. B. R. Gupta, “Network Analysis and synthesis”, S. Chand and company Ltd., 2010.
5. G. K. Mithal, “Network Analysis”, Khanna Publishers, 2000.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

Microprocessors Lab

LAB COURSE OUTLINE

Course Title | Short Title & Course Code

Microprocessors Lab | **MP LAB**

Course Description:

This course is designed to teach students the practical aspects of principles, interfacing and applications of microprocessor architecture, including both hardware and basic assembly language programming using the 8085 Microprocessor.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Total Semester Credits: 1

Prerequisite Course(s): Digital Electronics.

LAB COURSE CONTENT

(Note: Minimum Eight from List)

1. **Addition of two 8 bit numbers.**
   Performing simple arithmetic operations of addition using 8085 Microprocessor.
2. **Subtraction of two 8 bit numbers.**
   Performing simple arithmetic operations of subtraction using 8085 Microprocessor.
3. **Addition of two 16 bit numbers.**
   Performing simple arithmetic operations of addition using 8085 Microprocessor.
4. **Subtraction of two 16 bit numbers.**
   Performing simple arithmetic operations of subtraction using 8085 Microprocessor.
5. **Multiplication of two 8 bit numbers.**
   Performing simple arithmetic operations of multiplication using 8085 Microprocessor.
6. **Division of two 8 bit numbers.**
   Performing simple arithmetic operations of division using 8085 Microprocessor.
7. **Program for block transfer of data bytes.**
   Perform block transfer of data.
8. **To find square of a number using look-up table.**
9. **To find largest/smallest number in array of data.**
10. **Arrange an array of data in ascending/descending order.**
11. **Program to implement decimal up/down counter.**
12. **BCD to Hex / Hex to BCD Conversion.**

13 **Interfacing of 8253/54 Timer with 8085 Microprocessor and generate the square wave.**

14 **Case study of Microprocessor controlled temperature system / microprocessor controlled manufacturing process/ traffic signal controller. (Study only)**

References Books:

1. R. Gaonkar, "Microprocessor, Architecture, Programming and Applications with 8085", Penram International Publication, 5th Edition, 2004.
2. B. Ram, "Fundamentals of Microprocessors and Microcomputers", Dhanpat Rai Publication, 6th Edition, 2011(reprinted).
3. Gilmore, "Microprocessors- Principles and application", Tata McGraw Hill.
4. M. Rafiquzzaman, "Microprocessors- Theory and applications: INTEL and MOTOROLA", Revised Edition.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Third Year Engineering

(E&TC/E&C)

Faculty of Engineering and Technology

COURSE OUTLINE

Semester – V

W.E.F 2014 – 2015

TE Semester – V

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Electronic Circuit Design (TH)	D	3	---	---	3	20	80	---	---	100	3
Communication System-II (TH)	D	3	---	---	3	20	80	---	---	100	3
Microcontrollers & Peripheral Interface Controller (TH)	D	3	---	---	3	20	80	---	---	100	3
Feedback Control System (TH)	D	3	---	---	3	20	80	---	---	100	3
Electromagnetic Engineering (TH)	D	3	--	---	3	20	80	---	---	100	3
Electronic Circuit Design (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Feedback Control System (LAB)	D	---	---	2	2	---	---	25	---	25	1
Communication System-II (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Microcontrollers & Peripheral Interface Controller (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Computer Programming-III (LAB)	B	1	---	2	3	---	---	50	---	50	2
Industrial Training / EDP / Special Study	D	---	---	---	---	---	---	25	---	25	2
Total		**16**	**---**	**10**	**26**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

Note 1: Out of 3 practical ESE heads, at least 1 head should be practical.

TE Semester – VI

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Industrial Economics & Telecom Regulation (TH)	C	3	---	---	3	20	80	---	---	100	3
Power Electronics (TH)	D	3	---	---	3	20	80	---	---	100	3
Electronic Measurement (TH)	D	3	---	---	3	20	80	---	---	100	3
Audio Video Engineering (TH)	D	3	---	---	3	20	80	---	---	100	3
Industrial Management (TH)	C	3	---	---	3	20	80	---	---	100	3
Power Electronics (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Electronic Measurement (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Audio Video Engineering (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Application Software (LAB)	B	---	---	2	2	---	---	25	---	25	1
Minor Project	D	---	---	2	2	---	---	50	---	50	2
Seminar - I	D	---	---	2	2	---	---	25	---	25	2
Total		**15**	**---**	**12**	**27**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

Note 1: Out of 3 practical ESE heads, at least 1 head should be practical.

Electronic Circuit Design

COURSE OUTLINE

Electronic Circuit Design **ECD**

Course Title Short Title Course Code

Course Description:

This course presents the actual concepts of several electronic devices and circuits and the design details, in order to meet a given system specification.

	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**03**	**14**	**42**	**03**

Prerequisite Course(s): A background in basic electronics and circuit theory.

COURSE CONTENT

Electronic Circuit Design **Semester-V**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Design of Power Supplies **No of Lect. – 8, Marks: 16**

a) Design of unregulated power supply (half wave and full wave bridge rectifier with only Capacitor filters)
b) Design of Series Voltage Regulator (with error amplifier), fold back protection circuit. Improvement of Stabilization factor by using Darlington pair for regulator.
c) Design of IC LM317/337 based only adjustable voltage regulator circuits, design of dual tracking power supply using LM317/LM337 with unregulated power supply.
d) Design of switching regulators using IC LM 2575 / 2577 (buck and boost regulators – fixed and adjustable output voltage)

Unit-II: Design of Small Signal Amplifiers using BJT / FET No of Lect. – 8, Marks: 16

a) Design of single stage CE / CS amplifier with biasing circuit.
b) Design of single stage CB / CG amplifier with biasing circuit.
c) Design of Single stage CC/ CD amplifier with biasing circuit.
d) Design of current series negative feedback amplifier using BJT / JFET.

Unit-III: Power and Tuned Amplifiers **No of Lect. – 8, Marks: 16**

a) Design of Class A Amplifier (resistive load and transformer coupled load)
b) Design of Class B amplifier.
c) Design of Class AB amplifier.
d) Design of single tuned amplifier BJT / FET

Unit-IV: Design of Oscillators **No of Lect. – 8, Marks: 16**

a) Design RC and LC Oscillators – RC Phase shift oscillator, Hartley, Colpitts and Clapp oscillator
b) Design of multivibrator - Design of collector coupled Astable multivibrator and collector coupled Monostable multivibrator using BJT
c) Design of UJT relaxation Oscillator, Design of Schmitt trigger using BJT.

Unit-V: Design using Analog Integrated Circuits **No of Lect. – 8, Marks: 16**

a) Design of single supply ac inverting and non-inverting amplifier using IC324.
b) Design of FSK modulator using IC555, Design of ramp generator using IC555
c) Design of V/F and F/V convertors using TC9400
d) Study of different ICs available for digital modulation techniques (PAM, PWM, PPI, ASK, FSK).

Reference Books:

1) Bell - Electronics Devices and Circuits, PHI or Pearson 4/e
2) Goyal, Khetan - Monograph on Electronics Design Principles, Khanna Pub.
3) Rashid – Microelectronics Circuits Analysis and Design, Cenage Learning, 2/e
4) M.M. Shah - Design of Electronics Circuits and Computer Aided Design, New Age Int.
5) Bell – Solid State Pulse Circuits, PHI 4/e
6) Michael Jacob - Application and Design with Analog Integrated Circuits, PHI 2/e
7) Sergio Franco – Design with OP-AMP and Analog Integrated Circuits, TMH, 3/e
8) IC datasheets.

Communication System-II

COURSE OUTLINE

Communication System-II **CS-II**

Course Title Short Title Course Code

Course Description:

This course is aimed at introducing the fundamentals of digital communication to undergraduate students. The background expected includes a prior knowledge of second year course in Communication System-I. The goals of the course are to understand the basic principle of digital communication and application in different era.

Lecture	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Communication System-I.

COURSE CONTENT

Communication System-II **Semester-V**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE): 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Spectra, Probability and Random Variables **No of Lect. –9, Marks: 16**

a) Basic Signal Processing Operation in digital communication
b) Power density spectrum, Energy spectral density
c) Parseval's theorem, Rayleigh Energy theorem
d) Probability and sample space,
e) Random Variables, Random process and Probability Function.
f) Probability Models.

Unit-II: Waveform Coding and Baseband Shaping for Data Transmission **No of Lect. – 8, Marks: 16**

a) Pulse Code Modulation (PCM) & PCM with Noise.
b) Delta Modulation
c) Digital Multiplexing.
d) Discrete PAM Signals and Power Spectra of Discrete PAM Signals.
e) ISI & Nyquist's Criterion for Distortion less Baseband Binary Transmission.
f) Eye Pattern.

Unit-III: Digital Modulation Techniques **No of Lect. –9, Marks: 16**

a) Digital Modulation Formats
b) Coherent Binary Modulation Techniques
c) Coherent Quadrature Modulation Techniques
d) Noncoherent Binary Modulation Techniques
e) M-ary Modulation Techniques
f) Bit Vs symbol Error Probability and Synchronization

Unit-IV: Information and Detection Theory **No of Lect. – 8, Marks: 16**

a) Uncertainty, Information and Entropy
b) Source coding Theory
c) Huffman coding and Discrete Memory less Channels
d) Mutual Information, Channel Capacity and Channel Coding Theory
e) Differential Entropy and Mutual Information
f) Channel Capacity Theorem

Unit-V: Channel Coding **No of Lect. – 8, Marks: 16**

a) Coding introduction, Error probability with repetition in the binary symmetric channel.
b) Linear Block Codes
c) Algebraic Codes
d) Automatic repeat request

Reference Books:

1) S. Haykin, "Digital Communications", Wiley Student Edition, ISBN 9971-51-205-X.
2) A. Carlson, P. Crilly and J. Rutledge, "Communication Systems- An Introduction to Signals and Noise in Electrical Communication", McGraw Hill International Edition, 4th Edition, ISBN 0-07-121028-8.
3) H. Taub, D. Schilling, "Principles of Communication Systems", Tata McGraw Hill, 2nd Edition, 2005, ISBN 0-07-462456-3.

Microcontrollers & Peripheral Interface Controller (PIC)

COURSE OUTLINE

Microcontrollers & PIC	**MC&PIC**	
Course Title	Short Title	Course Code

Course Description:

This course provides an Extensive knowledge about 8051 microcontroller, its programming, interfacing, applications and introduction to PIC.

Lecture	**Hours / Week**	**No. Of Weeks**	**Total Hours**	**Semester Credits**
	03	**14**	**42**	**03**

Prerequisite Course(s): Course on 8085 Microprocessor and Digital Electronics.

COURSE CONTENT

Microcontrollers & PIC **Semester-V**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) :80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: The 8051 Microcontroller **No of Lect. – 8, Marks: 16**

a) Overview of the microcontroller Family, Block diagram description of 8051.
b) Memory and Register organization.
c) Stack and operation of stack. Stack related instructions.
d) Looping, Conditional and Unconditional Jumps, Subroutines, Time delay calculations, CALL and RET Instruction.
e) 8051 pin diagram, understanding the function of each pin.
f) I/O port structure and I/O port programming.

Unit-II: 8051 Programming **No of Lect. – 8, Marks: 16**

a) Addressing Modes in 8051.
b) Instruction set of 8051 microcontroller.
c) Programs based on instructions.

Unit-III: Timer, Serial port and Interrupt programming **No of Lect. – 8, Marks: 16**

a) Structure of Timer mode control register (TMOD register), Mode 1 programming.
b) Generation of large delay, Mode 2 programming
c) Counter programming, Timer control register (TCON register) structure.
d) Serial communication basics, 8051 Serial Port Programming.
e) 8051 interrupts, Interrupts Programming.

Unit-IV: Interfacing **No of Lect. – 9, Marks: 16**

a) Switch interfacing, LED interfacing, LCD interfacing,
b) ADC interfacing, DAC interfacing, Sensors interfacing,
c) Stepper motor, Relay interfacing.
d) DS12887 Real Time Clock (RTC) Interfacing
e) Serial communication protocols Inter Integrated Circuit (I^2C), Serial Peripheral Interface (SPI), MODBUS.

Unit-V: PIC microcontrollers **No of Lect. – 9, Marks: 16**

a) PIC microcontrollers overview and features, PIC 16C6X/7X, PIC 16C6X/7X ALU, CPU registers, status register, File selection register (FSR).
b) Pin Diagram, PIC reset actions, PIC oscillator connections.
c) PIC memory organization
d) PIC 16C6X/7X instructions, Addressing modes, I/O ports, interrupt in PIC 16C61/71, PIC 16C61/71 timers
e) PIC 16C61/71 ADC
f) Introduction to PIC 16F8XX Flash microcontrollers.

Reference Books:

1) M.A. Mazidi, J.C. Mazidi, R.D. McKinlay, The 8051 Microcontroller and Embedded Systems using Assembly and C, Second Edition, Pearson
2) Kenneth Ayala, The 8051 Microcontroller, Third Edition, Delmar Learning, a part of Cengage Learning (India Edition)
3) Ajay Deshmukh, Microcontrollers [Theory and Applications], Tata McGraw hill, New Delhi
4) Mike Predko - Programming and Customizing 8051 micro controller, TMH.
5) N Senthil Kumar, M Saravanan, S Jeevananthan, and Satish Shah- Microprocessors and Interfacing (Series - Oxford Higher Education)

Feedback Control System

COURSE OUTLINE

Feedback Control System **FCS**

Course Title Short Title Course Code

Course Description:

This course provides an introduction to feedback control system covering: basic concept of open loop and close loop system, types of control system and their components, modeling of physical system, transfer function methods. Time response of different order system. Stability method and frequency method such as bode plot, polar plot, Nyquist criterion analysis of state variables and controllers.

	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**03**	**14**	**42**	**03**

Prerequisite Course(s): Knowledge of Mathematics at FE and SE level.

COURSE CONTENT

Feedback Control System **Semester-V**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week **End Semester Examination (ESE) :80 Marks**
Paper Duration (ESE) :03 Hours
Internal Sessional Exam (ISE) :20 Marks

Unit-I: Introduction to control system **No of Lect. – 8, Marks: 16**

a) History and development of Automatic control system.
b) Types of control system & open loop and closed loop system.
c) Transfer function of Block diagram algebra.
d) Masons gain formula and transfer function of signal flow graph.
e) Conversion of Block diagram algebra to Signal flow graph.
f) Conversion of electrical system to Signal flow graph.

Unit-II: Time response and stability of control system **No. of Lect. - 8, Marks: 16**

a) Standard test signals
b) Time response of first and second order system.
c) Steady state error and error constant.
d) Design specifications of second order system.
e) Transient response & its specifications.
f) The concept of stability & Necessary condition of stability
g) Hurwitz stability criterion.
h) Routh stability criterion, Relative stability analysis.

Unit-III: The concepts of Root locus **No of Lect. – 8, Marks: 16**

a) General rule to draw root locus.
b) Construction of root locus.
c) Root counter.
d) Effect of addition of open loop poles.
e) Effect of addition of open loops zeros.
f) Design of lead and lag compensator using root locus.

Unit-IV: Frequency domain analysis **No of Lect. – 8, Marks: 16**

a) Correlation between Time and frequency response.
b) Basics of Magnitude and phase plot.
c) Construction of bode plot.
d) Concept of lead and lag compensator using bode plot.
e) Polar plot.
f) Nyquist stability criterion.
g) Assesment of Relative stability using Nyquist criterion.

Unit-V: state space analysis and controllers. **No of Lect. – 8, Marks: 16**

a) Concept of state (State variable and state model).
b) State model of linear system.
c) Solution of state equation
d) Controllability and observability.
e) Introduction to controller PI, PD and PID.
f) Stepper motor. Servo motor and synchronous motor.

Reference Books:

1) I.J. Nagrath and M. Gopal – Control system Engineering- New age 4th edition.
2) I.J. Nagrath and M. Gopal – Control system Engineering- New age 5h edition
3) Katsuhiko Ogata- Modern Control engineering- Pearson 4th edition.
4) Ashok Kumar- Control system- Tata McGraw Hill Publishing Company.
5) R. Amanda and P. Ramesh Babu- Control system Engineering- SciTech.
6) Smarajit Ghosh – Control systems second edition – PEARSON publishers.

Electromagnetic Engineering

COURSE OUTLINE

Electromagnetic Engineering **EME**

Course Title Short Title Course Code

Course Description:

This course covers the Basics of Electric field & Magnetic field, properties of conductor, properties of dielectric material & concept of capacitor with various structures. Electromagnetic waves as a UPW, Maxwell's equation in static, time varying & free space. This course deals with basics of antenna & parameters.

	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**03**	**14**	**42**	**03**

Prerequisite Course(s): Knowledge of Mathematics at FE and SE level.

COURSE CONTENT

Electromagnetic Engineering **Semester-V**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) :80 Marks
Paper Duration (ESE) :03 Hours
Internal Sessional Exam (ISE) :20 Marks

UNIT-I **No. of Lect. – 8, Marks: 16**

Coulomb's law and electric field intensity: –

a) Review of vector Analysis and coordinate systems.
b) Coulomb's force law & Numerical based on force law.
c) Concept of electric field intensity.
d) Volume charge density, surface charge density, Line charge density
e) Electric field due to point charge, line charge, surface charge, Volume charge. Numerical based on different configuration of charges.
f) Concept of Electric Flux. Relation between flux density & electric field intensity.

UNIT-II **No. of Lect. – 8, Marks: 16**

Gauss's law, Energy and Potential:-

a) Gauss's law, Application of Gauss's law to symmetrical charge distribution.
b) Divergence Theorem.(Statement & Proof)

c) Maxwell's first equation in electrostatics.
d) Work Done, Concept of Potential & Potential Difference.
e) Potential difference in field of point, Line, Surface, Volume charge.
f) Potential gradient, Relation between Potential gradient & Electric filed intensity.
g) Dipole and its electric field, Dipole movement.
h) Energy density in electrostatic field.

UNIT-III **No. of Lect. – 9, Marks: 16**

Conductor, Dielectrics and Capacitance:-

a) Current and current density. Current continuity equation.
b) Properties of conductors.
c) The nature of Dielectric materials.
d) Boundary Condition for perfect Dielectric materials, free space, conductor.
e) Capacitance, Parallel plate capacitor.
f) Calculation of capacitance of various configurations.
g) Poisson's and Laplace's equations.

UNIT-IV **No. of Lect. – 8, Marks: 16**

Magneto statics:-

a) Biot-Savarts law and its vector form.
b) Magnetic field due to finite, infinitely and circular loop long current carrying conductor.
c) Ampere's Circuital law, Point form of Ampere's circuital Law/Curl operator.
d) Stokes theorem.
e) Magnetic flux & Magnetic flux density.
f) Scalar and Vector magnetic potential.
g) Lorentz's Force equation. Energy stored in magnetic field.

UNIT-V **No. of Lect. – 8, Marks: 16**

Time Varying Fields & Uniform Plane Waves:-

a) Maxwell's equations (Differential, Integral and Phasor forms) for time varying, Static & free space.
b) Uniform plane waves, Transformation of UPW from time varying form into Phasor, Vice versa.
c) Representation of wave motion in free space. (Wave equations).
d) Representation of wave motion in perfect dielectrics and Lossy dielectrics.
e) Poynting's theorem & Wave power.
f) Propagation in good conductor and Skin effect.
g) Introduction to antenna basic parameter-Patterns, Beam area, radiation intensity, Beam efficiency, directivity & gain, antenna aperture, Effective height.

Reference Books:

1) Engineering Electromagnetic-William H. Hayt, J A Buck, Tata McGraw Hill Publication. 7th Edition.
2) K. D. Prasad - Antenna and Wave Propagation, Satya Prakashan.
3) Electromagnetics- Schaum's outline series, 2nd edition, Joseph A Edminister, Tata Mc Graw Hill edition.
4) R K Shevgaonkar, "Electromagnetic Waves", 1st Edition, Tata McGraw Hill.

Electronic Circuit Design Lab

LAB COURSE OUTLINE

Electronic Circuit Design Lab **ECD LAB**

Course Title Short Title Course Code

Course Description:

In this laboratory course emphasis is on the hand on design practice and implementation and testing of various circuits (discrete and IC based) in laboratory.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**15**	**30**	**1**

Total Semester Credits: 1

Prerequisite Course(s): A background in basic electronics and circuit theory.

LAB COURSE CONTENT

(Note: Minimum five experiments to be perform)

1. **Design and test discrete series voltage regulator (with error amplifier) with unregulated power supply.**

   a. Design and test of series voltage regulator (using error amplifier).
   b. Using step down transformer, full wave rectifier (using diodes) and capacitor filter, design and test unregulated power supply required for series voltage regulator.
   [Design of series voltage regulator is without protection circuit and max output current 500mA- do not use Darlington pair]

2. **Design and test Inverting /Noninverting amplifier.**

   a. Design and test single stage BJT CE / CC amplifier for given Av, S, Ri, Ro, F_L, Vcc, Q points, R_{LW}, Source resis.
   b. Perform DC and AC analysis find theoretical values and compare it with designed circuit values.
   [Design of single stage (use self-biasing) without feedback CE / CC BJT amplifier]

3. **Design and test of single tuned amplifier using BJT for given center frequency.**

   a. Design of biasing circuit (self bias)
   b. Designing of tuned circuit.
   c. Calculation and verification of f_0 and bandwidth.

4. **Design of Astable Multivibrator using BJT**

    a. Selection of transistor and external components.
    b. Calculation and verification of desired output frequency and amplitude of output signal.

OR

4. **Design and test Schmitt trigger using BJT.**

    a. Selection of transistor and external components for given UTP and LTP.
    b. Calculation and verification of desired UTP and LTP

5. **Design and fabricate any one circuit from Syllabus**

    a. Select the circuit from syllabus (only from Electronic Circuit Design and other than laboratory experiments).
    b. Design the circuit.
    c. Implement and test the designed circuit on Printed Circuit Board. [Maximum group size to conduct this experiment is Four. Implementation must be on PCB. Students have to write report (design, fabrication method and testing results) in their regular Laboratory manual]

All experiments (except Expt No 5), must perform using breadboard only.

Guide lines for ESE:-

ESE will be based on practical assignment submitted by the student in the form of journal. Evaluation will be based on paper work and performance in the practical.

Feedback Control System Lab

LAB COURSE OUTLINE

Feedback Control System Lab	**FCS LAB**	
Course Title	Short Title	Course Code

Course Description:

In this laboratory course student will be familiar with electrical network, motor and lead and lag controller. Also simultaneously student will be familiar about how to find out the Bode, polar & Nyquist plot with the help of MATLAB.

Laboratory	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	2	**15**	**30**	**1**

Total Semester Credits: 1

Prerequisite Course(s): Knowledge of Basic Electronics

LAB COURSE CONTENT

(Note: Minimum FOUR Experiments from each group.)

Group A

1) To Plot the magnitude & phase plot of lead electrical network.
2) To Plot the magnitude & phase plot of lag electrical network.
3) To determine the transient response of RLC electrical network
4) Study of flow control using PID controller.
5) Study of synchronous to observe angular displacement.
6) Study of stepper motor.

Group B

1) Obtain the unit step response of a second order system

a) Zeta= 0.5 and ω_n= 6 rad/sec.
$(S^2+9s+19)/ (s^3+7S^2+14S+8)$

2) Sketch the polar plot of (Unity f/b system)

a) G(s) = 20s/(s+10(s+10)
b) G(s) = 10/s(s+1)(s+2)

3) Sketch the Bode plot for the transfer function (Unity f/b system)

a) G(s) = 1000/s(1+0.1s)(1+0.001s)

b) $G(s)= 10/s(s+1)(s+2)$

4) Sketch the Nyquist plot for the system

a) $G(s)\,H(s) = 60/(s+1)(s+2)(s+5)$

b) $G(s)H(s) = 1/(s^2+0.8s+1)$

5) The open loop transfer function of a servo system with unity feedback is given by $G(s) = 10/(s+2)\,(s+5)$. Determine the damping ratio, undamped natural frequency of oscillation. What is the percentage overshoot of the response to a unit step input?

6)

a) A system has $G(s) = 0.035/s(1+0.5s)(1+0.04s)$ Design a suitable lag compensator to give velocity error constant 27.3 s^{-1} and phase margin =45°

b) The open loop transfer function of a unity feedback system $G(s) = K/s(s+1)(s+2)$ Design suitable lag-lead compensator to achieve the following:
Static velocity error constant = 10 s^{-1}. Phase margin = 50° and Gain margin less than Or equal to 10dB.

Guide lines for ESE:-

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of Group A and Group B. Evaluation will be based on paper work and performance in the practical.

Communication System-II Lab

LAB COURSE OUTLINE

Communication System-II Lab **CS-II LAB**

Course Title Short Title Course Code

Course Description:

This laboratory course is an introduction to the most common techniques that are used to build both analog and digital communication systems using a modern digital signal processing approach. Communication systems are introduced by looking first at baseband transmission methods such as pulse amplitude modulation (PAM) signaling, and pulse code modulation (PCM). The combination of AM, FM, PM and PAM or PCM finally leads to the most commonly used digital modulation systems such as frequency shift keying (FSK), phase shift keying (PSK) and more general 2-dimensional signal constellations using quadrature amplitude modulation (QAM). In the majority of cases the goal of a communication system is to transmit information reliably as fast as possible within a given channel bandwidth and power constraint.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**14**	**28**	**1**

Total Semester Credits: 1

Prerequisite Course(s): Communication System-I.

LAB COURSE CONTENT

(Note: Minimum FOUR Experiments from each group.)

Group A

1. **To generate and detect PCM signal.**

    a. Draw input and output waveform.
    b. From sampled output measure quantization level.
    c. Reconstruct PCM waveform from modulated signal.

2. **To understand waveform of Delta Modulation and Demodulation.**

    a. Observation of effect of slope overload.
    b. Observation of Granular noise and SNR.

3. **To understand waveform of Adaptive Delta Modulation and Demodulation.**

    a. Observation of decreasing effect of slope overload.
    b. Observation of Granular noise and SNR.

4. **To generation and detection of FSK input and output waveform.**

    a. Find the FSK frequency when applied logic '1' and '0'.
    b. Reconstruct same signal at receiving side.
    c. Draw detected input and output waveform on graph.

5. **To generation and detection of PSK input and output waveform.**

    a. Find the PSK phase changing when applied logic '1' and '0'.
    b. Reconstruct same signal at receiving side.
    c. Draw detected input and output waveform on graph.

6. **To generation and detection of ASK input and output waveform.**

    a. Find the ASK measure amplitude when applied logic '1' and '0'.
    b. Reconstruct same signal at receiving side.
    c. Draw detected input and output waveform on graph.

Group B

7. **To generation and detection of QPSK/QAM input and output waveform.**

    a. Observed the OPSK/QAM input and output waveform.
    b. Reconstruct same signal at receiving side.
    c. Draw detected input and output waveform on graph.

8. **To Study different line codes (NRZ, RZ, polar RZ, bipolar(AMI),Manchester)**

    a. Describe representation of each code.
    b. Compare each code and made observation.
    c. Draw given input and output waveform on graph.

9. Noise analysis using any software tool (use of any discrete distribution).Find response by changing parameters. (use any open source software)

10. Noise analysis using any software tool (use of any continuous distribution).Find response by changing parameters. (use any open source software)

11. Execute Shannon Fannon algorithm by using any software tool. .(use any open source software)

12. Execute Huffman coding by using any software tool. (use any open source software)

Guide lines for ESE:-

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of Group A and Group B. Evaluation will be based on paper work and performance in the practical.

Microcontrollers & Peripheral Interface Controller Lab

COURSE OUTLINE

Microcontrollers & PIC	**MC&PIC LAB**	
Course Title	Short Title	Course Code

Course Description:

In this laboratory course emphasis is on the understanding the instruction set of 8051 microcontroller and PIC. It provides comprehensive treatment of 8051 microcontroller along with technical knowhow about PIC family. The students can use this knowledge to analyze and build the embedded system for different applications.

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Laboratory	**2**	**14**	**28**	**1**

Total Semester Credits: 1

Prerequisite Course(s): Course on 8085 Microprocessor and Digital Electronics.

LAB COURSE CONTENT

(Note: Minimum SIX Experiments from group A and TWO experiments from group B.)

Group A

1. Study of 8051 / 8085 assembler and Simulator by writing program for addition and Subtraction.
2. Write and Execute program for multiplication and division.
3. Write and Execute program for Calculation of factorial.
4. Write and Execute program to flash LED.
5. Write and Execute program to interface a switch.
6. Write and Execute program to display 0 to 9 continuously on 7-Segment display.
7. Write and Execute program to demonstrate interfacing of Relay.
8. Write and Execute program to demonstrate interfacing of DAC.
9. Write and Execute program to demonstrate interfacing of ADC.

Group B

10. Write and Execute program to demonstrate interfacing of Stepper Motor.
11. Write and Execute program to demonstrate interfacing of LCD.

12. Two experiments based On PIC 16C6X/7X.
13. Two Experiments to understand the working of serial protocols.

Guide lines for ESE:-

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of Group A and Group B. Evaluation will be based on paper work and performance in the practical.

Computer Programming-III Lab

COURSE OUTLINE

Computer Programming-III Lab **CP-III Lab**

Course Title Short Title Course Code

Course Description:

This course provides an introduction to computer programming Language MATLAB/Scilab covering: Introduction to MATLAB/Scilab; Handling Arrays and Matrices; Programming in MATLAB/Scilab, M-File Scripts; MATLAB/Scilab Functions and Two-Dimensional Plots; Graphical User Interface and Applications of MATLAB/Scilab.

	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**01**	**14**	**14**	**02**
Lab	**02**	**14**	**28**	

Prerequisite Course(s): Knowledge of C Language and logical reasoning.

THEORY COURSE CONTENT

Computer Programming-III Lab **Semester-V**

Teaching Scheme
Lecture: 1 hours / week

Examination Scheme
Internal Continuous Assessment (ICA): 50 Marks

Unit-I: Introduction to MATLAB/Scilab **No of Lect. – 2**

a) Getting Started with MATLAB/Scilab. Command Window, Editor Window, Figure Window, Help Window, Command History Window, Current Directory Window, Workspace Window.
b) Data Types in MATLAB/Scilab, Variables, Keywords, Assignment Statement, MATLAB/Scilab System Variables, Semicolon, and Percentage Sign.
c) Commonly Used System MATLAB/Scilab Commands.

Unit-II: Handling of Arrays and Matrices **No of Lect. – 4**

a) Creating an Array, Accessing Elements of an Array, Regular Arrays, Expanding and Reducing an Array, the Length and Size functions.
b) Array Sorting, Mathematical Operations on Arrays (Addition, Substraction, Multiplication by Scalar, and Multiplication of two arrays).

c) Division of Two Polynomials, Relational and Logical operators on Arrays.
d) Creating a Matrix, Accessing Element of a Matrix, Length and Size of a Matrix.
e) Expanding and reducing the size of a Matrix, Shifting and sorting Matrices.
f) Creating Special Matrices (Identity Matrix, Anti-Identity Matrix, 0's Matrix, 1's Matrix, and Magic Square), Transpose, Determinant and Inverse of a Matrix.
g) Mathematical Operations on Matrices.

Unit-III: Programming in MATLAB/Scilab, M-FILE Scripts **No of Lect. – 4**

a) String Operations, String MATLAB/Scilab Functions, Time and Date Functions.
b) Introduction to M-file scripts, Creating, Saving and Running an M-file.
c) Variables of a Script File, disp function, fprintf function, Reading Input from keyboard, sscanf function.
d) The Conditional Control Statements, Nested Conditional Control Statements.
e) The Loop Control Statements, for loop, while loop.
f) Break, continue and return statement.

Unit-IV: MATLAB/Scilab Functions and Two-Dimensional Plots **No of Lect. – 3**

a) Creating MATLAB/Scilab function file, local and global variable, saving and using function file, Inline functions, Comparison between script files and function files.
b) The plot Command, fplot command, Plotting Multiple Graphs in the same plot.
c) Formatting a plot, plot with Logarithmic axis, histograms, and polar plots.
d) Plotting multiple plots on the same page, Examples of MATLAB/Scilab Applications on plots.

Unit-V: Graphical User Interface and Applications of MATLAB/Scilab **No of Lect. – 3**

a) Introduction to GUI, GUI Development Environment, Creating a Simple GUI.
b) GUI Components: textbox, pushbuttons, toggle button, checkbox, radio button, popup Menus, List box and Slider.
c) Dialog Boxes: Error and warning Dialog Boxes, Input Dialog Box, Question Dialog Box, List Dialog Box, and File Dialog Box.
d) Application: Linear Algebra, Curve Fitting and Interpolation, Numerical Integration, Digital Image Processing, etc.

Reference Books:

1) Stephen J. Chapman, "MATLAB Programming for Engineers", Thomsan Learning, 3rd Edition, 2007
2) Y. Kirani Singh and B.B. Chaudhari, "MATLAB Programming", PHI, 1st Edition, 2010
3) Amos Gilat, "MATLAB An Introduction with Applications", Wiley India, 1st Edition, 2010
4) Rudra Pratap, " Getting Started with MATLAB 7", OXFORD, 1st Indian Edition, 2006
5) www.scilab.org

LAB COURSE CONTENT

(NOTE: minimum 6 practical from group A and 2 practicals from group B)

GROUP A (MATLAB/Scilab)

1. **Study of creation of arrays.**
   a. Create a row vector that has different elements
   b. Create a column vector that has different elements
   c. Create a matrix for given elements.

2. **Study of various operations on matrices**
   a. Create two matrices
   b. Perform arithmetic operations like addition, subtraction, multiplication & division on any two matrices
   c. Prove addition of matrices is commutative and associative
   d. Show matrix multiplication is distributive

3. **To plot sinusoidal, triangular and square signal**
   a. Plot all signals in a given range on same figure with suitable naming.

4. **Compute sampling of continuous time signal.**
   a. Plot continuous time signal
   b. Plot signals for different conditions of sampling and verify sampling theorem
   c. All signals plot on one figure.

5. **To find the pole zero plot of the given network.**

   a. Obtain Transfer function
   b. Calculate poles & zeros of given system
   c. Plot the Plot -Zero plot for given function.

6. **To find the Polar /Nyquist plot of the given network.**
   a. Obtain transfer function
   b. Plot Polar/Nyquist plot for given system

7. **Modeling of any one differential equation**
   a. Select any one differential equation and implement it with the help of simulation

GROUP B (MATLAB/Scilab)

Applications of MATLAB/ Scilab to Electronics Engineering subjects (4 Practicals)

Reference Books:

1) Rudra Pratap, "Getting Started With MATLAB 7: A Quick Introduction For Scientists and Engineers".
2) Amos Gilat , " MATLAB : An introduction with applications, 4th edition.
3) Stephen Chapman - MATLAB programming for Engineer, Thomson.
4) www.scilab.org

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Industrial Training / EDP / Special Study

COURSE CONTENT

Industrial Training / EDP / Special Study	**IT/EDP/SS**	
Course Title	Short Title	Course Code

Semester-V
Total Semester Credits: 02

Examination Scheme
Internal Continuous Assessment (ICA): 25 Marks

Industrial Training

- Student shall undergo industrial training for a minimum period of **two weeks** during summer vacations between fourth semester and fifth semester.
- The industry in which industrial training is taken should be a medium or large scale industry
- The paper bound report on training must be submitted by the student in the beginning of Fifth semester along with a certificate from the company where the student took training.
- Every student should write the report separately.
- Institute / Department/T&P Cell have to assist the students for finding Industries for the training.
- Students must take prior permission from Department before joining for Industrial Training.

OR

EDP (Entrepreneurship Development Program)

- Student has to participate in Entrepreneurship Development Program for a minimum period of **One week** during summer vacations between fourth semester and fifth semester.
- Every student must submit the paper bound report based on the program in the beginning of Fifth semester along with a certificate (Course / Program completion) from the program organizers.
- Every student should write the report separately.
- Institute / Department may arrange Entrepreneurship Development Program at their campus.
- Students must take prior permission from Department before attending any Entrepreneurship Development Program.

OR

Special Study

- Student has to submit name of three topics of his interest to the department.
- Special study in a group shall not be allowed.
- The three-member committee appointed by Head of Department shall allot one topic out of the three topics submitted by the student.
- Every student must submit the paper bound report based on special study at the end of Firth semester.

- Department should allot guide to all such students, for monitoring their progress and guide them for literature survey / report writing etc.
- Evaluation of special study shall be done based on presentation made by student, followed by brief question answer session.

Evaluation of Industrial Training / EDP / Special Study

ICA: The Internal Continuous Assessment shall be based on the active participation of the students in the training / EDP / Special study and based on knowledge / skill acquired by the student. The three-member committee appointed by Head of Department shall assess the reports and award marks based on following:

(a) Report	10 marks.
(b) Presentation	10 marks.
(c) Viva-voce at the time of presentation	05 marks.
Total:	**25 marks.**

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Third Year Engineering

(E&TC/E&C)

Faculty of Engineering and Technology

COURSE OUTLINE

Semester – VI

W.E.F 2014 – 2015

Industrial Economics & Telecom Regulation

COURSE OUTLINE

Industrial Economics & Telecom Regulation **IETR**
Course Title Short Title Course Code

Course Description:

This course includes material from courses in economics, business, and public policy at the graduate level. Additionally, this course has been supplemented with material from investigations and consulting studies at the international level. A wide spectrum of material has been selected, with the purpose of introducing the participants to the important changes that are happening in the telecommunications industry, and the techniques usually used for cost estimations, prices, rates and other elements related to the regulation of telecommunications industry.

Lecture	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
	03	15	45	03

Prerequisite Course(s): General understanding of economics and management.

COURSE CONTENT

Industrial Economics & Telecom Regulation **Semester-VI**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week
End Semester Examination (ESE) :80 Marks
Paper Duration (ESE) :03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Basic concepts in economics **No of Lect. – 9, Marks: 16**

Demand, supply, elasticity of demand and supply, competition, monopoly, oligopoly, monopolistic competition, causes creating categories of monopoly organization, price determination under perfect competition and monopoly, price discrimination, equilibrium of firm under competition and monopoly. Functions of money, supply and demand for money, money price level and inflation, black money, consequences, Meaning, magnitude.

Unit-II: Banking and Taxation system of Country. **No of Lect. –9, Marks: 16**

Function of commercial banks, multiple credit creation, banking system in India, shortcomings and improvement. Central banking: Function of central banking illustrated with reference to RBI,

monitory policy meaning, objectives and features. Sources of public revenue: principles of taxation, direct and indirect taxes, distribution of incidence, tax structure, reform of tax system.

Unit-III: **No of Lect. – 9, Marks: 16**

International Trade and economic crises of 2008, Theory of international trade, balance of trade and payment, theory of protection, tariffs and subsidies, foreign exchange control, devaluation.
Basic concept of management- Planning, organization, communication, Leadership & motivation.
Marketing management and marketing Mix-Product, Place, price and promotion

Unit-IV: Telecommunications Regulation. **No of Lect. – 9, Marks: 16**

-The Task of Regulation, Markets and market failure, The rules of regulation.
-The Framework for Regulation, Legal frameworks, Instruments of regulation, Enforcement, Dangers of regulation and operational aspects.
-Regulatory Strategy and Price Controls, Market strategies/ structures, Engineering and technology.
-Regulation and the Future (John Buckley, Telecommunications Regulation)

Unit-V: **No of Lect. – 9, Marks: 16**

National Telecom Policy 1994,New Telecom Policy 1999, Guidelines For Up linking From India, Broadband Policy 2004, Guidelines For Obtaining License For Providing Direct-To-Home(DTH) Broadcasting Service In India. TRAI Act 1997, Cable Network Act, TRAI Regulation.
ITU's role in global communications.
(http://www.trai.gov.in/Default.asp
http://www.itu.int/net/home/index.aspx
http://www.itu.int/net/about/index.aspx
Black, Telecommunications Law in the Internet Age, 2002, Elsevier)

Reference Books:

1) R Jayaram, Namita R Kotwani, "Industrial Economics and Telecommunication Regulations", PHI
2) John Buckley, Telecommunications Regulation, Institution of Electrical Engineers © 2003, Published by: The Institution of Electrical Engineers, London, United Kingdom. (ISBN:0852964447)
3) John R McNamara, "The economics of innovation in the telecommunications industry", Quorum Books, Newyork.
4) Hank Intven, McCarthy Tetrault, "Telecommunication Handbook"
5) Indian Economy: A.N Agrawal

Power Electronics

COURSE OUTLINE

Power Electronics **PE**
Course Title Short Title Course Code

Course Description:

This course includes power semiconductor-based devices such as SCR, IGBT and related applications. This course is designed to introduce to the students to the basic principles and applications of power semiconductor devices. It includes fundamentals, operation & characteristics of the power devices. This course provides instruction in the theory and application of power devices in the electronics and electrical industry. Emphasis is placed on the physical characteristics and uses of power devices.

Lecture	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): A background in basic electronics and circuit theory.

COURSE CONTENT

Power Electronics **Semester-VI**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Introduction to Power Devices **No of Lect. – 9, Marks: 16**

a) **Silicon Controlled Rectifier (SCR):** Structure, symbolic representation, working principle, two transistor Analogy of SCR, characteristics (Static and Dynamic), Turn-ON methods, Gate triggering circuits of SCR (R,RC,UJT).
b) **Commutation Methods:** Class A, B, C, D, E, F commutation (Circuit diagram, working principle and waveforms)
c) **Protection circuits of SCR:** di/dt and dv/dt protection and Snubber circuit
d) **IGBT, GTO, DIAC, TRIAC:** Structure, symbolic representation, Working principle, characteristics.

Unit-II: Line Frequency Controlled Converters / Rectifiers No of Lect. – 9, Marks: 16

a) **Single phase Half Controlled Bridge Rectifier (R & RL Load)-** Circuit diagram, waveforms, average load voltage, RMS load voltage, average load power, active power, reactive power, current distortion factor, displacement factor, input power factor, efficiency, Ripple factor, Form factor.
b) **Single phase Full Controlled Bridge Rectifier (R&RL Load) -** Circuit diagram, waveforms, average load voltage, RMS load voltage, average load power, active power, reactive power, current distortion factor, displacement factor, input power factor, efficiency, Ripple factor, Form factor.
c) **Three phase half and full controlled converter (R & RL load)** - Circuit diagram, waveforms, average load voltage, RMS load voltage, Average load current, Operating Modes.
d) **Effect of Source Inductance:** 1-Phase and 3-Phase Fully controlled Rectifier

Unit-III: DC – DC Converter No of Lect. – 7, Marks: 16

a) Classification of Choppers, Control strategies of dc - dc- converter
b) **Step down and Step up dc-dc converter**- Circuit diagram, waveform, and output voltage calculations. Continuous conduction mode, Boundary between continuous and discontinuous conduction Mode and Discontinuous Conduction Mode.
c) **Full Bridge dc-dc converter**: PWM with Bipolar voltage switching (Derivation of output voltage.)
d) **Switch mode power supply**: Block diagram and explanation.

Unit-IV: Inverters No of Lect. – 8, Marks: 16

a) **Inverters:** Basic Series and Parallel inverters, construction and principle of operation,
b) **Square and PWM Bridge Inverters:** Single phase half bridge and full bridge inverters with R and R-L load, output voltage calculations. Square wave, quasi-square wave and sinusoidal PWM switching, selection of frequency modulation ratio and amplitude modulation ratio.
c) **Harmonic reduction Techniques**.
d) **Three phase Bridge inverter**: with balanced star resistive load, 120 degree and 180 degree conduction mode for line and phase voltages.

UNIT V: AC Controllers, UPS and simulation of converters No of Lect. – 9, Marks: 16

a) **AC controllers**: Principle of On-Off control or integral cycle and phase angle control**.**
b) 1-Phase Half wave and full wave AC control with R and R -L load, derivation of output Voltage.
c) UPS- Basic principle, Different configurations/ types of UPS – Off-line On-line, Line Interactive, their comparison. , Battery- Ah, back up time and battery charger rating calculations.
d) Simulation of single phase full converter, single phase semi converter, single phase full bridge inverter, single phase AC voltage controller.

Reference Books:

1) Ned Mohan, T. M. Undeland and W. P. Robbins- Power Electronics, converters , Application, and Design, John Wiley and sons , (3rd Edition)
2) M. D. Singh , K. B. Khanchandani - Power Electronics, TMH (3rd Edition)
3) M. H. Rashid - Power Electronics circuits, devices and applications, PHI, 3/e. Or Pearson.
4) Dr. Shailendra Jain, Modeling and simulation using MATLAB-Simulink, Wiley India pvt.Ltd.
5) P. C. Sen Power Electronics Tata Mc-Graw-Hill Publishing Company Limited.
6) Dr. P. S. Bimbhra, Power Electronics, Khanna Publication.
7) M Ramamurthy - An Introduction to Thyristor and their application, Second Edition,
8) M. S. Jamil Asgar, - Power Electronics, PHI, 2004, New Delhi.
9) S. K. Bhattacharya - Industrial Electronics and control , Tata Mc-Graw-Hill (TMH)
10) Deodatta Shingare, Industrial and Power Electronics, Electrotech Pub.
11) MATLAB-SimPowerSystem manuals.

Electronic Measurement

COURSE OUTLINE

Electronic Measurement **EM**
Course Title Short Title Course Code

Course Description:

The main objective of this course is to introduce and expose the students to various measuring instrument, their block diagram, specifications and applications. It includes analog instruments, digital instruments, generators, analyzers, and C.R.O. & data acquisition system.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	14	42	04

Prerequisite Course(s): Knowledge of Elements of Electrical & Electronics Engineering and Component Devices and Instrumentation Technology.

COURSE CONTENT

Electronic Measurement **Semester-VI**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week **End Semester Examination(ESE) : 80 Marks**
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Analog instruments: **No of Lect. – 8, Marks: 16**

a) Q-meter.
b) True RMS responding voltmeter.
c) Vector voltmeter.
d) Vector impedance meter.
e) Bolometer -Measurement of power.
f) Field strength meter.
g) Automatic bridges.

Unit-II: Digital Instruments **No of Lect. – 8, Marks: 16**

a) Digital Frequency Meter.
b) Digital measurement of time.
c) Universal Counter , Electronic Counter.
d) Digital tachometer, Digital PH meter.
e) Phase meter, Capacitance meter.
f) Automation in digital instruments.

Unit-III: Signal Generators and Analyzers **No of Lect. – 9, Marks: 16**

a) Frequency synthesized signal generator,
b) Random noise generator,
c) Sweep generator, TV Sweep generator, Marker generator, Wobbluscope.
d) Vectroscope,
e) Optical Time-Domain Reflectometer.
f) Frequency selective wave analyzer, Heterodyne wave analyzer.
g) Harmonic distortion analyzer.
h) Spectrum analyzer and its applications.

Unit-IV: Oscilloscope **No of Lect. – 9, Marks: 16**

a) Block diagram of CRO, vertical amplifier, horizontal deflecting systems, triggered sweep and trigger pulse circuit.
b) Delay line and its types.
c) Dual beams CRO, dual trace CRO.
d) Sampling (VHF) oscilloscope, storage oscilloscope and digital read out oscilloscope.
e) Probes for CRO
f) Digital storage oscilloscope

Unit-V: Data Acquisition, Conversion and Transmission **No of Lect. – 8, Marks: 16**

a) Generalized Data Acquisition System, Objectives of DAS, single channel and multi channel DAS.
b) Data loggers.
c) Digital Transducer
d) Data transmission systems, advantages and disadvantages of digital over analog transmitter, TDM.
e) The IEEE 488 bus.
f) Testing of audio amplifier and radio receiver.

Reference Books:

1) H. S. Kalsi, "Electronic Instrumentation", TMH, 2nd Edition, 2007.
2) A. D. Helfric and W. D. Cooper, "Modern Electronic Instrumentation and Measurement Technique", Pearson LPE, 3rd Edition, 2005.
3) A. K. Sawhney, "Electrical and Electronics measurement and Instrumentation", Dhanpat Rai and company, 18th Edition, 2007.
4) K. Lal Kishore, "Electronic Measurement and Instrumentation", Pearson 4th, Edition, 2012.

Audio Video Engineering
COURSE OUTLINE

Audio Video Engineering **AVE**
Course Title Short Title Course Code

Course Description:

This course introducing the fundamentals of Television and Consumer Electronic to undergraduate students. As the follow-up to this course, the reader is advised to the access to this course "Colour television –principal and practices" for further information on CTV principles, detailed coverage of integrated circuits used in color receiver and for alignment and servicing of such receivers.

	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	03	15	45	03

Prerequisite Course(s): Physics, Analog Communication, Digital Communication, Electromagnetic Engineering.

COURSE CONTENT

Audio Video Engineering **Semester-VI**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) :80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Methods of sound recording and reproduction No of Lect. – 9, Marks: 16

a) Introduction to Disc recording, Magnetic recording, optical recording-CD and DVD.
b) Monophony, stereophony, Hi-Fi (High Fidelity) System.
c) PA system-Basics of aquatics, Block diagram, requirement, Characteristics, its planning for various uses.
d) Introduction to satellite radio reception (word space).
e) Introduction to blue ray disc format.

Unit-II: Basic concept of Television. No of Lect. – 9, Marks: 16

a) Scanning methods, Horizontal and vertical synchronization.
b) Camera Tubes-Image Orthicon, Vidicon, Plumbicon, Saticon, Silicon Diode array.
c) Aspect ratio, Kell factor.
d) Horizontal and vertical resolution.
e) Video bandwidth, Positive and negative modulation, Composite video signal.
f) Television Transmission-VSB transmission, TV Channels, TV Standard, TV Channels bands.
g) Basic block diagram of Monochrome TV receiver.

Unit-III: Colour Television receiver **No of Lect. – 9, Marks: 16**

a) Colour fundamental, compatibility, frequency interleaving.
b) Colour mixing, color camera tube. Colour purity.
c) Picture tubes-Static and dynamic convergence.
d) Encoder and decoder and colour different signals comparison.
e) Different system concepts-PAL, SECAM, NTSC system.
f) Colour TV transmitter and receiver block diagram.

Unit-IV: Advanced TV system and techniques **No of Lect. – 9, Marks: 16**

a) Introduction to digital compression techniques.
b) Introduction to JPEG, MPEG techniques.
c) Block diagram of Digital TV-transmitter and receiver.
d) Introduction to Advanced Display, Plasma, LCD, LED, Organic LED.
e) Introduction to HDTV (high-definition TV) transmitter and receiver.

Unit-V: Advanced Broadcasting systems **No of Lect. – 9, Marks: 16**

a) Introduction to digital cable TV conditional access system (CAS).
b) DTH system, Video on demand.
c) Introduction to 3D DTV system, CCTV, digital terrestrial TV (DTV).
d) Introduction to IPTV and mobile TV.
e) Block diagram and working of FAX Machine.

Reference Books:

1) A.M.Dhake-TV and Video Engineering,TMH
2) R. G. Gupta - TV Engineering and Video system , TMH
3) Kelth Jack - Video Demisified , Penram International
4) S. P. Bali - Colour TV Theory and Practice , TMH
5) R.Gulati - Monochrome and colour TV 4th edition , New Age
6) Bernard Grobb, Charles E - Basic TV and Video system, TMH (6Th Ed.)
7) Philips handbooks on audio ,video and consumer electronics application notes
8) Olson-High Quality Sound recording and reproduction

Industrial Management

COURSE OUTLINE

Industrial Management	**IM**	
Course Title	Short Title	Course Code

Course Description:

This course provides an introduction to: basics of management their organizational structures with man power development, financial management, quality management & industrial acts.

Lecture	**Hours / Week**	**No. Of Weeks**	**Total Hours**	**Semester Credits**
	03	**15**	**45**	**03**

Prerequisite Course(s): General understanding of trade and management

COURSE CONTENT

Industrial Management **Semester-VI**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week **End Semester Examination (ESE):80 Marks**
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Basics of Managements **No of Lect. – 9, Marks: 16**

a) Introduction, definition of management,
b) Scientific management.
c) Function of management.
d) Principles of managements.
e) Level of management, managerial skill/roles.
f) Relation between administration, management and organization.

Unit-II: Organizational Structures **No of Lect. – 9, Marks: 16**

a) Principles of organization. Design of organization.
b) Forms of organization-Line, Lines and staff.
c) Types of ownerships-Partnership, proprietorship
d) Joint stock Company, private limited, Govt. ltd, public limited.
e) Cooperative organization.
f) Public sector and joint ventures.

Unit-III: Personal Management **No of Lect. – 9, Marks: 16**

a) Factors affecting man power planning.
b) Sources of recruitment. Talent acquisition.
c) Education & training methods of training workers.
d) Labor welfare, communication in Industries
e) Suggestion system, discipline in industries.
f) e-business& e-governances.

Unit-IV: Financial management **No of Lect. – 9, Marks: 16**

a) Definition & function of Financial Management
b) Capital Structure. Fixed & working capital. Role of SEBI (Securities & exchange Board of India).
c) Sources of Finance. Loans from Banks. Trade credit. Public deposits.
d) Wants, utility, Demand.
e) Supply, Elasticity of demand & Supply.

Unit-V: Quality management & Industrial Acts. **No of Lect. – 9, Marks: 16**

a) Definition of quality, quality control.
b) Process control. Total quality concepts
c) ISO 9001-2000.
d) Factories Act, industrial accidents, industrial safety.
e) Rights patents, trademarks, copy rights.

Text Book: 1) M. Mahajan: Industrial Engineering & Production Management, Dhanpat Rai& company.

Reference Books:

2) O. P. Khanna: Industrial Engineering & Management, Dhanpat Rai& company.
3) Koontz: Essential of Management, TMH6/e.
4) M.Y.Khan&P.K.Jain : Financial Management, TMH.

Power Electronics Lab

LAB COURSE OUTLINE

Power Electronics Lab	**PE LAB**	
Course Title	Short Title	Course Code

Course Description:

In this laboratory course emphasis is on the understanding of different Power semiconductor devices and their applications like controlled rectifiers, choppers, inverters and ac regulators.

Laboratory	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	2	**14**	**28**	**1**

Total Semester Credits: 1

Prerequisite Course(s): Knowledge of Elements of Electrical & Electronics Engineering.

LAB COURSE CONTENT

(Note: Minimum TWO Experiments from each group.)

Group A

1. Study of R, RC triggering circuits of SCR to plot waveforms for various values of firing angle.
2. Study of UJT triggering circuits of SCR to plot waveforms for various values of firing angle.
3. Study and design of Class A, B, C, D, E and F commutation circuits of SCR.(Any two)

Group B

1. Study of 1 - ϕ Half controlled Bridge rectifier with R and RL Load, plot input and output voltage waveforms, average load voltage v/s firing angle.
2. Study of 1- ϕ full controlled converter with R and R-L load, plot input and output voltage waveforms, average load voltage v/s firing angle.
3. Study of 1- ϕ full controlled Bridge converter with R and R-L load, plot input and output voltage waveforms, average load voltage v/s firing angle.

Group C

1. Study of circuit and waveforms of step-up dc –dc converter and plot output voltage v/s duty ratio and switching frequency.
2. Study of circuit and waveforms of step-down dc –dc converter and plot output voltage v/s duty ratio and switching frequency.
3. Study of SMPS.

Group D

1. Study of Series Inverter and find efficiency.
2. Study of Parallel Inverter and find efficiency.
3. Simulation of single phase full converter, development of model, plotting the waveform on figure and FFT analysis (use MATLAB/Scilab - SimPowerSystem Software).
4. Simulation of single phase full bridge inverter, development of model, obtain frequency spectrum using powergui block (use MATLAB/Scilab - SimPowerSystem Software).

Group E

1. Study and plot V-I characteristics of Diac/Triac/GTO/IGBT(any one).
2. Study of 1- ϕ AC controller with R load and measure load voltage and plot waveforms for different firing angles.
3. Study of UPS.

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 10. Evaluation will be based on paper work and performance in the practical.

Electronic Measurement Lab

LAB COURSE OUTLINE

Electronic Measurement Lab — Course Title

EM LAB — Short Title Course Code

Course Description:

In this laboratory course emphasis is on the understanding of different instruments front panel of Q meter, true RMS meter, Universal Counter, CRO, DSO, Data logger and Distortion factor meter etc. The students can perform different measurements using these instruments.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	14	28	1

Total Semester Credits: 1

Prerequisite Course(s): Knowledge of Elements of Electrical & Electronics Engineering and Component Devices and Instrumentation Technology.

LAB COURSE CONTENT

(Note: Minimum FOUR Experiments from each group.)

Group A

1. Measurement of reactive and resistive components with LCR-Q meter.
2. Measurement of Vrms signal with true RMS meter / DMM.
3. Measurement of frequency and Time with the help of frequency counter.
4. Measurement of motor speed using Digital Tacho meter.
5. Measurement of various parameters with DATA logger.
6. Measurement of Phase angle with the help of Digital Phase Meter.

Group B

7. Measurement of frequency and phase shift using Lissajous pattern and testing of different components using CRO.
8. Measure and store the frequency and amplitude with the help of DSO.
9. Measurement of distortion and nature of distortion by Harmonic distortion analyzer.

10. Computerized analysis of radio receiver and measurement of power with it.
11. Analysis of test signal with the help of Spectrum analyzer.
12. Measurement of distance with OTDR meter.

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

Audio Video Engineering Lab

LAB COURSE OUTLINE

Audio Video Engineering Lab	**AVE LAB**	
Course Title	Short Title	Course Code

Course Description:

This course introducing the fundamentals of Audio Video Engineering to undergraduate students. As the follow-up to this course, the reader is advised to the access to this course "Colour television –principal and practices" for further information on CTV principles, detailed coverage of integrated circuits used in colour receiver and for alignment and servicing of such receivers.

Laboratory	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	2	**8**	**16**	**1**

Total Semester Credits: 1

Prerequisite Course(s): Physics, Analog Communication, Digital Communication, Electromagnetic Engineering.

LAB COURSE CONTENT

(Note: Minimum FOUR Experiments from each group.)

Group A

1. Study of colour TV receiver.
2. Voltage and waveform analysis for colour TV.
3. Alignment and fault finding of colour TV using pattern generator (2 expts.).
4. Study of HDTV .
5. Study of digital TV.
6. Practical visit to TV transmitter/Studio.

Group B

1. Study of DTH and set of box.
2. Study of CD/DVD players.
3. Study of PA system with cordless microphone .
4. Study of audio system ,MP3 player ,satellite radio(Tone controlled).
5. Study of tape recorder.
6. Web page designing.

Guide lines for ESE:-

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of Group A and Group B. Evaluation will be based on paper work and performance in the practical.

Application Software Lab

COURSE OUTLINE

Application Software Lab Course Title | **AS LAB** Short Title | Course Code

Course Description:

This laboratory course emphasis is on the understanding of the open source Electronics Design Automation (EDA) tool like gEDA, KiCad, Ngspice and Oscad. But only Oscad is capable of doing circuit design, simulation and layout design together. Oscad is free and open source EDA tool and that can be i installed on Ubuntu 12.04 / 12.10 or windows operating system. Using Oscad student can create circuit schematic, analyze the result using simulation, and design PCB layout.

	Hours per	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**10**	**20**	**1**

Total Semester Credits: 1

Prerequisite Course(s): Basic of analog and digital electronics.

LAB COURSE CONTENT

(Note: Minimum FOUR Experiments from each group.)

Group A

1. **Installation of Oscad on Ubuntu 12.04 /12.10 and windows.**

   a. Compare open source, free version and license version operating system.
   b. Find the steps to install Open source Oscad on Ubuntu 12.04 / 12.10 and windows operating system.

2. **Study of Architecture of Oscad.**

   a. Describe the meaning of Electronic Design Automation (EDA) tool.
   b. Describe the advantages and disadvantages of Oscad.
   c. Use of Oscad in circuit making, simulation and PCB design.

3. **Study of schematic creation, simulation and PCB design.**

   a. Describe the steps to use Oscad in schematic creation, simulation and PCB design on Ubuntu or on windows operating system.
   b. Describe the procedure of AC and DC analysis.

4. **Simulation of typical circuit using a) R C b) Diode.**

   a. Develop circuit consist of RC network.
   b. Find voltage and current at each node of circuit and compare with the theoretical calculated value.
   c. Develop circuit consist of diode. Measure voltage and current of diode.
   d. Compare simulated result with the theoretical calculated values.

5. **Simulation of typical circuit using a) Transistor b) MOSFET**

   a. Describe operation and construction simple transistor amplifier.
   b. Simulate the circuit and find I_B, I_C, I_E, and V_{CE}.
   c. Compare simulated result with theoretical calculated values.
   d. Describe operation and construction of simple MOSFET based circuit.
   e. Compares all simulated node voltage and current with theoretical calculated values.

Group B

6. **Simulation and PCB design of typical circuit using IC 555.**

   a. Identify the timer 555 IC pin configuration and its use.
   b. Draw the typical circuit using timer 555 IC.
   c. Find out the time when output is high using RC combination.
   d. Find out the steps to create PCB layout.

7. **Simulation and PCB design of typical circuit using Op-Amp 741 IC.**

   a. Identify the Op-Amp 741 pin configuration and its use.
   b. Draw Inverting or Non-Inverting amplifier using IC 741.
   c. Find out the output voltage and gain of Op-Amp.
   d. Compare the simulated and theoretical calculated values.
   e. Create PCB layout.

8. **Simulation and PCB design of typical circuit using 74xx series IC.**

   a. Describe various IC available in 74xx series
   b. Draw the circuit using 74xx series and verify the truth table.
   c. Create PCB layout.

9. Simulation and PCB design of typical circuit using two stage amplifiers.

a. Describe operation and construction of simple two stage transistor amplifier circuit.
b. Simulate the circuit and find I_B, I_C, I_E, and V_{CE}.
c. Find the AC analysis and compare input and output wave form.
d. Compare simulated result of I_B, I_C, I_E, and V_{CE} of each transistor with theoretical calculated values.
e. Create PCB layout.

10. Simulation and PCB design of simple DC power supply. (DC power supply circuit include transformer- rectifier-filter- regulator.)

a. Draw and describe circuit diagram of simple DC power supply.
b. Describe the use of DC power supply.
c. Measure the voltage and current at each stage of circuit.
d. Create PCB layout.
e. (**Optional**- Implement DC power supply circuit on single side copper clad PCB and compare the all node voltage and current with simulated results).

Reference book-

1) **Oscad**- An open source EDA tool for circuit design, simulation, analysis and PCB design. By "**Kannan M. Moudgalya , IIT Bombay**", Shroff Publication and distributors Pvt. Ltd.
2) **http://oscad.in**

Guide lines for ESE:-

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of Group A or Group B. Evaluation will be based on paper work and performance in the practical.

Minor Project

COURSE CONTENT

Minor Project	**MIP**	
Course Title	Short Title	Course Code

Semester-VI

Laboratory	**Hours per**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	2	**10**	**20**	**2**

Examination Scheme
Internal Continuous Assessment (ICA): 50 Marks

- Every student shall undertake the Minor Project in semester VI.
- Each student shall work on an approved project, a group of **05 students (maximum)** shall be allotted for the each minor project.
- Minor project may involve fabrication, design or investigation of a technical problem that may take design, experimental or analytical character or combine element of these areas. The project work shall involve sufficient work so that students get acquainted with different aspects of fabrication, design or analysis.
- Each student is required to maintain separate log book for documenting various activities of minor project.
- The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of minor project. Maximum four minor project groups shall be assigned to one teaching staff.
- Assessment of the project for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-A.**
- Before the end of semester, student shall deliver a seminar and submit the seminar report (paper bound copy)in following format:
    - Size of report shall be of minimum 25 pages.
    - Student should preferably refer minimum five reference books / magazines/standard research papers.
    - Format of report
        - Introduction.
        - Literature survey.
        - Theory (Implementation, Methodology, Applications, Advantages, Disadvantages. etc)
        - Future scope.
        - Conclusion.

Assessment of Minor Project

Name of the Project: _____

Name of the Guide: _____

Table-A

SN	Exam Seat No	Name of Student	Project Selection	Documentation	Design /Simulation/Logic	PCB/hardware/programming	Result Verification	Presentation	Total
			5	10	10	10	10	5	50

Seminar-I

COURSE CONTENT

Seminar-I	**S-I**	
Course Title	Short Title	Course Code

Semester-VI

Laboratory	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	2	**10**	**20**	**2**

Examination Scheme
Internal Continuous Assessment (ICA): 25 Marks

1. For Seminar-I every student will individually study a topic assigned to him / her and submit a report and shall deliver a short lecture / Seminar on the topic during the term.
2. The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Seminar-I. Seminar shall be related state of the art topic of his choice approved by the committee.
3. Seminar topic should not be repeated and registration of the same shall be done on first come first serve basis.
4. Topic of Seminar shall be registered within a two week from commencement of VI Semester and shall be approved by the committee.
5. Maximum six seminar supervision shall be allotted to each teacher.
6. Before the end of semester, student shall deliver a seminar and submit the seminar report (paper bound copy).

7. ASSESSMENT OF SEMINAR-I

Assessment of the Seminar-I for award of ICA marks shall be done by the guide and a departmental committee jointly, as per the guidelines given in **Table- B**

Title of Seminar: _____

Name of Guide: _____

Table-B

SN	**Exam Seat No**	**Name of Student**	**Topic Selection**	**Literature survey**	**Report writing**	**Depth of understanding**	**Presentation**	**Total**
			5	5	5	5	5	25

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

BACHELOR OF ENGINEERING (B.E.)

(FINAL YEAR)

ELECTRONICS AND COMMUNICATION,

ELECTRONICS AND TELECOMMUNICATION

TERM – I and II

W.E.F 2008 - 2009

NORTH MAHARASHTRA UNIVERSITY, JALGAON
STRUCTURE OF TEACHING AND EVALUATION
B.E. (ELECTRONICS and COMMUNICATION / ELECTRONICS and TELECOMMUNICATION)

FIRST TERM

W.E.F. 2008-09

SR.No.	Subject	Teaching Scheme Hours / Week			Examination Scheme				
		Lectures	Tutorial	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Radiation and Microwave Technology	4	-	2	3	100	25	25	-
2	* Fiber Optic Communication	4	-	2	3	100	25	-	-
3	* Digital Signal Processing and Processors	4	-	2	3	100	-	25	-
4	* Computer Communication Networks	4	-	-	3	100	25	-	-
5	Elective - I	4	-	2	3	100	25	25	-
6	* Project - I	-	-	2	-	-	25	-	25
7	* Seminar	-	-	2	-	-	25	-	-
	Total	**20**		**12**		**500**	**150**	**75**	**25**
	Grand Total	**32**			**750**				

SECOND TERM

SR. No.	Subject	Teaching Scheme Hours / week			Examination Scheme				
		Lectures	Tutorial	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Telematics	4	-	2	3	100	25	-	25
2	Television and Consumer Electronics	4	-	4	3	100	25	25	-
3	Satellite communication	4	-	2	3	100	25	-	-
4	Elective -II	4	-	2	3	100	25	25	-
5	* Industrial Visit / Case Study	-	-	-	-	-	25	-	-
6	* Project - II	-	-	4	-	-	100	-	50
	Total	**16**	**-**	**14**		**400**	**225**	**75**	**50**
	Grand Total	**30**			**750**				

*** Common with B.E. (Electronics Engineering)**

ELECTIVE I	i) Data Communication and Design
	ii) * Biomedical Instrumentation
	iii) System Programming
	iv) * VLSI Design
	v) Broad band Communication

ELECTIVE II	i) * Embedded System
	ii) * Digital Image Processing
	iii) * Neural Network and Fuzzy systems
	iv) Telecomm. Network Management
	v)Nanotechnology

NORTH MAHARASHTRA UNIVERSITY JALGAON
B.E. (ELECTRONICS AND COMMUNICATION, ELECTRONICS AND TELECOMMUNICATION)

W.E.F : 2008- 09

TERM - I
RADITATION AND MICROWAVE TECHNIQUES

Teaching scheme:
Lectures: 4 hrs / week
Practicals: 2 hrs / week

Examination scheme:
Theory Paper : 100 Marks (3 Hours)
Practical : 25 Marks
Term Work : 25 Marks

UNIT I

Guided waves and Transmission lines : Transmission line parameter, Transmission line equation, Transmission coefficient, reflection coefficient, Impedance matching, quarter wave transmission line, single stub, double stub matching (Analytically and using Smith chart), Solution of quarter wave transformer and single stub by using smith chart only

Electromagnetic Theory: Maxwell's Equation, Uniform waves, free space impedance **Lectures 10, Marks 20**

UNIT II

Wave guide Theory: Comparison between Transmission line and Waveguide, waveguide types rectangular and circular. Wave propagation through rectangular waveguide, Solution of wave equation in rectangular waveguide, Rectangular wave guide modes, Waveguide characteristics for TE and TM modes (for rectangular waveguide), equation for cut off wavelength, guided wavelength, guided velocity, group velocity

Passive Microwave components : Terminator, attenuator, ,traveling detector, Microwave filter, parametric amplifier, resonator, E-plane, H-plane, Magic Tee, Hybrid circuits, Ferrite Components, Microwave bridge Isolator, Circulator, Directional coupler, E-plane Tee, H-plane Tee, magic tees, Directional couplers, Ferrite components, Microwave bridge, Circulator, Isolator, slotted line, Tuners, coupling probes **Lectures 10, Marks 20**

UNIT III

Microwave Tubes: Limitations of conventional Tubes, Klystron tubes, Two cavity Klystron, Multi cavity Klystron, Modes of Reflex klystron, Efficiency of Reflex Klystron, **Slow wave structure: (TWT) :** O type, M type, Magnetron Efficiency, Advantages and disadvantages

Solid state Devices: GUNN diode, PIN diode, IMPATT, BARITT, TRAPATT, Monolithic Microwave strip line devices, Microwave Integrated circuits, Applications of Microwave Integrated Circuits **Lectures 10, Marks 20**

UNIT IV

PMicrowave Antenna

RF antenna and Microwave antenna, Horn antenna, Parabolic reflector with all types of feeding methods, slotted antenna, Lens antenna, Microwave strip line antennas, Equation for antenna gain, Directivity and Beam width of all above antenna types.

Microwave measurements: Frequency, Power, attenuation, VSWR, Impedance measurement. **Lectures 10, Marks 20**

UNIT V

Microwave Applications:

Wireless Microwave communication system: Radio Receiver Architecture, Noise Characterization
Radiometer System: Theory and application, total Power Radiometer, Dicke Radiometer
Microwave heating
Power Transfer
Bio-medical application

RADAR: Principle of Radar System, Pulse radar, Radar range equation, Doppler Effect, Blind Speed, CW Doppler MTI Radar

Lectures 10, Marks 20

References:

1. R. E. Collins - Foundation of microwave engineering, Tata McGraw Hill
2. Pozar - Microwave Engineering , John Wiley
3. Annapurana Das, S. K das - Microwave Engineering, Tata McGraw Hill
4. Samuel Liao – Microwave Devices and circuits, PHI
5. K. C. Gupta – Microwave, New Age
6. Peter A. Rizivi - Microwave Engineering,

List of Practical:

1. Reflex Klystron Characteristics
2. GUNN Diode Characteristics
3. Microwave Junction: Power splitting Characteristics
4. Directional coupler: Isolator, Coupling factor
5. Circulator, Isolator (Y type) Circulator and Isolation Calculation
6. VSWR Measurement (Using V_{max} / V_{min} Method)
7. Antenna Horn (Radiation Pattern and beam width)
8. Antenna parabolic (Radiation Pattern and beam width)
9. Measurement of attenuation (Fixed and variable)

Note: Minimum **EIGHT** practicals are to be performed.

NORTH MAHARASHTRA UNIVERSITY JALGAON
B.E. (ELECTRONICS, ELECTRONICS AND COMMUNICATION, ELECTRONICS AND TELECOMMUNICATION)

W.E.F : 2008- 09

TERM - I
FIBER OPTIC COMMUNICATON

Teaching scheme:
Lectures: 4 hrs / week
Practical: 2 hrs / week

Examination scheme:
Theory Paper: 100 Marks (3 Hours)
Term Work : 25 Marks

UNIT I

Introduction to Optical Fiber Communication System:

Block diagram of OFCS, Advantage and Disadvantage of OFCS over other communication systems. Ray theory of transmission and concept of acceptance angle and Numerical Aperture (Numericals based on this), Meridonial and skew propagate wave theory of optical propagation : cut – off wavelength. Group velocity and Group delay, Types of fibers (According to materials, Refractive index profile, Mode of propagation) Fiber Optic Splices, connectors, couplers, Directional Coupler.

Lectures 10, Marks 20

UNIT II

Light Sources and Detectors:

Sources : Factors or Characteristics for their selection in OFCS, **Types :** Light Emitting diodes, Laser diodes, Surface emitter LEDS, Edge emitter LEDS, Super luminescent LEDS, LED operating Characteristics, **Modulation Bandwidth:** 3-dB electrical bandwidth, 3-dB optical Bandwidth, Radiation patterns of surface and Edge emitters, **Laser diode:** Laser principles, semiconductor laser diode , Hetero junction Laser , strip- gromentry lasers, Distributed feedback lasers, laser diode operating Characteristics, Radiation patterns.

Detectors: Characteristics or factors for their Selection, P-N photo diode, P-I-N Photo diode, Avalanche photodiode, detector parameters: Quantum efficiency, Responsivity, speed of Response (Numericals based on this) **Lectures 10, Marks 20**

UNIT III

Modulation: Noncoherent / Coherent

Intensity Modulation: LED Modulation and Circuits (Analog and digital) Analog modulation formats; AM / IM Sub carrier Modulation, FM / IM Sub carrier Modulation. Digital Modulation formats; PCM: RZ, NEZ, Manchester, Bipolar codes, Other digital formats: PPM, PDM, OOK, FSK and PSK.

Detection: (Coherent detection / Heterodyne / Homodyne detection):- Optical heterodyne receivers, Optic Frequency Division Multiplexing. **Lectures 10, Marks 20**

UNIT IV

Losses in fibers: Absorption, scattering and bending losses. Signal distortion in optical fiber: Material dispersion, waveguide dispersion, intermodal dispersion. Noise in optical fiber: Thermal Noise, shot noise, S / N Ratio, Noise equivalent power (Numericals based on this)

Fiber Optics System Design: Optical power budgeting, Rise-time budget.

Optical Fiber Measurements: Measurement of Attenuation, dispersion, refractive index. Field Measurements: Optical time domain reflectometry. (OTDR) **Lectures 10, Marks 20**

UNIT V

Advanced Systems and Techniques: -

Wavelength Division Multiplexing, DWDM, optical amplifiers, Optical filters, Integrated optics, Optical Networks: SONET / SDH, Photonic switching, Local Area Networks, Optical Sensors. **Lectures 10, Marks 20**

References:

1. Jonn M. Senior - Optical fiber communication (Principles and Practice), Pearson
2. G. Keiser - Optical fiber communication, MH
3. Joseph Palais - Fiber optic communications, Pearson
4. Wilson Hawkes - Opto electronics, PHI
5. Selvrajan, Srinivas - Optical fiber communication, TMH
6. B.P.Pal - Optical fiber systems and sensors
7. Govind P. Agrawal - Fiber optic communications systems, wiley 3rd Ed.

List of Practical:

1. Electrical characteristics of (Different type LED)
2. Photometric characteristics of LED / LD (Polar Plot, Intensity Measurement)
3. NA Measurement for Single / Multi de, Gi / S1, fiber
4. Attenuation Measurement of optical fiber
5. Spectral characteristics of LED / LD
6. Fiber optic Analog / Digital transmitter / receiver parameter measurement
7. Study of fiber optical connectors
8. Spectral response of optical fiber
9. Parameter measurement of opto isolator
10. Study of OTDR.

Note: Minimum **EIGHT** practicals are to be performed

NORTH MAHARASHTRA UNIVERSITY JALGAON
B.E. (ELECTRONICS, ELECTRONICS AND COMMUNICATION, ELECTRONICS AND TELECOMMUNICATION)

W.E.F : 2008- 09

TERM - I

DIGITAL SIGNAL PROCESSING AND PROCESSORS

Teaching scheme:
Lectures: 4 hrs / week
Practical: 2 hrs / week

Examination scheme:
Theory Paper: 100 Marks (3 Hours)
Practical : 25 Marks

UNIT I

Discrete Time Signals and Systems:

Introduction: Basic elements of Digital Signal Processing Systems, Advantage and Limitation of Digital over Analog Signal Processing, Application of Digital Signal Processing: Spectral Analysis, Echo Cancellation, Image Processing, Biomedical Signal Processing, Classification of Signals. Discrete Time Signals: Representation, Standard Discrete Time Signals, Classification of Discrete Time Signals, Simple Manipulations of Discrete Time Signals, Sampling of Analog signals, Aliasing, Sampling Theorem. Discrete Time System: Block diagram representation of Discrete Time Systems, Classification of Discrete Time System, Convolution Sum, Properties of Convolution, Causality and Stability condition in terms of the Impulse Responses. Meaning of IIR, FIR, Recursive, Nonrecursive Systems, and Impulse Response of LTI Recursive System. Cross Correlation and Auto Correlation of two sequences. **Lectures 10, Marks 20**

UNIT II

Z Transform and its application to the analysis of LTI system:

Definition of Z transform, Meaning of ROC, Properties of ROC, Properties of Z transform, Inverse Z transform, Pole Zero plot of the function, Pole location and time domain behavior for causal sequences. Analysis of LTI Systems in Z domain: The System Function of LTI system, Response of LTI system with zero initial condition, Transient and Steady state responses, Causality and Stability of System. Pole zero cancellation. The one sided Z transform, Response of the system with nonzero initial conditions. Solution of difference Equations using Z transform. **Lectures 10, Marks 20**

UNIT III

Frequency Analysis of Discrete Time Signals and Systems:

The Fourier Transform of Discrete time Aperiodic Signals and Energy Density Spectrum, Frequency response of Discrete Time Systems, Magnitude and Phase response. Frequency Domain Sampling: The Discrete Fourier Transform, IDFT, The DFT as Linear Transformation, Twiddle factor, Properties of the DFT, Use of DFT in linear filtering, Frequency analysis of signals using DFT. Magnitude spectrum of signals. FFT Algorithms: Radix2 DIT and DIF algorithms to computer DFT and IDFT. **Lectures 10, Marks 20**

UNIT IV

Design and Realization of Digital Filters:

Basic Network Elements, FIR Filter Structure and Design: Direct form, cascade form, frequency sampling and linear phase structure. Fourier series, Windowing method. Gibbs phenomenon, Frequency sampling method of design. IIR Filter structure and Design: Direct form, Cascade form, Parallel form and Transposed structures. Impulse invariance, Bilinear Transformation method of design. **Lectures 10, Marks 20**

UNIT V

DSP Architecture:

Architectural features of DSP processors: Multiplier and Multiplier Accumulator (MAC), Modified Bus Structures and Memory Access schemes in DSP, Multiple access memory, Multiport Memory, Pipelining, Special addressing modes, Onchip Peripherals. Different generation of DSP Processors, Fixed point and floating point numeric representation and Arithmetic, Introducing the TI 6000 platform, Features of TMS320C62X Processors, EDMA, Host Port Interface, Expansion Bus, External Memory Interface (EMIF), Boot Loader, McBSP, Interrupts, Timers, Basic Interfacing Techniques. **Lectures 10, Marks 20**

References:

1. Proakis and Monolakis - Digital Signal Processing-Principles, Algorithms and Applications, Pearson Publication / PHI
2. Mitra S.K. - Digital Signal Processing, TMH Publication
3. B.Venkataramani, M.Bhaskar - Digital Signal Processor, Architecture, Programming and Applications,TMH.
4. Texas Instruments - Technical Reference Manual
5. Teaching Material for TI6000 platform from Texas Instruments
6. Thomas Cavicchi - Digital Signal Processing, Wiley
7. Ingle & Prokis – Digital Signal Processing Using MATLAB, 2nd Ed, Thomson Learning.

List of Practical:

1. Basic operations on sequences of equal and unequal lengths.
2. Sampling of continuous time signal and aliasing effect.
3. Convolution of two sequence\ Impulse response.
4. Spectrum of signals using DFT.
5. Frequency response of LTI Discrete time system.
6. Designing of FIR Filter.
7. Designing of IIR Filter.
8. Sampling audio signal at different sampling rate using DSP kit.
9. Interfacing with DSP Kit.
10. Implementation of digital filter using DSP Kit.
11. Using ADC and DAC for signal acquisition and play back after processing.

Note: Minimum **EIGHT** practicals are to be performed. At least **TWO** on any DSP platform.

NORTH MAHARASHTRA UNIVERSITY JALGAON
B.E. (ELECTRONICS, ELECTRONICS AND COMMUNICATION, ELECTRONICS AND TELECOMMUNICATION)

W.E.F : 2008- 09

TERM - I
COMPUTER COMMUNICATION NETWORK

Teaching scheme:
Lectures: 4 hrs / week

Examination scheme:
Theory Paper: 100 Marks (3 Hours)
Term Work : 25 Marks

UNIT I

Introduction to Computer Network: OSI model, TCP / IP and other network models, Different Networks: Novell Netware, Arpanet, NSFNET, Internet. Network Topologies: LAN, WAN, MAN

Physical Layer: Basic for data communication: Fourier analysis, Bandwidth Limited Signal. Transmission media: Twisted pair, Baseband coaxial cable, Broadband coaxial cable, Fiber optics. Wireless Transmission: Radio transmission, Microwave transmission, Infrared and light wave Transmission. Switching. ISDN: Narrowband ISDN: ISDN services, System architecture, Interface. Broadband ISDN: Virtual switching, Circuit switching, ATM Network, Transmission in ATM networks, ATM switches. Cable TV and internet over cable **Lectures 10, Marks 20**

UNIT II

Data link layer: Design issues: Framing, Error detection and correction code, Flow control Data Link Protocols: Unrestricted Simplex Protocol, stop and wait protocol, Simplex Protocol for a Noisy Channel. Sliding Window Protocols: One bit sliding window, Using Go-Back n, Protocol using Selective Repeat. Practical Example of Data Link Protocols: The Data Link layer in HDLC, internet, ATM.

Medium access sub layer: Channel allocation Problem: Static Channel and dynamic Channel allocation in LANs and MANs. Multiple Access Protocols: ALOHA, Carrier Sense Multiple Access, Collusion Free Protocols, Wireless LAN Protocols. IEEE Standards For LANS and MANS:IEEE Standard 802.3 and Ethernet, (IEEE Standard 802.4) token Bus, (IEEE Standard 802.5) Token Ring, (IEEE Standard 802.6) distributed Queue Dual Bus. (IEEE Standard 802.2) Logical Link Control.

Lectures 10, Marks 20

UNIT III

Network layer : Design Issue: Internal Organization ,Virtual circuit and Datagram subnets, Routing algorithm: Shortest Path Routing, Flooding, Hierarchical Routing, Broad Cast Routing, Routing for mobile host, Multicast routing, Congestion Control Algorithms: Congestion Prevention Policies, Control in virtual Circuits Subnets, choke Packets, Load Shedding.

Lectures 10, Marks 20

UNIT IV

Internetworking: The network layer in the internet: IP Protocol, IP Address, Subnet, Internet control Protocols, Internet multicasting, IPv4: Datagram, Fragmentation, Checksum, Options ,IPv6: Advantages, Packets Formats Extension Headers. Address Resolution Protocol (ARP), RARP, DHCP. The Network Layer in the ATM Networks: Routing and Switching, Traffic Shaping, Congestion Control, ATM LANs.

Lectures 10, Marks 20

UNIT V

Transport layer: The Internet Transport Protocols: TCP: Services, Features, Segments, Connections, Flow control, Error Control, congestion Control, UDP. QOS (Quality of Services) ATM AAL layer protocol.

Application layer: Network security, Domain Name system, SNMP, Electronic Mail; the World Wide Web, Multi media.

Lectures 10, Marks 20

References:

1. Andrew S Tanebaum - Computer Networks, 4th Ed. PHI/ Pearson education.
2. Behrouz A Forouzan - Data Communication and Networks, 3rd Ed. TMH.
3. S. Keshav - An Engineering approact to Computer Networks, 5th Ed. Pearson.
4. W.A. Shay - Understanding communication and Networks, Thomson.
5. Irvine Olifer - Computer Networks: Principles, Technology and Protocols, Wiley India.
6. William Stalling – Data and Computer communications, 7th Ed. PHI

Term Work: It is 50% based on theory and 50% based on minimum FIVE assignments on above syllabus (one assignment for each unit)

NORTH MAHARASHTRA UNIVERSITY JALGAON
B.E. (ELECTRONICS AND COMMUNICATION, ELECTRONICS AND TELECOMMUNICATION)

W.E.F : 2008- 09

TERM - I

DATA COMMUNICATION AND DESIGN (ELECTIVE I)

Teaching scheme:
Lectures: 4 hrs / week
Practical: 2 hrs / week

Examination scheme:
Theory Paper: 100 Marks (3 Hours)
Practical : 25 Marks
Term work : 25 Marks

UNIT I

Digital Transmission Fundamentals

Digital signals, Limits of achievable data rate in digital communication, Data communication – components, data representation , Transmission impairment throughput, propagation speed, propagation time, wavelength, Attenuation distortion, delay distortion, Thermal noise , Inter modulation noise , Impulse Noise, Cross talk, channel capacity, source coding, data Rate, and channel capacity. **Lectures 10, Marks 20**

UNIT II

Digital Modulation

Modems, Digital continuous wave modulation techniques for Modem , Baud rate, QAM modern constellation patterns, Telephone modems- Modern stard,, traditional modems, 56M modems, Interface control for typical modem, EIA 232 / V.24 interface, interfacing with computer , Broad b modems. Cable modems. **Lectures 10, Marks 20**

UNIT III

Switching techniques High Speed Digital Access

Different switching techniques, circuit switching telephone , Signaling systems 1H Architecture overview , Packet switching N/w. T1 carrier system / E1 / , T3 / E3 carriers, SONET/ SDB, SDL Technical , ADSL technology, cellular Telephone systems, **Lectures 10, Marks 20**

UNIT IV

Data communication Media

Transmission media guided transmission media (Physical description , application , transmission char.) Twisted pair (unshielded , shielded , twisted pair) , category 3 , 5 , 5E , 6 . UTP, coaxial cable. Wireless transmission unguided media; (Terrestrial microwave satellite microwave) fiber optic communication, satellite communication. , wireless fidelity **Lectures 10, Marks 20**

UNIT V

Ethernet

Traditional Ethernet, fast Ethernet, gigabit Ethernet. Multiple access, rom access, MA, CSMA/ CD , CSMA/CA, control access, FDMA, TDMA, CDMA, . IEEE 802.3, 802.4, 802.5, X.21, X.25, SDLC/HDLC protocol stards. Introduction to N/w connecting devices, bridge , router, gateway, hub, etc. **Lectures 10, Marks 20**

Reference Book:

1) Behrouz A, Forouzan -Data communication, TMH
2) Stallings W. - Data Computer communication , PHI 6th Ed.
3) Shay W - Understanding Data communication and Networks, 3rd Ed., Thomson
4) Godbole A - Data communications, TMH

List of Practical:

1. Implementation of LAN using star topology and connectivity between two computers using crossover UTP5 cable.
2. To establish internet connectivity using dial up modem on windows system.
3. Study of network components such as Preparation of various cables, information attenuator, hubs, switches, bridges, routers, gateways, color codes of AT and T (2 Practicals)
4. Study of MODEM Trainer kit
5. Study of RAM for MODEM
6. Study of CDMA Trainer
7. study of GSM Trainer

Note: Minimum **EIGHT** practicals are to be performed

NORTH MAHARASHTRA UNIVERSITY JALGAON
B.E. (ELECTRONICS, ELECTRONICS AND COMMUNICATION, ELECTRONICS AND TELECOMMUNICATION)

W.E.F : 2008- 09

TERM - I

BIOMEDICAL INSTRUMENTATION (ELECTIVE I)

Teaching scheme:
Lectures: 4 hrs / week
Practical: 2 hrs / week

Examination scheme:
Theory Paper: 100 Marks (3 Hours)
Practical : 25 Marks
Term work : 25 Marks

UNIT I

Modern Imaging System:

Principles of NMR Imaging systems, Image reconstruction technique, Basic NMR components, biological effects of NMR imaging, Advantages, diagnostic ultrasound, physics of ultrasound waves, Medical ultrasound, Basic Pulse Echo Apparatus, A-scan, M- mode, B-scan, Real time Ultrasonic imaging system, Biological effects of ultrasound, Medical thermography, Physics of thermography, Infrared Detector, pyro-electric vidicon camera etc. **Lectures 10, Marks 20**

UNIT II

Cardiac Pacemakers and Defibrillators:

Need for pacemakers, external pacemakers, and Implantable pacemakers, recent developments, pacing system analyzer, need for defibrillators, DC defibrillators, Implantable defibrillators, and Defibrillators analyzers. Blood gas analyzers Acid base balance, Blood pH measurement, measurement of blood PCO_2, Blood PO_2 measurement, intra arterial blood gas monitoring, and complete gas analyzers, types of blood cells, coulter counters, and Auto recognition and differential counting of cells.

Lectures 10, Marks 20

UNIT III

Instruments for Surgery:

Principle of surgical diathermy, surgical diathermy machine, safety aspects, surgical diathermy analyzers, LASER, pulsed RUBY laser, Nd - YAG laser, He-Ne laser, Argon laser, CO_2 laser, laser safety, microwave diathermy, ultrasonic therapy unit,, pain relief through electrical simulation. **Lectures 10, Marks 20**

UNIT IV

Heamo-dialysis Machines and ventilators:

Function of kidneys, Artificial kidney , Dialysers, Membranes for Heamo-dialysis Heamo-dialysis Machine, Portable kidney machine, Mechanics of respiration Artificial ventilation , ventilators Types, ventilator terms, classification of ventilators Modern ventilators, HF ventilators, Humidifiers, Nebulisers and Aspirators. **Lectures 10, Marks 20**

UNIT V

Biomedical Telemetry and telemedicine:

Introduction, physiological parameters adaptable, wireless telemetry, single channel, Multi-channel, multi–patient telemetry, components of Bio-telemetry system, Implantable telemetry, Transmission of Analog and physiological signals over telephone , Telemedicine. Spectro-photometry, colorimeters, Automated Biochemical analysis. Infusion Pumps, Implantable Infusion systems. **Lectures 10, Marks 20**

References:

1. Cromwell - Biomedical Instrumentation, Pearson / PHI
2. Khandpur - Handbook of Biomedical Instrumentation
3. Webster - Biomedical Instrumentation, Wiley

List of Practical:

1. Measurement of echo with ultrasound system.
2. Study of Internal Pacemaker.
3. Study of Pacemaker simulator.
4. Measurement of pacing pubes with the pacemaker system.
5. Study of ON - DEMAND pacemaker system
6. Measurement of blood cell count.
7. Study of Surgical diathermy machine.
8. Study of Heamo dialysis Machine
9. Study of Nebulisers.
10. Measurement of Heart beats by wireless telemetry system.
11. Study of Ultrasonic therapy machine.
12. Study of Spectrophotometer.

Note: Minimum **EIGHT** practicals are to be performed

NORTH MAHARASHTRA UNIVERSITY JALGAON
B.E. (ELECTRONICS AND COMMUNICATION, ELECTRONICS AND TELECOMMUNICATION)

W.E.F : 2008- 09

TERM - I
SYSTEM PROGRAMMING (ELECTIVE I)

Teaching scheme:
Lectures: 4 hrs / week
Practical: 2 hrs / week

Examination scheme:
Theory Paper: 100 Marks (3 Hours)
Practical : 25 Marks
Term work : 25 Marks

UNIT I

Introduction to system software: Types of Software and Application Software Spectrum of system Software, Need of system Software, Assembler, Loader, Compiler. Symbolic Debuggers, Interpreter, Macro, Operating system and its types. Assembler- Structure of Assembler, Basic Functions, Assembler directives, Types of Assembler, General design specification of an Assembler, Purposes of Passes, Databases for Passes, Literals, Design of Pass I and Pass II Assembler.

Lectures 10, Marks 20

UNIT II

Data Structure -Stack Array, Queue, Link list, Data Structure, Sorting Technique, Linear and binary search. Macro and Macroprocessor- Macro definition and call, Features of macro, Macro expansion, Nested Macros, Design of Macroprocessor single pass and two pass macroprocessor. **Lectures 10, Marks 20**

UNIT III

Loader and Linkage editor- Basic functions of Loader, Relocation and Linking concepts, and different Loader schemes, other Loader schemes, binders, Linking Loaders, overlay Dynamic Binders, Design issue of Direct Linking Loaders. Compiler- Concept, Phases of compiler, Types of complier, Parser, Parsing technique, Top-down and Bottom-up parsing, Shift reduce and recursive descent parser, Operator precedence parser, Predictive parser, L-R parser. **Lectures 10, Marks 20**

UNIT IV

Operating System Concepts- Need of OS, Types of OS, like Batch, Time sharing, Multiprogramming, Multitasking real time and personal OS.

Process Concepts and Management: - Process concepts, process state, process state Transition, PCB, operation on process, OS Services for Process Management.

Deadlocks - Principals, Detections, Preventions Recovery and Avoidance Algorithm. Scheduling - Process scheduling long term, middle term and short term scheduling CPU burst, scheduling algorithm and performance evolution.

Lectures 10, Marks 20

UNIT V

Memory Management -Concept of Memory management, Contiguous Memory allocation, paging and segmentation concepts, , virtual memory concept. File Management- File concepts, Access Methods, Directory Structure, single, two, three level structure, Protection, file sharing allocation methods. Dynamic Linking In Windows- (Introduction and concepts only) clipboard, OLE terminology and Technology, Dynamic Data Exchange Dynamic Linking Libraries (DLL) **Lectures 10, Marks 20**

References:

1. Jhon J. Donovan - System Programming, TMH.
2. Dhamdhere - System Programming and Operating System, TMH, 2nd Ed.
3. L Beck - System Software, Pearson, 3rd Ed.
4. Aho Ulman - Complier Construction, Pearson LPE.
5. Silberschatz, Galvin, Gagne.- Operating System Principles , John Wiley and Sons, 7th Ed.
6. Tanenbaum - Modern Operating System, Pearson, 2nd Ed.
7. J.P. Bennett - Compiling Technique, TMH

List of Practical:

1. Language Programming for 8085 / 8051.
2. Implementation of sorting method (Any two) in C / C++.
3. Implementation of searching methods (Linear and Binary Search) in C / C++.
4. Implementation of stack/queue using linked list data structure in C / C++.
5. Develop an application to simulate first pass of two pass assembler for 8085 Microprocesser.
6. Design of simple Loader.
7. Design of Parser for a subset of C by using C / C++.
8. Design of Line and Screen Editor in C / C++.
9. Design of Microprocessor (Nested Macro Calls within definition) in C / C++.
10. Implementation of CPU Scheduling algorithm,
11. Implementation of memory management algorithm.
12. Implementation of interprocess Communication.

Note: Minimum **EIGHT** practicals are to be performed

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TERM - I
VLSI DESIGN (ELECTIVE I)

Teaching scheme:
Lectures: 4 hrs / week
Practical: 2 hrs / week

Examination scheme:
Theory Paper: 100 Marks (3 Hours)
Practical : 25 Marks
Term work : 25 Marks

UNIT I

Introduction:

History of HDL: Brief history of VHDL, brief history of Verilog. Structure of VHDL and Verilog module: Structure of Entity / Module, Port. Operators in VHDL and Verilog: Logical, Relational, Arithmetic Shift and Rotate Operators. Data types of VHDL and Verilog. Types of Architecture use in VHDL and Verilog: Behavioral Description, Structural Description, Switch level Description, Data-flow Description, Mixed-type Description. Simulation and Synthesis and comparison between them.

Lectures 10, Marks 20

UNIT II

Data-flow Description (VHDL / Verilog): Structure of Data-flow Description: Signal declaration and Signal assignment statements, Concurrent Signal assignment statements, Constant declaration and assignment statements, Assigning a delay to the signal assignment statements, VHDL / Verilog Programming using Data-flow description and Common errors occurs during programming.

Behavioral Description (VHDL / Verilog): Structure of Behavioral Description for both VHDL/Verilog. VHDL variable assignment statement. Sequential statements for VHDL / Verilog: IF statement, Signal and variable (only for VHDL) assignment, Case statement, Loop statement. VHDL/ Verilog Programming using Behavioral description and Common errors occur during programming. **Lectures 10, Marks 20**

UNIT III

i) Structural Description (VHDL / Verilog): Organization of structural design, Binding, State machines, Generic (VHDL), Parameter (Verilog), VHDL / Verilog Programming using Structural description and Common errors occurs during programming.

ii) Switch Level Description (VHDL / Verilog): Single NMOS and PMOS switches: NMOS and PMOS switch description for VHDL / Verilog, Serial and parallel combinations of switches. Switch level description of: Primitive gates, Combinational logics, Sequential circuits. CMOS switch. Bidirectional switches.

iii) Procedures (VHDL), Task (Verilog) and Functions (VHDL / Verilog) **Lectures 10, Marks 20**

UNIT IV

Mixed type Description (VHDL / Verilog): User defined data types in VHDL, VHDL Packages, Implementation of Arrays, and Mixed-type Description Programming.

Advanced HDL Description (VHDL / Verilog): File processing in VHDL / Verilog. VHDL record types. Programming of File processing for VHDL / Verilog.

Architecture of Xilinx 9500 series CPLD. **Lectures 10, Marks 20**

UNIT V

Xilinx Spartan 4000 series FPGA.

Testing of Logic Circuits:

Fault model, path sensitizing, random test. Design of testability, BIST (Built in self test), Boundary scan test.

Introduction to various Debugging Tools .Introduction to Simulation Tools.

Introduction to Digital Pattern Generator and Logic Analyser. Advantage of Logic Analyzer with built in Digital Pattern Generator over Simulator. **Lectures 10, Marks 20**

References:

1. John F. Wakerly - Digital Design, Principles and Practices, Pentice Hall Publication.
2. Nazeib M. Botros - HDL programming Fundamentals VHDL and Verilog , Thomson.
3. Stephen Brown and Zvonko Vranesic - Fundamentals of Digital Logic with VHDL design, McGraw Hill
4. Douglas Perry - VHDL , Tata MC-Graw Hill
5. Xilinx data manual - The Programmable Logic data Book
6. Sudhakar Yalamanchil - An Introduction to VHDL from Synthesis to Simulation
7. Bhaskar – A VHDL Primer, Pearson
8. Zwolinski – Digital System Design with VHDL, Pearson

List of Practical:

Minimum **EIGHT** Practical on VHDL / Verilog coding, simulation and synthesis with implementation on CPLD / FPGA devices. and test performance using 32 channel pattern generator integrated with logic analyzer apart from verification by simulation with tools . Use the pattern generator to generate input signal and truth tables. (PC Based instruments may also be used)

Simulation, Synthesis, and Implementation and observe Real-time validation using pattern generator and Integrated logic Analyzer:

Group A. Combinational Logic: (At least THREE of the following must be covered)

1. Write VHDL code to realize all the logic gates

2. Write a VHDL program for the following combinational designs
   a. 2 to 4 decoder
   b. 8 to 3 (encoder without priority & with priority)
   c. 8 to 1 multiplexer
   d. 4 bit binary to gray converter
   e. Multiplexer, demultiplexer, comparator

3. Write a VHDL code to describe the functions of a Full Adder Using following modeling styles.
4. Write VHDL code to display messages on the given seven segment display and LCD and accepting Hex key pad input data

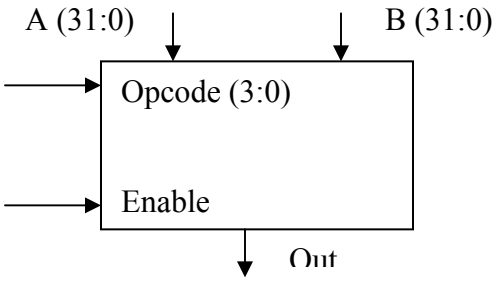
Group B. Sequential logic: (At least THREE of the following must be covered)

1. Develop the VHDL codes for the following flip-flops,
   SR, D, JK, T.

2. Design 4 bit binary, BCD counters (Synchronous reset and Asynchronous reset) and “any sequence” counters.
3. Implementation of 8 – Bit Left / Right Shift Register.

Group C. Implement 32 bit ALU for any (Arithmetic / Logical) Function.
(At least ONE of the following must be covered)

Write a model for 32 bit ALU using the schematic diagram shown below.(example only)



- ALU should use combinational logic to calculate an output based on the four bit op-code input
- ALU should pass the result to the out bus when enable line in high, and tri-state the out bus when the enable line is low.
- ALU should decode the 4 bit op-code according to the given in example below

OPCODE	ALU OPERATION
1.	A + B
2.	A - B
3.	A Complement
4.	A * B
5.	A AND B
6.	A OR B
7.	A NAND B
8.	A XOR B

Group D. INTERFACING (At least Two of the following must be covered)

1. Write VHDL code to control speed, direction of DC and Stepper motor
2. Write VHDL code to accept 8 channel Analog signals, Temperature sensors and display the data on LCD panel or seven segment displays.
3. Write VHDL code to generate different waveforms (Sine, Square, Triangle, Ramp etc.,) using DAC change the frequency and amplitude.
4. Write VHDL code to simulate Elevator operations
5. Write VHDL code to control external lights using relays.

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TERM - I

BROADBAND COMMUNICATION (ELECTIVE I)

Teaching scheme:
Lectures: 4 hrs / week
Practical: 2 hrs / week

Examination scheme:
Theory Paper: 100 Marks (3 Hours)
Practical : 25 Marks
Term work : 25 Marks

UNIT I

Switching Techniques:

Introduction, circuit switching, Routing for circuit switching networks, control signaling. Common channel signaling, Packet switching, Packet size, X.25 protocol, packet level, sequence of events. Comparison of circuit and packet switching.

Lectures 10, Marks 20

UNIT II

Frame Relay:

Introduction, Frame relay protocols, architecture, comparison with X.25 protocol, frame mode call control, call control protocol. Frame relay congestion control, Congestion, Approaches, traffic rate management, explicit congestion avoidance, implicit congestion control. **Lectures 10, Marks 20**

UNIT III

ISDN:

Introduction to ISDN, IDN, Principles of ISDN, Evolution of ISDN, ISDN Standards, Architecture, Transmission structure, User network interface configuration, ISDN protocol architecture, ISDN Connection, Addressing. Inter Networking ISDN – ISDN, ISDN – PSTN, ISDN – CSPDN. **Lectures 10, Marks 20**

UNIT IV

ATM:

Overview, Virtual channels, Virtual paths, VP and VC switching, ATM cells, Header format, Generic flow control, Header error control, Transmission of ATM cells, Adaptation layer, AAL services and protocols. ATM switching building blocks, ATM cell processing in a switch, Matrix type switch, Input, Output buffering, central buffering, Performance aspects of buffering switching networks. **Lectures 10, Marks 20**

UNIT V

Broadband standards:

Broadband ISDN Standards, Broadband Services, Broadband Architecture, User network interface. Broad band ISDN protocol, architecture, physical layers, SONET / SDH. **Lectures 10, Marks 20**

References:

1) Williams stallings - ISDN and Broadband ISDN with frame Relay and ATM , PHI , 4TH Ed
1) Mischa Schwartz - Broadband Internet Network, PHI
2) Bernand Forozen. - Data Communication. and Networking, TMH
3) Balaji kumar - Broadband Communication, MGH

List of Practical:

- Simulation of any one of the PSTN switch Configuration (T / S / T Switch)
- Implementation of congestion control algorithm
- Implementation of routing algorithm (Shortest path)
- Case Study – ISDN – ISDN and ISDN - PSTN

Note: Minimum **EIGHT** practicals are to be performed, based on the syllabus.

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TERM - I
PROJECT I

Teaching scheme:
Practicals: 2 hrs / week

Examination scheme:
Oral : 25 Marks
Term Work : 25 Marks

1. Every student individually or in a group (group size is of 3 students. However, if project complexity demands a maximum group size of 4 students, the committee should be convinced about such complexity and scope of the work.) shall take a project in the beginning of the (B.E. first Term) seventh term in consultation with the guide and the project must be completed in the (B.E. Second Term) eighth term.

2. The project proposal must be submitted in the institute in the beginning of the (B.E. first Term) seventh term. While submitting project proposal care is to be taken that project will be completed within the available time of two term i.e 2 Hrs per week for (B.E. first Term) seventh term and 4 Hrs per week for (B.E. Second Term) eighth semester (total time become 12*2 + 12*4 = 72 Hrs per project partner). The final title of the project work should be submitted at the beginning of the (B.E. Second Term) eighth semester. .

3. Project title should be precise and clear. Selection and approval of topic:

   Topic should be related to real life application in the field of Electronics and Telecommunication

   OR

   Investigation of the latest development in a specific field of Electronics or Communication or Signal Processing

   OR

   The investigation of practical problem in manufacture and / or testing of electronics or communication equipments

   OR

   The Microprocessor / Microcontroller based applications project is preferable.

   OR

   Software development project related to VHDL, Communication, Instrumentation, Signal Processing and Agriculture Engineering with the justification for techniques used / implemented is accepted.

   OR

   Interdisciplinary projects should be encouraged. The examination will be conducted independently in respective departments.

4. The group should maintain a logbook of activities. It should have entries related to the work done, problems faced, solution evolved etc., duly signed by guide.

5. The group is expected to complete details system design, layout etc. in (B.E. first Term) seventh term, as a part of term work in the form of a joint report. Project report must be submitted in the prescribed format only. No variation in the format will be accepted.

6. One guide will be assigned at the most three project groups.

7. The guides should regularly monitor the progress of the project work.

8. Assessment of the project for award of TW marks shall be done by the guide and a departmental committee (consisting of minimum two teachers with experience more than three years) as per the guidelines given in the following table.

A) ASSESSMENT OF PROJECT I TERMWORK B.E. FIRST TERM

NAME OF THE PROJECT _____
NAME OF THE GUIDE: _____

Sr No	Exam Seat No	Name Of Student Marks	Assessment by guide (70%)					Assessment by Departmental committee (30%)			Grand Total	Out of 25 Marks
			Literature survey	Topic Selection	Documentation	Attendence	Total	Evaluation (10%)	Presntaion (20%)	Total		
			10	05	15	05	35	05	10	15	50	25

Sign of Guide Sign. of Committee Members Sign. of H. O. D.

9. The guide should be internal examiner for oral examination (If experience is greater than three years).

10. The external examiner should be from the related area of the concerned project. He should have minimum of five years of experience at degree level / industry.

11 .The evaluations at final oral examination should be done jointly by the internal and external examiners.

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TERM - I
SEMINAR

Teaching scheme:
Practical: 2 hrs / week

Examination scheme:
Term Work : 25 Marks

1. For seminar every student will individually study a topic assigned to him / her and submit a report and shall deliver a short lecture / Seminar on the topic at the end of term.
2. Selection of topic should be done by students in consultation with concerned guide
    a. Topic should be related to branch but it should be extended part of the branch (latest and advance topic).
    b. The topic should be such that the student can gain latest knowledge. Student should preferably refer at least one research paper
3. Seminar topic should not be repeated in the department and registration of the same should be done on first come first served basis
4. Seminar report should be submitted in paper bound copy prepared with computer typing
    a. Size of report depends on advancement of topic.
    b. Student should preferably refer minimum 5 reference books / magazines.
    c. Format of content
        i. Introduction.
        ii. Literature survey.
        iii. Theory 1) Implementation 2) Methodology
        3) Application 4) Advantages, Disadvantages.
        iv. Future scope.
        v. Conclusion.

5 ASSESSMENT OF SEMINAR for TERM WORK
Title of seminar: _____
Name of guide : _____

Sr. No.	Exam Seat No.	Name of Student	Assessment by examiners					Grand Total
			Topic Selection	Literature Survey	Report Writing	Depth of understanding	Presentation	
			5	5	5	5	5	25

6 . Assessment of Literature survey will be based on
    a. Collection of material regarding history of the topic.
    b. Implementation.
    c. Recent applications.

7. Assessment of Depth of understanding will be based on
    a. Questioning by examiners.
    b. Questioning by students.
    c. What the student understands i.e. conclusion regarding seminar.

8. Assessment of presentation will be based on;
    a. Presentation time (10 minutes)
    b. Presentation covered (full or partial)
    c. Way of presentation
    d. Questioning and answering (5 minutes)

9. Examiners should be a panel of two one of them must be guide. Examiner must have experience at least 3 years. Examiners will be appointed by HOD in consultation with Principal.

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TERM - II
TELEMATICS

Teaching scheme:
Lectures: 4 hrs / week
Practical: 2 hrs / week

Examination scheme:
Theory Paper: 100 Marks (3 Hours)
Oral : 25 Marks
Term work : 25 Marks

UNIT I

Telephone switching and Traffic Engineering:

Evolution of telecommunication, simple telephone communication, basics of switching systems Dialing mechanism, electronics switching, digital switching system, SPC configuration , Architecture features, centralized and distributed SPC, enhanced services.

Traffic Engineering, Introduction, Traffic usages, traffic measurement unit, traffic distribution, Grade of service Blocking probability, Numericals on above topics. **Lectures 10, Marks 20**

UNIT II

Switching networks

Single stage and multistage switching N/W, blocking probability, Lee's model to evaluate blocking probability of three stage network , concept of time division time switching, time multiplexed time and space switching, combination switch ST, TS, STS, TST stages, Brief description of combination switching. **Lectures 10, Marks 20**

UNIT III

Mobile cellular Telephony:

Limitations of conventional mobile Telephone system, Frequency band allocation, Basic cellular system components, operations of a cellular. Calculation of maximum number of calls per hour per cell, frequency channels per cell, concept of frequency reuse, cell splitting: Hand off mechanism, Delayed hand off, Forced hand off. Mobile assisted hand off. Cell site hand off, Inter system hand off, co-channel Interference reduction factor, fading. Multi-user communication . TDMA, FDMA and CDMA. **Lectures 10, Marks 20**

UNIT IV

Digital cellular systems:

GSM, radio aspects, features of GSM. Architecture details channel structure, security aspects, Authentication and ciphering key. Different call flow sequences in GSM, North American CDMA cellular standard , radio aspect, forward link and Reverse link structure, key features of standard. **Lectures 10, Marks 20**

UNIT V

IP telephony

Introduction to VOIP, low level protocols, - RTP / RTCP / UDP, voice activity detection and discontinuous transmissions. IP telephony protocols: - H.323 standard, session Initiation protocol (SIP), Gateway location protocol, QOS requirements, RSVP Architecture, message format , reservation merging. **Lectures 10, Marks 20**

References :

1. Vishwanathan - Telecommunication switching systems , PHI
2. William C.Y. LEE - Wireless and cellular Telecommunications, MGH , 3rd Ed.
3. Raj Pandya - Mobile and personal communication systems , PHI
4. Rappaport - Wireless communication , PHI
5. Alberto Leon Garcia - Communication network, TMH
6. Andreas F. Molisch - Wireless communication, Wiley

List of Practical:

1. Study of Electronic Telephone exchange (C-Dot OR E-10B)
2. Traffic Measurement calculations
3. Mobile Transmitter and Receiver (Trainer Kit)
4. To study GSM architecture
5. To Study cordless Telephone system
6. To study CDMA
7. To study VOIP
8. To study RSVP Architecture.
9. Study of DTMF signaling including DTMF decoder
10. Study of GSM AT commands.

Note: Minimum **EIGHT** practicals are to be performed

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TERM - II

TELEVISION AND CONSUMER ELECTRONICS

Teaching scheme:
Lectures: 4 hrs / week
Practical: 2 hrs / week

Examination scheme:
Theory Paper: 100 Marks (3 Hours)
Practical : 25 Marks
Term work : 25 Marks

UNIT I

Basic concept of Television: TV broadcasting, Scanning methods, Synchronization, Aspect ratio, Kell factor, Horizontal and Vertical resolution, video bandwidth, positive and negative modulation. Composite video signal. **Camera Tubes:** Image Orthicon, Vidicon, Plumbicon, Saticon, Silicon diode array, **Television transmission:** VSB transmission, TV channels, TV standards, TV Channels bands, block diagram of monochrome TV receiver. **Lectures 10, Marks 20**

UNIT II

Colour Television receivers: Colour fundamentals, compatibility, frequency interleaving, colour mixing. Colour camera tube, picture tubes – static and dynamic convergence, colour purity. PAL, SECAM, NTSC system concept, encoder and decoder and their comparison. Colour TV transmitter and receiver block diagram. **Lectures 10, Marks 20**

UNIT III

Advanced TV system and techniques: Introduction to digital compression technique : GPEG, MPEG.,Block diagram of digital TV:- transmitter and receiver, HDTV- transmitter and receiver, DTH system, Video on demand. Introduction of Plasma and LCD TV. Cable TV. Introduction of 3D DTV system. CCTV, digital terrestrial TV (DTT). **Lectures 10, Marks 20**

UNIT IV

Methods of sound, video recording and reproduction: Disc recording, magnetic recording, optical recording- CD and DVD. Monophony, stereophony, Hi-Fi system. **PA system:** Block diagram, requirement, characteristics, its planning for various uses. Introduction to satellite radio reception (word space) **Lectures 10, Marks 20**

UNIT V

Modern Home Appliances : Block Diagram and working of FAX Machine, Washing Machine, Microwave Oven, Video Games, CD and DVD players, Digital diary. **Internet Applications:** E-mail, FTP, WWW. Solar Cells and Panels. Introduction to Palm Top, Pen Drive. **Lectures 10, Marks 20**

References:

1. A. M. Dhake - TV and Video Engineering , TMH
2. R. G. Gupta - TV Engineering and Video system , TMH
3. Kelth Jack - Video Demisified , Penram International
4. S. P. Bali - Colour TV Theory and Practice , TMH
5. Bernard Grobb, Charles E - Basic TV and Video system , TMH (6^{Th} Ed.)
6. R. R. Gulati - Monochrome and colour TV , New Age
7. Philips Handbooks on Audio, Video and Consumer Electronics application notes
8. Olson - High Quality Sound recording and reproduction

List of Practical:

1. Study of colour TV Receiver
2. Voltage and Waveform analysis for colour TV.
3. Alignment and fault finding of colour TV using wobbuloscope and pattern generator (02 Expts.)
4. Study of DTH and Set Top Box.
5. Study of CD / DVD player.
6. Practical Visit to TV transmitter / Studio.
7. Study of PA system with cordless microphone.
8. Study of Audio System, MP3 player, Satellite radio.
9. Study of HDTV.
10. Study of Digital TV.
11. Web page designing.
12. Study of Tape recorder

Note: Minimum **EIGHT** practicals are to be performed

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TERM - II
SATELLITE COMMUNICATIONS

Teaching scheme:
Lectures: 4 hrs / week
Practical: 2 hrs / week

Examination scheme:
Theory Paper: 100 Marks (3 Hours)
Term work : 25 Marks

UNIT I

Introduction: General background, frequency allocations for satellite services, basic satellite system, system design considerations, applications. **Satellite Orbits:** Introduction, laws governing satellite motion, orbital parameters, orbital perturbations, Doppler effects, geostationary orbit, antenna look angles, antenna mount, limits of visibility, Earth eclipse of satellite, sun transit outage, inclined orbits, sun-synchronous orbit, launching of geostationary satellites.

Lectures 10, Marks 20

UNIT II

Wave Propagation and Polarization: Introduction, atmospheric losses, ionospheric effects, rain attenuation, other impairments, antenna polarization, polarization of satellite signals, cross polarization discrimination, ionospheric depolarization, rain depolarization, ice depolarization. **Satellite Antenna:** Antenna basics, aperture antennas, parabolic reflectors, offset feed, double reflector antenna shaped reflector systems. **Lectures 10, Marks 20**

UNIT III

Link Design: Introduction, transmission losses, link power budget equation, system noise, carrier to noise ratio for uplink and downlink, combined uplink and downlink carrier to noise ratio, intermodulation noise. **Multiple Access Techniques:** Introduction, FDMA, TDMA, FDMA / DMA, operation in a multiple beam environment, CDMA, multiple access examples .

Lectures 10, Marks 20

UNITT IV

Satellite Transponder: Transponder Model, Satellite front end, RF filtering of digital carrier, Satellite signal processing Transponder limiting. **Communication Satellites:** Introduction, design considerations, lifetime and reliability, spacecraft sub systems, spacecraft mass and power estimations, space segment cost estimates. **Earth Stations:** Introduction, design considerations, general configuration and characteristics. **Lectures 10, Marks 20**

UNIT V

Non Geostationary Orbit Satellite Systems: Introduction, reasons, design considerations, case study, example of systems. **Satellite Applications**: INTELSAT Series, INSAT, VSAT, DBS Television and Radio, Remote sensing, Mobile satellite services: GSM and GPS, Satellite navigation system, DTH, Internet Connectivity, Video Conferencing.

Lectures 10, Marks 20

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References:

1. M. Richharia - Satellite Communications systems, Mc Millan publication ,2nd Ed.
2. Dennis Roddy - Satellite Communications, Mc-Graw Hill publication , 3rd Ed.
3. Timothy Pratt, Charles Bostian, Jeremy Allnut - Satellite communications , John Wiley & Sons , 2nd Ed.
4. J. Martin - Communication Satellite Systems, PHI Publication.
5. Robert M. Gagliardi - Satellite Communication , CBS Publishers and Distributors , 2nd Ed.

Term Work: It is 50% based on theory and 50% based on minimum FIVE assignments on above syllabus (one assignment for each unit)

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TERM - II
EMBEDDED SYSTEM (ELECTIVE II)

Teaching scheme:
Lectures: 4 hrs / week
Practical: 2 hrs / week

Examination scheme:
Theory Paper: 100 Marks (3 Hours)
Practical : 25 Marks
Term work : 25 Marks

UNIT I

Embedded system Introduction:

Introduction to Embedded System, History, Design challenges, optimizing design metrics, time to market, applications of embedded systems and recent trends in embedded systems, embedded design concepts and definitions, memory management, hardware and software design and testing, communication protocols like SPI, SCI, I2C, CAN etc

Lectures 10, Marks 20

UNIT II

System Architecture:

Introduction to ARM core architecture, ARM extension family, instruction set, thumb Instruction set, Pipeline, memory management, Bus architecture, study of on-chip peripherals like I / O ports, timers, counters, interrupts, on-chip ADC, DAC, RTC modules, WDT, PLL, PWM, USB etc. **Lectures 10, Marks 20**

UNIT III

Interfacing and Programming:

Basic embedded C programs for on-chip peripherals studied in system architecture. Need of interfacing, interfacing techniques, interfacing of different displays including Graphic LCD (320X240), interfacing of input devices including touch screen etc, interfacing of output devices like thermal printer etc., embedded communication using CAN and Ethernet, RF modules, GSM modem for AT command study etc. **Lectures 10, Marks 20**

UNIT III

Real Time Operating System Concept:

Architecture of kernel, task scheduler, ISR, Semaphores, mailbox, message queues, pipes, events, timers, memory management, RTOS services in contrast with traditional OS. Introduction to Ucos II RTOS, study of kernel structure of Ucos II, synchronization in Ucos II, Inter-task communication in Ucos II, memory management in Ucos II, porting of RTOS.

Lectures 10, Marks 20

UNIT V

Embedded Linux:

Introduction to the Linux kernel, Configuring and booting the kernel, the root file system, Root file directories, /bin, /lib etc., Linux file systems, Types of file system: Disk, RAM, Flash, Network. Some debug techniques- Syslog and strace, GDB, TCP / IP Networking- Network configuration, Device control from user space- Accessing hardware directly, Multi processing on Linux and Inter Process Communication- Linux process model and IPCs, Multithreading using pThreads - Threads verses Processes and pThreads, Linux and Real-Time Standard kernel problems and patches. **Lectures 10, Marks 20**

References:

1. Rajkamal - Embedded Systems, TMH.
2. David Simon - Embedded systems software primer, Pearson
3. Steve Furber - ARM System-on-Chip Architecture, Pearson
4. Jean J Labrose - MicroC / OS-II, Indian Low Price Edition
5. DR.K.V.K.K. Prasad - Embedded / real time system, Dreamtech
6. Iyer, Gupta - Embedded real systems Programming , TMH
7. Steve Heath - Embedded System Design , Neuwans

LAB EXERCISE

- Integrated Development Environment Overview (Project creation, down load and debug)
- Study of JTAG Debugger/on-board debugger-emulator.
- ARM Instructions execution (Barrel Shifter, LDR / STR, SMT / LDM)

List of Practical:

GROUP - A

1) Writing basic C-programs for I / O operations
2) C-Program to explore timers / counter
3) C-programs for interrupts
4) Program to demonstrate UART operation

GROUP - B

5) Program to demonstrate I2C Protocol.
6) Program to demonstrate CAN Protocol.

GROUP - C

7) Program to interface LCD
8) Program to interface Keyboard and display key pressed on LCD
9) Program to interface stepper motor

GROUP - D

10) Program to demonstrate RF communication
11) Program to implement AT commands and interface of GSM modem
12) Implementation of USB protocol and transferring data to PC.
13) Implementation of algorithm /program for the microcontroller for low power modes.

uCOS II / Embedded Linux RTOS Examples

GROUP - E

14) Interfacing 4 x 4 matrix keyboards and 16 x 2 characters LCD displays to microcontroller / microprocessor and writing a program using RTOS for displaying a pressed key.
15) Writing a scheduler / working with using RTOS for 4 tasks with priority. The tasks may be keyboard, LCD, LED etc. and porting it on microcontroller/ microprocessor.

GROUP - F

16) Implement a semaphore for any given task switching using RTOS on microcontroller board.
17) Create two tasks, which will print some characters on the serial port, Start the scheduler and observe the behavior.

GROUP – G

18) RTOS based interrupt handling using Embedded Real Time Linux.
19) Program for exploration of (Process creation, Thread creation) using Embedded Real Time Linux.

GROUP – H

20) Program for exploring Message Queues using Embedded Real Time Linux.
21) Ethernet Based Socket Programming using Embedded Real Time Linux.

Note: 1) At least **ONE** practical should be performed from **EACH GROUP**.
2) **TWO** practical should be performed using the **JTAG debugger / on-board Debugger- emulator.**

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TERM - II
DIGITAL IMAGE PROCESSING (ELECTIVE II)

Teaching scheme:
Lectures: 4 hrs / week
Practical: 2 hrs / week

Examination scheme:
Theory Paper: 100 Marks (3 Hours)
Practical : 25 Marks
Term work : 25 Marks

UNIT I

Digital Image Processing:

Introduction, Examples of Fields that use Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of Image Processing Systems, Image Sensing and Acquisition, Image Sampling and Quantization, Representing Digital Images, Spatial and Gray level Resolution, Basic pixel relationship, Distance Measures, Statistical Properties: Histogram, Mean, Standard Deviation, Introduction to DCT, Walsh, Hadamard, and Wavelet Transform.

Lectures 10, Marks 20

UNIT II

Image Enhancement:

Enhancement in Spatial Domain: Basic Gray Level Transformations, Histogram Processing, Enhancements using arithmetic and logical operations, Basics of Spatial Filtering, Smoothening and Sharpening Spatial filters, Enhancement in Frequency Domain: Smoothening and Sharpening frequency Domain Filters. **Lectures 10, Marks 20**

UNIT III

Image Coding and Compression:

Image Coding Fundamentals, Image Compression Model, Error Free Compression, VLC, Huffman, Arithmetic, RLC, Lossless Predictive Coding; Lossy-Compression, Lossy Predictive Coding, Transform Coding, Discrete Cosine Transform, Image Compression Standards, JPEG Baseline Coder Decoder. **Lectures 10, Marks 20**

UNIT IV

Image Restoration and Color Image Processing:

Image Degradation Model, Noise Models, and Restoration in Presence of Noise in spatial Domain, Linear Filtering, Inverse Filter, Wiener Filter, Constrained Least Square Restoration, Geometric Transformation, Spatial Transformation, and Grey Level Transformation. Color Image Processing, Color Image Fundamentals, Color models, RGB to HIS and vice versa, Color Transforms, Smoothing and Sharpening **Lectures 10, Marks 20**

UNIT V

Image Segmentation:

Image Segmentation: Point, line, Edge detection, Canny Edge Detection, Second Order Derivative, Hough Transform, Thresholding, Region Based Segmentation, Region Growing, Region Splitting and Merging, Image Representation, Chain Codes, Signature, Texture, Use of Principal Component for Description. **Lectures 10, Marks 20**

References:

1. Gonzalez and Woods - Digital Image Processing, Pearson Education/ PHI.
2. Arthur Weeks Jr - Fundamentals of Digital Image Processing, PHI.
3. A. K. Jain - Digital Image Processing, PHI
4. Pratt - Digital Image Processing, Wiley
5. Castleman - Digital Image Processing, Pearson

List of Practical:

1. Study of different file formats e.g. BMP, TIFF and extraction of attributes of BMP.
2. Study of statistical properties- mean, standard deviation, profile, variance and Histogram plotting.
3. Histogram equalization and modification of the image.
4. Gray level transformations such as contrast stretching, negative, power law transformation etc.
5. Spatial Domain filtering- smoothing and sharpening filters.
6. DCT / IDCT of given image.
7. Edge detection using Sobel, Prewitt and Roberts operators.
8. Capturing image through grabber card from camera and Process it.
9. Pseudo coloring.
10. Converting color image to B / W image and vice versa
11. Creating noisy image and filtering using MATLAB

Note: Minimum **EIGHT** practicals are to be performed.

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B.E. (ELECTRONICS, ELECTRONICS AND COMMUNICATION, ELECTRONICS AND TELECOMMUNICATION)

W.E.F : 2008- 09

TERM - II

NEURAL NETWORK AND FUZZY SYSTEM (ELECTIVE II)

Teaching scheme:
Lectures: 4 hrs / week
Practical: 2 hrs / week

Examination scheme:
Theory Paper: 100 Marks (3 Hours)
Practical : 25 Marks
Term work : 25 Marks

UNIT I

Introduction:

Biological neurons and their artificial model. Models of neuron: McCulloch-pitts Model, Perceptron, Adaline ,Topology: Basic structures of artificial neural network , Basic learning laws: Hebb's law, Perceptron learning law, Widrow and Hoff LMS learning law, Correlation learning law, Instar and Outstar learning law, Learning Methods: Hebbains learning , Competitive learning, Differential competitive learning , Error correction learning, Reinforcement learning, Stochastic learning.

Lectures 10, Marks 20

UNIT II

Perceptron Layer Network:

Perceptron learning Rule. Perceptron architecture: Single neuron Perceptron, Multiple-Neuron perceptron. Training Multiple neuron Perceptron. Limitations of Perceptron.

Supervised Hebbian Learning:

Linear association, Hebbs rule, Performance analysis, Variation of Hebians rule. Performance Surfaces and Optimum points: Taylor's series, Directional derivatives, Necessary condition for Optimality. **Lectures 10, Marks 20**

UNIT III

Widrow - Hoff Learning:

ADALINE Network, Single ADALINE, Mean square error, LMS algorithm, Analysis of convergence, Adaptive Filtering: Adaptive noise cancellation, Echo cancellation.

Backpropogation Network:

Multilayer Perceptron: Pattern classification, Function approximation. Back propagation algorithm: Performance index, Chain rule, Back propagation the sensitivity. **Lectures 10, Marks 20**

UNIT IV

Fuzzy Mathematics:

Classical sets, fuzzy sets, Fuzzy set operations, Procedure of Fuzzy Sets, Crisp Relations, Fuzzy Relations, Operation of Fuzzy Relations , Fuzzy Tolerance and Equivalence Relations membership functions, Defuzzyfication Methods. Manipulation of Linguistic Variables. **Lectures 10, Marks 20**

UNIT V

Application of Neuro - fuzzy System : Introduction to Neuro **-** Fuzzy System. Types of Neuro – Fuzzy nets, Neuro – Fuzzy Systems Design and implementation.

Fuzzy classification by equivalence relations: C-means clustering, hardening relations from clustering, Fuzzy pattern recognitions. Control applications: Control system design stages, Control Surface, System Identification Problem, Simple Neuro - Fuzzy Logic Controller, Industrial applications. **Lectures 10, Marks 20**

Reference Books:

1 Fausett - Fundamentals of Neural networks : Architectures, Algorithnors Applications , Pearson
2 B. Yegnanarayana - Artificial Neural Networks, Prentice Hall of India, New Delhi
3 Martin T. Hagan - Neural Network Design , PWS Publishing company (A devision of International Thomson Publishing Inc.)
4 J.M. Zurada - Introduction to Artificial Neural Network, Jaico Publishing House
5 Meherotra Kishan ,Mohan C.K, Ranka Sanjay - Elements Of Artificial Neural networks, Penram Int Pub Mumbai.
6 D.E Goldberg , Addision - Genetic Algorithm in Search Optimization and Machine Learning, Wesley Publication
7 Kalyanmoy Deb - Optimization for Engineering Design Algorithms and Examples, Prentice Hall of India New Delhi
8 George J. Klir / Bo Yuan - Fuzzy Sets And Fuzzy Logic, Prentice Hall of India New Delhi / Pearson
9 T. J. Ross - Fuzzy Logic With Engineering Application , McGraw hill Inc. 1995.

Practical: All the Practicals are based on Any Concerns Software .

1. Design and implementation of artificial neural network to compute XOR for two inputs using feedback artificial neural network.
2. Design a perceptron network to solve Classification problem with different classes of input vectors.(Take two or more classes of input vectors)
3. Design the Perceptron model for pattern recognition. (Take prototype pattern as example)
4. Simulate Adaline algorithm.
5. Implement Back-propagation simulator.
6. Find out the Fuzzy Relation of the given Fuzzy Sets.
7. Verify any one Defuzzification method.
8. Fuzzy pattern recognition.
9. Design any control system using fuzzy logic in simulink

Note: Minimum **EIGHT** practicals are to be performed.

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W.E.F : 2008- 09

TERM - II

TELECOMMUNICATION NETWORK MANAGEMENT (ELECTIVE II)

Teaching scheme:
Lectures: 4 hrs / week
Practical: 2 hrs / week

Examination scheme:
Theory Paper: 100 Marks (3 Hours)
Practical : 25 Marks
Term work : 25 Marks

UNIT I

Foundations and TMN architecture:

Network management standards, network management model, organization model, information model, abstract syntax notation 1 (ASN. 1), encoding structure, macros, functional model. Terminology, functional TMN architecture, Information architecture, physical architecture, TNN tube, TMN and OSI **Lectures10, Marks 20**

UNIT II

Network management application functional requirements:

Configuration management, fault management, performance management, error correlation technology, security management, accounting management, service level management, management service, community definitions, capturing the requirements, simple and formal approaches, semi formal and formal notations **Lectures10, Marks 20**

UNIT III

Information service element and modeling for TMN:

CMISE model, service definitions, errors, scooping and filtering features, synchronization, functional units, association services, common management information protocol specification. Rationale for information modeling, management information model, object oriented modeling paradigm, structure of management information, managed object class definition, management information base (MIB) **Lectures10, Marks 20**

UNIT IV

Simple Network Management Protocol:

SNMPv1: managed networks, SNMP models, organization model, information model, **SNMPv2:** communication model, functional model, major changes in SNMPv2, structure of management information (SMI), MIB, SNMPv2 protocol compatibility with SNMPv1, **SNMPv3:** architecture, applications, MIB security, remote monitoring SM and MIB, RMON1 and RMON2.

Lectures10, Marks 20

UNIT V

Network management examples and tools:

ATM integrated local management interface, ATM, MIB M1, M 2, M 3, M 4 interfaces, ATM digital exchange interface management, digital subscriber loop (DSL) and asymmetric DSL technologies, ADSL configuration management, performance management, network statistics management, network management system, management platform case studies: OPENVIEW, ALMAP **Lectures10, Marks 20**

References:

1. Mani Subramanium - Network management principles and practice , Pearson Education
2. Lakshmi Raman - Fundamentals of Telecommunication Network Management, PHI
3. Airdarous Salah - Telecommunication Network Management Technologies and implementations, PHI

List of Practical:

1. Connectivity of LAN computer to internet using dial up modem / leased line modem (installing and configuration)
2. Installation and configuration of network application like telnet.
3. Users creation, rights assignment, mappling drives, sharing files, printers etc using SNMP. Study and analysis of network
4. Design and implementation of network based on number of nodes and traffic.
5. Implementation of routing algorithms (software based) any TWO practicals, (shortest path)
6. Implementation of encryption and decryption (software based)
7. Campus networking – case study

Note: Minimum **EIGHT** practicals are to be performed, based on above syllabus.

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TERM - II
NANO –TECHNOLOGY (ELECTIVE II)

Teaching scheme:
Lectures: 4 hrs / week
Practical: 2 hrs / week

Examination scheme:
Theory Paper: 100 Marks (3 Hours)
Practical : 25 Marks
Term work : 25 Marks

UNIT I

Introduction to physics of solid state, Structure of Energy Bands-Insulators, Semiconductors, conductors, Effective masses, Fermi surfaces, localized Particles-Donors, Acceptors, Deep traps.

Nano, size of matter, different kind of small, Nano Challenges, Fundamental science behind Nanotechnology, Electrons, Atoms, Ions, Molecules, Metals, Other material, Biosystems, Molecular Recognition, Electrical conduction and ohm's law, Quantum Mechanics, Quantum ideas **Lectures 10, Marks 20**

UNIT II

Investing and manipulating materials in Nano scale, Electron Microscopies, Scanning probes Microscopies, optical Microcopies for nanoscience and technology
Tools for Measuring Nanostructures, Scanning Probe Instrument, Nanoscale Lithography
Tools for measuring Nanostructures, Scanning probe Instrument, Nanoscale Lithograpthy, Dip. Pen. Lithography, E beam Lithogaphfy, Nanosphere Lithographty, Polarizmatization, nanobricks and building Blocks. **Lectures 10, Marks 20**

UNIT III

Carbon Nano tubes –Synthesis and purification, Filling of Nano tubes, Mechanism of Growth, Electronic Structure, Transport Properties, Mechanical properties, Physical properties, Applications of Nano Tubes such as Field emission and shielding , Computer, Fuel Cell, chemical sensors
Properties of Nanotubes- strength and elasticity, Uses of Nano tubes
Smart Materials, Sensors, nanoscale Bio structure, Energy capture, Transformation and storage, Optics, Electronics, Natural nano scale Sensor, Electromagnetic sensors, Electronics Nose. **Lectures 10, Marks 20**

UNIT IV

Building blocks digital better, Linking brains with computer, FET to SET fabricating new chips, Quantum wells, wires, Dots - preparation of quantum Nanostructures
Synthesis of Quantum Dots - General strategies, Synthesis in Confined Media, Uses of Nano particles.
Semiconductor Quantum Dots, Synthesis of Quantum dots, Electronic Structure of Nanocrystals **Lectures 10, Marks 20**

UNIT V

Nanoelectronics – Introduction, The tools of manufacturing of Micro and nanofabrication optical Lithography, Electron Beam lithography, atomic lithography, Quantum Information and quantum computer , How is quantum computer works and difference between the classical computer.
Application in Medical, Understanding how pharmaceutical, Companies develop drug, Delivering new drug Technology, Oil and Water won't help, Mincells, special delivery cancer with Nanoshell. **Lectures 10, Marks 20**

References:

1. Mark Ratnakar, Daniel Ratnakar – Nanotechnology : A gentle Introduction to Next Big Idea, Prentice hall of India
2. Richard Booker, Eart Boy sen - Nanotechnology Fun and easy way, Wiley
3. Charles P. Poole J.V. Frank J. Owens - Introduction to Nanotechnology , Wiley India ISBN
4. T. Pradeep - Nano: The essentials, understanding Nanoscience and Nanotechnology , TMH
5. Mick Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons, Burkhard Ragase - NANOTECHNOLOGY basic science and emerging technologies - Overseas press ISBN81 -88689 - 20-3

Note: Minimum **EIGHT** practicals are to be performed, based on above syllabus

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W.E.F : 2008- 09

TERM - II
INDUSTRIAL VISIT / CASE STUDY

Teaching scheme:
NIL

Examination scheme:
Term Work : 25 Marks

EDUCATION TOUR / TECHNICAL VISITS / CASE STUDY AND ITS EVALUATION

1. During (B.E. First Term / Second Term) seventh and / or eighth terms or during vacation between (B.E. First Term / Second Term) seventh and eighth terms, every student; shall visit minimum two industries, factories arranged by colleges and accompanied by teachers. There shall be at least one teacher for a group of 20 students and at least one non-teaching staff accompanied with the students.

2. The colleges should obtain appropriate certificates of visit from the concerned organizations just after the visits.

3. Students should submit written report about the visits individually at the end of (B.E. Second Term) eighth term.

4. The report should contain information about the following points:

   (a) The organization - activities of organization and administrative setup technical personnel and their main duties.
   (b) The project / industry brief description with sketches and salient technical information.
   (c) The work / processes observed with specification of materials, products, equipments etc. and role of engineers in that organization.
   (d) Suggestions (if any) for improvement in the working of those organizations.

5. The evaluation of the report of technical visits will be made by panel of two teachers appointed by principal based on following points:

   (a) Coverage aspect: All above points should be covered.
   (b) Detailed observations: System / Process / Product explained with data, diagram specifications.
   (c) Quality of presentation: Report should be very objective and should consist of clear and systematic organization of topics and information.
   (d) Viva - voce: A viva -voce shall be conducted on the technical visit report by the teachers to assess the specific knowledge gained by the students for technical applications.

6. The case study should include the study problem in Electronics or in Electronics and telecommunication Engineering branch.

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B.E. (ELECTRONICS, ELECTRONICS AND COMMUNICATION, ELECTRONICS AND TELECOMMUNICATION)

W.E.F : 2008- 09

TERM - II
PROJECT II

Teaching scheme:
Practicals: 4 hrs / week

Examination scheme:
Oral : 50 Marks
Term Work : 100 Marks

1. The Project group in (B.E. first Term) seventh term will continue the project work in (B.E. Second Term) eighth term and complete project in all respect (assembly, testing, fabrication, tabulation, test result etc.)
2. The group should maintain a logbook of activities. It should have entries related to the work done, problems faced, solution evolved etc., duly signed by guide.
3. The guides should regularly monitor the progress of the project work.
4. The project work along with project report should be submitted as part of term work in (B.E. Second Term) eighth term on or before the last day of the (B.E. Second Term) eighth term
5. Project report must be submitted in the prescribed format only. No variation in the format will be accepted.
6. Assessment of the project for award of TW marks shall be done by the guide and a departmental committee (consisting of minimum two teachers with experience more than three years) as per the guidelines given in the following table.

B) ASSESSMENT OF PROJECT II TERMWORK (B.E. SECOND TERM)

NAME OF THE PROJECT: _____

NAME OF THE GUIDE: _____

Sr. No	Exam. Seat No	Name Of Students	Assessment by guide (70%)						Assessment by department (30%)			Grand Total
			Fabrication /software / actual work	Execution of project	Project report	Scope/ Cost / Utility	Attende-nece	Total	Evaluation (10%)	Prese-ntaion (20%)	Total	
		Marks	20	10	20	10	10	70	10	20	30	100

Sign of Guide Sign. of Committee Members Sign. of H. O. D.

7. The guide should be internal examiner for oral examination (If experience is greater than three years).
8. The external examiner should be from the related area of the concerned project. He should have minimum of five years of experience at degree level / industry.

9. The evaluation at final oral examination should be done jointly by the internal and external examiners.

10. The Project work should be kept in department for one academic year after University Examination .

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Second Year Engineering (Information Technology)

Faculty of Engineering and Technology

COURSE OUTLINE

Semester – III

W.E.F 2013 – 2014

Annexure - I

SE Semester - III

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory			Practical	Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Engineering Mathematics-III	D	3	1	---	4	20	80	---	---	100	4
Information Theory	B	3	---	---	3	20	80	---	---	100	3
Discrete Structure & Graph Theory	D	3	1	---	4	20	80	---	---	100	4
Digital System & Microprocessor	D	3	---	---	3	20	80	---	---	100	3
Object Oriented Technology	D	3	---	---	3	20	80	---	---	100	3
Soft Skills – III	C	1	---	2	3	---	---	50	---	50	2
Information Theory Lab	B	---	---	2	2	---	---	50	---	50	1
Discrete Structure & Graph Theory Lab	D	---	---	2	2	---	---	25	25 **(PR)**	50	1
Digital System & Microprocessor Lab	D	---	---	2	2	---	---	25	25 **(PR)**	50	1
Object Oriented Technology Lab	D	---	---	2	2	---	---	25	25 **(PR)**	50	1
Total		**16**	**2**	**10**	**28**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

SE Semester - IV

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Data Communication	D	3	---	---	3	20	80	---	---	100	3
Microprocessor & Microcontroller Interfacing	D	3	1	---	4	20	80	---	---	100	4
Data Structures	D	3	1	---	4	20	80	---	---	100	4
Computer Organization	D	3	---	---	3	20	80	---	---	100	3
Computer Graphics & Multimedia	D	3	---	---	3	20	80	---	---	100	3
Application Development Lab	B	1	---	2	3	---	---	50	---	50	2
Data Communication Lab	D	---	---	2	2	---	---	50	---	50	1
Microprocessor & Microcontroller Interfacing Lab	D	---	---	2	2	---	---	25	25 **(PR)**	50	1
Data Structures Lab	D	---	---	2	2	---	---	25	25 **(PR)**	50	1
Computer Graphics & Multimedia Lab	D	---	---	2	2	---	---	25	25 **(PR)**	50	1
Total		**16**	**2**	**10**	**28**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

Engineering Mathematics –III

COURSE OUTLINE

Course Title	Short Title	Course Code
Engineering Mathematics -III	**EM-III**	

Course Description:

This course is aimed at introducing the fundamentals of basic Mathematics to undergraduate students. The background expected includes a prior knowledge of Mathematics from first year engineering or diploma and familiarity with various laws, principles and theories. The goals of the course are to understand the basic principle of Mathematics and its application in different area.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**40**	**04**
Tutorial	**01**	**15**	**13**	

Prerequisite Course(s): Engineering Mathematics-I, Engineering Mathematics-I / Diploma Mathematics.

COURSE CONTENT

Engineering Mathematics -III **Semester- III**

Teaching Scheme	**Examination Scheme**	
Lecture: 3 hours / week	**End Semester Examination (ESE)**	**: 80 Marks**
Tutorial: 1 hour / week	**Paper Duration (ESE)**	**: 03 Hours**
	Internal Sessional Exam (ISE)	**: 20 Marks**

1. Laplace Transform (08 Hours, 16 marks)

- Definition and Existence of Laplace transforms.
- Laplace Transform of elementary/standard functions.
- Theorems and Properties of Laplace Transform (without proof).
- Inverse Laplace Transform.
- Laplace Transform of Unit step function.
- Solution of differential equations using LT.

2. Fourier Transform and Z-Transform (08 Hours, 16 marks)

A) Fourier Transform:

- Introduction to Fourier Integral theorem.
- Fourier Transforms, Fourier Cosine Transforms, Fourier Sine Transform and their inverse.

B) Z- Transform:

- Definition and standard properties (without proof)
- Region of Convergence.
- Z-Transform of standard / elementary sequences.
- Inverse Z-transform.

3. Statistics and Probability distributions (08 Hours, 16 marks)

- Introduction to Mean, Mode, Median standard deviation, Variance, Coefficient of Variation.
- Moments, Skewness and kurtosis.
- Correlation and Regression.
- Binominal Distribution.
- Poisson distribution.
- Normal distribution.

4. Testing of Hypothesis and Significance (08 Hours, 16 marks)

- Introduction to population parameters and statistics.
- Testing of Hypothesis, Null Hypothesis and Alternative Hypothesis.
- Level of Significance.
- Test of Significance of large sample.
- Chi-Square test.

5. Fuzzy Sets and System (08 Hours, 16 marks)

- Introduction to Fuzzy sets.
- Standard Fuzzy sets operations.
- Crisp sets, Crisp sets verses Fuzzy sets.
- Fuzzy arithmetic.
- Constructing Fuzzy sets and operations on Fuzzy sets and systems
- Applications of Fuzzy sets.

Text Book:

1. Debashis Dutta, "Textbook of Engineering Mathematics", New Age International Publishers.
2. Witold Pedrycz and Fernando Gomide, "An Introduction to Fuzzy Sets: Analysis and Design", Prentice Hall of India, New Delhi.

Reference Books:

1. H.K. Dass, "Advanced Engineering Mathematics", S. Chand Publication, New Delhi.
2. Erwin Kreyszig, " Advanced Engineering Mathematics", Wiley Eastern Ltd.
3. B.S. Grewal, "Higher Engineering Mathematics" , Khanna Publication, Delhi.
4. Wylie C.R. & Barrett , " Advanced Engineering Mathematics", Mc Graw Hill.
5. B.V. Raman, "Engineering Mathematics", Tata Mc Graw Hill.
6. N. P. Bali , "A Text Book of Engineering Mathematics", Laxmi Publication.
7. George J. Klir and Bo Yuan, ''Fuzzy Sets and Fuzzy Logic: Theory and Applications".

Information Theory

COURSE OUTLINE

Course Title	Short Title	Course Code
Information Theory	**IT**	

Course Description:

This subject imparts the fundamentals of both information theory and data compression. The subject details how programmers and electronic communications professionals can use cryptography-the technique of enciphering and deciphering messages-to maintain the privacy of computer data. It describes dozens of cryptography algorithms, gives practical advice on how to implement them into cryptographic software, and shows how they can be used to solve security problems.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	**15**	**45**	**03**

Prerequisite Course(s): Fundamental knowledge of Computer.

COURSE CONTENT

Information Theory **Semester-III**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week **End Semester Examination (ESE) : 80 Marks**
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Introduction **(08 Hours, 16 marks)**

a) Computer security concepts
b) Security attacks
c) Security services and Security mechanism.

Classical Encryption Techniques

a) Symmetric cipher model
b) Substitution techniques
c) Transposition techniques
d) Rotor machines
e) Steganography
f) Cryptographic Protocols

Block Ciphers and DES

a) Block cipher principles
b) Data Encryption Standard
c) Differential and Linear cryptanalysis

2. Block Cipher Operation **(08 Hours, 16 marks)**

a) Multiple encryption and Triple DES
b) Electronic code book
c) Cipher block chaining mode
d) Cipher feedback mode
e) Output feedback mode
f) Counter mode

Introduction to Number Theory

a) Prime numbers
b) Fermat's and Euler's Theorems
c) Testing for primality
d) Chinese remainder theorem

Public-key Cryptosystem and RSA:

a) Principles
b) RSA algorithm

3. Cryptographic Hash Functions **(08 Hours, 16 marks)**

a) Applications of hash functions
b) Simple hash functions
c) Requirements and security
d) Secure Hash Algorithm (SHA)

Digital Signatures

a) Introduction to Digital Signatures
b) ElGamal and Schnorr digital signature scheme
c) Digital signature standard

Key Management and Distribution

a) Symmetric key distribution using symmetric and asymmetric encryption
b) Distribution of public keys
c) X.509 certificates
d) Public key infrastructure

4. Data Compression **(08 Hours, 16 marks)**

a) Introduction
b) Coding and Modeling
c) Shannon-Fano algorithm
d) Huffman algorithm, Adaptive Huffman coding
e) Arithmetic coding
f) Statistical modeling

5. Graphics and Speech Compression **(08 Hours, 16 marks)**

a) Dictionary based compression
b) Sliding window compression
c) LZ78 compression, Speech compression
d) Lossy graphics compression

Text Books:

1. William Stallings, "Cryptography and Network Security", Fifth edition, Pearson, 2011
2. Mark Nelson and Jean-Loup Gailly, "The Data Compression Book", Second edition, BPB Publications

Reference Books:

1. Bruce Schneider, "Applied cryptography: Protocols, Algorithms and sources code in C", Second edition, Willey, 2008.
2. Atul Kahate, "Cryptography and Network Security", Second edition, TMH, 2007.
3. D.C. Hankerson , Greg A. Harris and Peter D. Johnson Jr., "Introduction to Information Theory and Data Compression", Second edition, CRC Press, 2003.
4. Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, "Handbook of Applied Cryptography", CRC Press, 1996.
5. Forouzan, "Cryptography & Network Security", Second edition, TMH, 2010.

Discrete Structure and Graph Theory

COURSE OUTLINE

Course Title	Short Title	Course Code
Discrete Structure and Graph Theory	**DSGT**	

Course Description:

The objective of this course is to introduce the students to the fundamentals of Discrete Structures and also with Graph Theory with concepts of the C programming language and enable them to apply these concepts for solving real world problems.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	15	45	04
Tutorial	01	15	15	

Prerequisite Course(s): Fundamental knowledge of C

COURSE CONTENT

Discrete Structure and Graph Theory **Semester-III**

Teaching Scheme	Examination Scheme	
Lecture: 3 hours / week	**End Semester Examination (ESE)**	**: 80 Marks**
Tutorial: 1 hour / week	**Paper Duration (ESE)**	**: 03 Hours**
	Internal Sessional Exam (ISE)	**: 20 Marks**

1. Propositions, Sets, Probability (08 Hours, 16 marks)

a Propositions, compound proposition, basic logical operations, truth tables, tautology, contradiction.

b Quantifiers: universal and existential quantifiers.

c Theory: Set, Combinations of Sets, Mathematical Induction Principle.

d Cardinality of finite Sets, Rule of sum, Rule of product.

e Permutations, Combinations.

f Discrete Probability.

2. Relations and Functions: (08 Hours, 16 marks)

a Definitions, properties of Binary relations.

b Equivalence Relations and partitions, Partial ordering relations.

c Lattice, chains and antichains.

d Transitive Closure and Warshall's Algorithm.

e Functions Definitions, Composition of Functions, Types of Function.

f Recursive Functions, Pigeonhole principle.

3. Recurrence Relation and Analysis of Algorithms (08 Hours, 16 marks)

a Recurrence Relation, Linear Recurrence Relations with constant Coefficients.

b Homogeneous Solutions, Particular Solutions, total solutions, Solution by the method of generating functions.

c Introduction, Largest number algorithm, sorting algorithms: Bubble sort.

d Divide and conquer algorithms: binary search algorithm.

e strassens matrix multiplication, Time Complexity of Algorithms.

f Complexity of Problems, Tractable and Intractable Problems.

4. Graphs and Trees (08 Hours, 16 marks)

a Basic terminology, multigraphs and weighted graph , paths and circuits.

b Dijkstra's shortest path algorithms.

c Euler and Hamiltonian Paths and circuits .

d factors of a graph, Planner graph.

e Trees, rooted trees, path length in rooted trees.

f prefix code, binary search trees.

g spanning trees and cut set, minimum spanning trees.

h kruskal's and prim's algorithms for minimum spanning tree.

5. Algebraic system Boolean algebra (08 Hours, 16 marks)

a Semigroup, Subsemigroup, Monoid, Submonid.

b Abelian Group, Subgroups.

c Isomorphism, Automorphism,Homomorphism .

d Ring, Integral domain ,field .

e Lattice and Algebraic systems, Principle of duality.

f basic properties of lattice defined by lattices, distributive and complemented lattices.

g Boolean lattices and Boolean algebras, Boolean functions and Boolean Expressions.

h Number system and Interconversion of number systems.

Text Books:

1. C.L. Liu , " Elements of Discrete Mathematics", Second edition, TMH.
2. Seymour Lipschutz, Marc Lipson, " Discrete Mathematics", Second edition, TMH.

Reference Books:

1. Kenneth H. Rosen, Discrete Mathematics and its Application, Fifth edition, TMH.
2. V. K. Balakrishnan, " Graph Theory", TMH.
3. B. Kolman , R. Busby and S. Ross, "Discrete Mathematical Structures" Fourth edition, Pearson .
4. J. Treamblay , R. Manohar ," Discrete Mathematical structures with application to computer science" , TMH.
5. Sukhendu dey, "Graph theory and its applications", Shroff publications.
6. John Dossey,Otto,Spence,Eynden, "Discrete Mathematics", Pearson publications, Fifth edition.

Digital System and Microprocessor

COURSE OUTLINE

Course Title	Short Title	Course Code
Digital system and Microprocessor	**DSM**	

Course Description:

The objective of this course is to introduce the students with a comprehensive study of the digital system covering basic concepts of digital system and microprocessors.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	**15**	**45**	**03**

Prerequisite Course(s): Fundamental knowledge of digital system and microprocessors.

COURSE CONTENT

Digital System and Microprocessor **Semester-III**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week **End Semester Examination (ESE) : 80 Marks**
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. **Review of fundamental concepts of digital electronics**
   (08 Hours, 16 marks)
   a. Logic Gates
   b. Implementation of logic gates using universal gates
   c. Digital Signal: Positive & Negative logic
   d. Boolean Algebra
   e. Kmap representation (2, 3 and 4 variable)
   f. Grouping in the Kmap
   g. Don't Care condition in Kmap

2. **Combination logic design** **(08 Hours, 16 marks)**
   a. Kmap representation (5 and 6 variable)
   b. Grouping in the Kmap

c. Don't Care condition in Kmap
d. Design of adder and subtractor
e. Design of BCD adder and BCD subtractor
f. Combination logic design examples
g. Design of multiplexer & its examples
h. Demultiplexer & its examples
i. Design of comparator

3. Sequential logic design (08 Hours, 16 marks)

a. Sequential Logic Design
b. One bit memory cell
c. SR and JK flip flop
d. D and T flip flop
e. Design of synchronous and asynchronous counter
f. Sequence generator & detector

4. 8086 Microprocessor (08 Hours, 16 marks)

a. 8086 Architecture & Register Organisation
b. 8086 Memory Segmentation
c. 8086 Addressing Modes
d. 8086 Signal Descriptions
e. 8086 Instruction Set

5. 8086 assembly programming (08 Hours, 16 marks)

a. Assembler directives
b. DOS and BIOS interrupts
c. Macros and Procedures
d. Assembly language programming of 8086

Text Books:

1. R.P. Jain, "Modern Digital Electronics", Tata McGraw Hill, Fourth edition.
2. A. K. Ray and K.M. Bhurchandi, "Advanced Microprocessors and Peripherals", Tata McGraw Hill, Third edition.

Reference Books:

1. M. Morris Mano, "Digital Logic and Computer Design", Pearson, 1979.
2. V.K.Puri, "Digital Electronic Circuit and System", Tata McGraw Hill, 1997.
3. F.J. Hill, "Digital Logic and Microprocessor", John Willy & sons.

4. Anandkumar, “Fundamentals of Digital Circuits”, Pearson.
5. John Wiley and Sons, “Introduction to Switching Theory and Logic Design”, Hill and Peterson, Third edition.
6. Douglas V Hall, “Microprocessor and Interfacing, Programming and Hardware”, Tata McGraw Hill, Second edition.
7. Soumitra Kumar Mandal, “Microprocessor and Microcontroller: Architecture, Programming and Interfacing using 8085, 8086 and 8051”, Tata McGraw Hill.
8. B Ram, “Advanced Microprocessors and Interfacing”, Tata McGraw Hill.
9. Peter Abel, “IBM PC Assembly Language and Programming”, Pearson, Fifth edition.

Object Oriented Technology

COURSE OUTLINE

Course Title	Short Title	Course Code
Object Oriented Technology	**OOT**	

Course Description:

The objective of this course is to introduce the students to the concepts of C++ programming language and enable them to apply these concepts for solving real world problems.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	**15**	**45**	**03**

Prerequisite Course(s): C Programming.

COURSE CONTENT

Object Oriented Technology **Semester-III**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Introduction to Object Oriented Programming

(08 Hours, 16 marks)

a. Introduction to procedural, modular and object-oriented programming techniques.
b. Limitations of procedural programming.
c. Need of object-oriented programming. Advantages, disadvantages and applications of OOP.
d. Class, objects, abstraction, encapsulation, data hiding, inheritance, polymorphism and message passing.
e. The basics of C++
f. Expressions

2. Classes and Objects, Function and Operator Overloading

(08 Hours, 16 marks)

a. Class and objects
b. Constructors and destructors:
c. Functions in C++
d. Function Overloading
e. Operator overloading

3. Pointers and Arrays (08 Hours, 16 marks)

a. Introduction, pointer declaration, voids pointers.
b. Pointers to class objects, this pointer.
c. Pointers to members, accessing private members with pointers.
d. Characteristics of arrays, initialization of arrays.
e. Arrays within a class, arrays of objects.
f. Dynamic memory allocation using new and delete operators.
g. One dimensional and two dimensional arrays using pointers.

4. Inheritance, Virtual functions and Polymorphism

(08 Hours, 16 marks)

a. Introduction, base and derived classes. Inheritance types, access modifiers.
b. Single inheritance, multiple and multilevel inheritance, hybrid, hierarchical, multipath inheritance and virtual base classes.
c. Overriding base class members. Constructors and inheritance, calling base class constructor.
d. Static and dynamic binding. Pointers to base and derived classes.
e. Virtual functions, rules for virtual functions, working of virtual functions, pure virtual functions.
f. Virtual base classes.

5. Files and Streams, Managing Console I/O Operations and Templates

(08 Hours, 16 marks)

a. Concept of a file, file stream operations.
b. Opening a file using constructor and open function, closing a file, detecting end-of-file, file modes, file pointers.
c. Introduction to C++ streams, stream classes, unformatted and formatted I/O.
d. ios class functions and flags, manipulators.
e. Introduction to function template and class template.
f. Overloading of templates functions.

g. Member function templates and template arguments.
h.

Text Books:

1. E. Balagurusamy, “Object Oriented Programming with C++”, Fifth Edition, Tata McGraw Hill, 2011.
2. Robert Lafore, “Object Oriented Programming in C++”, Fourth Edition, Pearson Education, 2002.

Reference Books:

1. Ashok N. Kamthane, “Object-Oriented Programming with ANSI and Turbo C++”, Pearson Education, 2006.
2. Rajesh K. Shukla, “Object-Oriented Programming in C++”, Wiley India, 2008.
3. Bjarne Stroustrup, “C++ Programming Language”, Third Edition, Addison Wesley, 2002.
4. Yashavant P. Kanetkar, “Let Us C++”, Second Edition, BPB Publications, 2003.
5. Venugopal K.R., “Mastering C++”, First Edition, TMH, 1999.
6. Mahesh Bhave, Sunil Patekar, “Object Oriented Programming with C++”, Second Edition, 2012.
7. Herbert Schildt, “The Complete Reference C++”, Fourth Edition, TMH, 2003.

Soft Skills – III

COURSE OUTLINE

Course Title	Short Title	Course Code
Soft Skills – III	**SK-III**	

Course Description:

Through this course we have tried to prepare the students for the industry. Most companies test mathematical and logical ability through an aptitude test. This subject aims at working on these skills of a student through strategies formulae and practice exercises.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	1	**14**	**14**	**2**

Prerequisite Course(s): Fundamental knowledge of High School Mathematics.

COURSE CONTENT

Soft Skills – III **Semester-III**

Teaching Scheme **Examination Scheme**

Lecture: 1 hour / week **Internal Continuous Assessment (ICA): 50 Marks**

Unit-I: Arithmetic-1 **(03 Hours, 10 marks)**

a. Basic Formulae

i. Divisibility Rules
ii. Speed Maths
iii. Remainder Theorem
iv. Different Types of Numbers
v. Applications

b. HCF, LCM and Linear Equations

i. HCF – Successive Division and Prime Factorization Methods
ii. LCM – Successive Division and Prime Factorization Methods
iii. Applications

iv. Linear Equations – Elimination Method
v. Substitution Method
vi. Applications

c. Averages and Mixtures

i. Concept of Average
ii. Faster Ways of Finding It
iii. The Allegation Method
iv. Applications

Unit-II: Arithmetic–II **(03 Hours, 10 marks)**

a. Percentages

i. Concept of Percentage
ii. Working with Percentages
iii. Applications

b. Profit and Loss

i. Difference between Cost and Selling Price
ii. Concept of Profit Percentage and Loss Percentage
iii. Applications

c. Time and Work

i. Basic Time and Work Formula
ii. Relation between Time and Work
iii. Applications

Unit-III: Arithmetic–III **(03 Hours, 10 marks)**

a. Permutations and Combinations

i. Sum Rule of Disjoint Counting
ii. Product Rule of Counting
iii. Concept of Factorial
iv. Permutations
v. Linear Permutations
vi. Combinations
vii. Circular Permutations
viii. Applications

b. Probability

i. Definition and Laws of Probability
ii. Mutually Exclusive Events
iii. Independent Events
iv. Equally Likely Events
v. Exhaustive Events
vi. Cards
vii. Dice
viii. Applications

c. Time and Distance

i. Speed
ii. Conversion Factors for Speed
iii. Average Speed
iv. Moving Bodies – Passing, Crossing and Overtaking
v. Relative Speed
vi. Boats and Streams
vii. Applications

Unit-IV: Non-Verbal Reasoning (02 Hours, 10 marks)

a. Analogies

i. Examples
ii. Applications

b. Classification

i. Examples
ii. Applications

c. Sequences

i. Examples
ii. Applications

Unit-V: Analytical Reasoning (03 Hours, 10 marks)

a. Analytical Puzzles

i. Classification Puzzles
ii. Ordering Puzzles
iii. Assignment Puzzles
iv. Applications

b. Letter and Number Series

i. Different Types of Letter Series
ii. Different Types of Number Series
iii. Mixed Series

c. Coding and Decoding

i. Letter Coding
ii. Number Coding
iii. Mixed Coding
iv. Odd Man Out
v. Applications

Guide lines for ICA:
ICA will be based on credit tests and assignments submitted by the student in the form of journal.

Reference Books:

1. R. S. Aggarwal, "Quantitative Aptitude", S. Chand Publication, New Delhi, 2012.
2. R. S. Aggarwal, "A Modern Approach to Verbal Reasoning", S. Chand Publication, New Delhi, 2012.
3. R. S. Aggarwal, "A Modern Approach to Non-Verbal Reasoning", S. Chand Publication, New Delhi, 2012.

Information Theory Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Information Theory	**IT**	

Course Description:

This laboratory provides students with a comprehensive study of the basic concepts of cryptography and data compression. It will helps the students to understand how programmers and electronic communications professionals can use cryptography-the technique of enciphering and deciphering messages-to maintain the privacy of computer data and also shows how they can be used to solve security problems.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**15**	**30**	**01**

Total Semester Credits: 1

Prerequisite Course(s): Fundamental knowledge of Computers and any programming language (Ex. C language).

LAB COURSE CONTENT

Outline of Content:

(Note: Minimum SIX Experiments from group A and FOUR from group B.)

Group A

1. **Program for simple encryption and decryption of the message**
   - A simple encryption and decryption of a message can be implemented by using any programming language
   - The program should consist of two modules: Encryption and Decryption
2. **Program for Vernam Cipher (One-time Pad)**
   - Program should consist of encryption and decryption module
3. **Program for Simple Transposition Technique**

- A simple transposition technique such as 'Rail Fence' technique can be implemented
- In this technique plain text is written in zig - zag form to obtain cipher text

4. **Program for Electronic Code Book (ECB) Mode**
   - Algorithmic mode ECB can be implemented
   - Program must exhibits the working of ECB i.e. block-by-block encryption and decryption

5. **Program for Cipher Block Chaining (CBC) Mode**
   - Algorithmic mode CBC can be implemented
   - Program must exhibits the working of CBC

6. **Program for Chinese Remainder Theorem**
   - A simple program is written to show the working of Chinese remainder theorem

7. **Program for Diffie-Hellman Key Exchange Algorithm**
   - Key exchange is a big problem in symmetric key and it can be resolved by using Diffie-Hellman key exchange algorithm

8. **Program for RSA algorithm**
   - Public key algorithm (RSA) can be implemented for simple input
   - Program must consist of three modules: Key generation, Encryption and Decryption

9. **Study of Digital Signature**
   - A digital signature is a mechanism that enables the creator of a message to attach a code that acts as a signature.

Group B

1. **Program for Caesar Cipher**
   - A simple program on Caesar cipher can be implemented
   - It should consists of two modules: encryption and decryption
   - Encryption: Cipher text=Plain text + (Key=3)
   - Decryption: Plain text= Cipher text - (Key=3)

2. **Program for Simple Stream Cipher**
   - Stream ciphers works on bit-by-bit basis
   - It should consists of two modules: encryption and decryption
   - Encryption: Cipher text bit=Plain text bit XOR Key bit
   - Decryption: Plain text bit = Cipher text bit XOR Key bit

3. **Study of JPEG Standard**
   - Image compression standard

4. **Study of Adaptive Huffman Coding Technique**
   - Limitation of Huffman coding techniques are removed in adaptive coding

5. **Program for RLE Encoding Technique**
   - Run-Length encoding technique is lossless data compression technique. It is generally used for text and image compression.

Reference Books:

1. William Stallings, "Cryptography and Network Security", Fifth edition, Pearson, 2011
2. Mark Nelson and Jean-Loup Gailly, "The Data Compression Book", Second edition, BPB Publications
3. Bruce Schneider, "Applied cryptography: Protocols, Algorithms and sources code in C", Second edition, Willey, 2008.
4. Atul Kahate, "Cryptography and Network Security", Second edition, TMH, 2007.
5. D.C. Hankerson , Greg A. Harris and Peter D. Johnson Jr., "Introduction to Information Theory and Data Compression", Second edition, CRC Press, 2003.
6. Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, "Handbook of Applied Cryptography", CRC Press, 1996.
7. Forouzan, "Cryptography & Network Security ", Second edition, TMH, 2010.

Discrete Structure and Graph Theory Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Discrete Structure and Graph Theory	**DSGT LAB**	

Course Description:

This laboratory provides students with a comprehensive study of the C programming language in discrete structures and graph theory. Classroom lectures stress the strengths of C which provide students with the means of writing efficient codes for discrete structures and graph theory.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**15**	**30**	**01**

Total Semester Credits: 1

Prerequisite Course(s): Fundamental knowledge of C.

LAB COURSE CONTENT

Outline of Content:

(Note: Minimum FIVE experiments from the group A and minimum FIVE experiments from the group B.)

(Group A)

1. **A program for logical operations using bitwise operators.**
   Perform logical operations like AND,OR,NOT,IF THEN,IF AND ONLY IF
2. **A program for set operations: Union, Intersection, Difference, Symmetric difference.**
   Perform set operations like union, intersection, difference, symmetric difference, complement
3. **A program for generation of Power set of a given set.**
   Producing power set for a given input set.
4. **A program for generation of permutations.**
   Producing permutations set for a given input set.

5. **A program for generation of combinations.**

   Producing permutations set for a given input set.
6. **A Program for Bubble sort.**

   Sorting of given numbers by using Bubble sort.

(Group B)

1. **A Program for Matrix multiplication.**

   Performing Multiplication of two matrices.
2. **A Program for Binary search.**

   Searching of a given number using binary search.
3. **A Program for Shortest Path algorithm using Dijkstra's.**

   Finding shortest path in a graph using Dijkstra's algorithm.
4. **A program for implementation of Kruskal's algorithm.**

   To find minimum spanning tree using kruskals algorithm.
5. **A program for implementation of Prim's algorithm.**

   To find minimum spanning tree using kruskals algorithm.
6. **A program for Inter conversion of number system.**

   Interconverting numbers from one base to another base.

Reference Books:

1. Kenneth H. Rosen, Discrete Mathematics and its Application, Fifth edition, TMH
2. V. K. Balakrishnan, " Graph Theory", TMH.
3. B. Kolman , R. Busby and S. Ross, "Discrete Mathematical Structures", Fourth edition, Pearson.

Digital System and Microprocessor Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Digital System and Microprocessor	**DSM**	

Course Description:

This laboratory provides students with a comprehensive study of the digital system covering basic concepts of digital system and microprocessor covering microprocessor concepts. This laboratory focuses on basic analysis and design of digital circuit's and the basic concepts and programming related to microprocessor.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**15**	**30**	**01**

Total Semester Credits: 1

Prerequisite Course(s): Fundamental knowledge of basic digital design and microprocessor concepts.

LAB COURSE CONTENT

Outline of Content:

(Note: Minimum SIX experiments from group A and FOUR experiments from group B)

Group A (Digital System)

1. **Verify the truth table of all logic gates and verify the Demorgan's theorem**
    a. Draw the logical symbol and truth table
    b. Implement the connection on bread board and verify the truth table
2. **Implement any logic gates by using universal gates**
    a. Construct logic gates using universal gates
    b. Implement the connection on bread board and verify the truth table

3. **Construct and Implement Half Adder and Full adder**

    a. Construct Half Adder and Full adder
    b. Implement the connection on bread board and verify the truth table

4. **Construct and Implement Half Subtractor and Full Subtractor**

    a. Construct Half Subtractor and Full Subtractor
    b. Implement the connection on bread board and verify the truth table

5. **Construct and Implement various Code converters (Binary to Gray and Gray to Binary)**

    a. Construct Code Converter
    b. Implement the connection on bread board and verify the truth table

6. **Verify Muliplexer and Demultiplexer**

    a. Construct Muliplexer and Demultiplexer
    b. Implement the connection on bread board and verify the truth table

7. **Verify the truth table of BCD to 7-Segment display**

    a. Construct BCD to 7-Segment display
    b. Implement the connection on bread board and verify the truth table

8. **Implement and verify S-R, J-K,D, and T flip flop using ICs**

    a. Construct flip flops
    b. Implement the connection on bread board and verify the truth table

Group B (8086 Microprocessor)

Program using Macro

Display personal information using Macro

1. **Program using NEAR and FAR Procedure**

    Addition of two numbers using NEAR and FAR Procedure Perform

2. **Perform arithmetic operations on two numbers**

    Addition/subtraction/multiplication of two numbers using NEAR and FAR Procedure

3. **Find factorial of given number**

    Factorial of given number using recursive instruction

4. **Program for Password Verification**

   Program for Password Verification

5. **Perform the BCD Addition**

   Addition of two 16 bit BCD numbers

6. **Program to Display System Time & Date**

   Display current Time & Date of system

7. **Convert HEX To BCD and BCD to HEX**

   a. HEX to BCD Conversion
   b. BCD to HEX Conversion

Guide lines for ESE:

- ESE will be based on the practical assignments submitted by the students in the form of journal.
- In the ESE, the students may be asked to perform the practical assignment with minor modification.
- Evaluation will be based on the paper work of algorithm, understanding of the logic and the syntax, quality of the program, execution of the program, type of input and output for the program.

Reference Books:

1. M. Morris Mano, "Digital Logic and Computer Design", Pearson, 1979.
2. V.K.Puri, "Digital Electronic Circuit and System", Tata McGraw Hill, 1997.
3. F.J. Hill, "Digital Logic and Microprocessor", John Willy & sons.
4. Anandkumar, "Fundamentals of Digital Circuits", Pearson.
5. John Wiley and Sons, "Introduction to Switching Theory and Logic Design", Hill and Peterson, Third edition.
6. Douglas V Hall, "Microprocessor and Interfacing, Programming and Hardware", Tata McGraw Hill, Second edition.
7. Soumitra Kumar Mandal, "Microprocessor and Microcontroller: Architecture, Programming and Interfacing using 8085, 8086 and 8051", Tata McGraw Hill.
8. B Ram, "Advanced Microprocessors and Interfacing", Tata McGraw Hill.
9. Peter Abel, "IBM PC Assembly Language and Programming", Pearson, Fifth edition.

Object Oriented Technology Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Object Oriented Technology	**OOT**	

Course Description:

This laboratory provides students with a comprehensive study of the C++ programming language. Classroom lectures stress the strengths of C++, which provide students with the means of writing efficient, maintainable, and portable code.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**15**	**30**	**01**

Total Semester Credits: 1

Prerequisite Course(s): Fundamental knowledge of Computers and C programming

LAB COURSE CONTENT

Outline of Content:

(Note: Minimum SIX Experiments from group A and FOUR from group B.)

Group A

1. **Write a program for a simple class and object.**
   Performing simple arithmetic operations using C++ class and object like,
   a. Addition,
   b. Subtraction,
   c. Multiplication,
   d. Division.
2. **Write a program for parameterized constructor.**

Demonstrate the use parameterized constructor by passing different types of parameters to the constructor.

3. **Write a program for overloading constructors.**
   Demonstrate the concept of overloading constructor functions using class and object.

4. **Write a program to find the area of rectangle, triangle and sphere using function overloading.**
   To calculate the area of rectangle, triangle and sphere using function overloading and class and object.
5. **Write a program to overload unary operator using member function.**
   Demonstrate the overloading of unary operators using the concept of member functions.
6. **Write a program to overload binary operator using member function.**
   Demonstrate the overloading of binary operators using the concept of member functions.
7. **Write a program for arrays of pointers to objects.**
   Declaring an array of pointers to objects using suitable example.
8. **Write a program using single inheritance, multiple inheritance and hierarchical inheritance.**
   Demonstrate the use of single inheritance, multiple inheritance and hierarchical inheritance by taking suitable example.
9. **Write a program using multilevel inheritance and hybrid inheritance.**
   Demonstrate the use of multilevel inheritance and hybrid inheritance by taking suitable example.
10. **Write a program for virtual base classes.**
    To calculate the total mark of a student using the concept of virtual base class.
11. **Write a program to read and write class objects from files.**
    Writing/reading class object to/from file.
12. **Write a program to format output using ios class functions and flags.**
    To format the output using different ios class functions and flags.
13. **Write a program to format output using manipulators.**
    To format the output using different manipulators.
14. **Write a program using class template.**
    To swap the numbers using the concept of function template.
15. **Write a program for overloading of template functions.**
    Overload templates functions with the number of parameters.

Group B

1. **Write a program for the copy constructor.**
   To calculate factorial of a given number using copy constructor.
2. **Write a program to overload unary operator using friend function.**
   Demonstrate the overloading of unary operators using the concept of friend function.

3. **Write a program to overload binary + operator using member function for concatenation of two strings.**
   Demonstrate the overloading of binary + operator using the concept of member function for concatenation of two strings.
4. **Write a program for matrix multiplication using new and delete dynamic memory allocation operators.**
   Perform the matrix multiplication using new and delete dynamic memory allocation operators.
5. **Write a program to convert class type data to basic type data.**
   Perform the class type data conversion to any basic type data.
6. **Write a program for run time polymorphism using virtual functions.**
   Perform the run time polymorphism using virtual functions.
7. **Write a program for bubble sort using template functions.**
   Perform the bubble sort using the concept of template functions.

Reference Books:

1. E. Balagurusamy, "Object Oriented Programming with C++", Fifth Edition, Tata McGraw Hill, 2011.
2. Robert Lafore, "Object Oriented Programming in C++", Fourth Edition, Pearson Education, 2002.
3. Ashok N. Kamthane, "Object-Oriented Programming with ANSI and Turbo C++", Pearson Education, 2006.
4. Rajesh K. Shukla, "Object-Oriented Programming in C++", Wiley India, 2008.
5. Bjarne Stroustrup, "C++ Programming Language", Third Edition, Addison Wesley, 2002.
6. Yashavant P. Kanetkar, "Let Us C++", Second Edition, BPB Publications, 2003.
7. Venugopal K.R., "Mastering C++", First Edition, TMH, 1999.
8. Mahesh Bhave, Sunil Patekar, "Object Oriented Programming with C++", Second Edition, 2012.
9. Herbert Schildt, "The Complete Reference C++", Fourth Edition, TMH, 2003.

Guide lines for ESE:-

- ESE will be based on the practical assignments submitted by the students in the form of journal.
- In the ESE, the students may be asked to perform the practical assignment with minor modification.
- Evaluation will be based on the paper work of algorithm, understanding of the logic and the syntax, quality of the program, execution of the program, type of input and output for the program.

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Second Year Engineering

(Information Technology)

Faculty of Engineering and Technology

COURSE OUTLINE

Semester – IV

W.E.F 2013 – 2014

Data Communication

COURSE OUTLINE

Course Title	Short Title	Course Code
Data Communication	**DC**	

Course Description:

This course is aimed at introducing the fundamentals of data communications to undergraduate students. The goals of the course are to understand the basics and knowledge about the Data Communications using components and protocols of data communications.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	**15**	**45**	**03**

Prerequisite Course(s): Fundamentals of Data Communication.

COURSE CONTENT

Data Communication **Semester- IV**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1 Introduction to Data Communication and Signals

(08 Hours, 16 marks)

a Basics of Data Communication: Characteristics and Components
b Data Representation and Data Flow
c Networks, Introduction to ISO-OSI Reference model
d Introduction to Signals and Transmission Impairments: Analog and Digital
e Periodic Analog Signals, Digital Signals
f Transmission impairment, data rate limits, Performance

2 Digital transmission and Analog transmission

No of Lect – 8, Marks:16

a Digital to Digital Conversion

b Analog to Digital Conversion
c Transmission Modes
d Digital-to-analog Conversion

3 Multiplexing and Transmission Media (08 Hours, 16 marks)

a Multiplexing
b Guided Media
c Unguided Media

4 Switching and Multiple Access (08 Hours, 16 marks)

a Circuit-switched Networks
b Datagram networks
c Virtual-circuit networks
d Multiple Access

5 Error Control and Data Link Control (08 Hours, 16 marks)

a Types of errors
b Block coding
c Linear block codes
d Cyclic codes
e Checksum
f Flow and error control

Text Books:

1. Behrouz A Forouzan, "Data Communications and Networking", Fourth edition: Tata McGraw Hill.
2. P. C. Gupta, "Data Communications", PHI Publications.

Reference Books:

1. William Stallings, "Data & Computer Communications", Seventh edition: PHI Publication.
2. Leon - Garcia, Indra Widijaja, "Communication Networks Fundamental Concepts and Key Architectures", Second edition: McGraw Hill Education.
3. Achyut Godbole, "Data Communication Networks", Tata McGraw Hill.
4. Bruce Hartpence, "Packet Guide to Routing and Switching", O'Reilly.
5. Bruce Hartpence, "Packet Guide to Core Network Protocol" , O'Reilly.
6. James Irvine & David Harle, "Data Communication and Networks: An Engineering Approach", Wiley Edition.

Microprocessor & Microcontroller Interfacing

COURSE OUTLINE

Course Title	Short Title	Course Code
Microprocessor & Microcontroller Interfacing	**MPMCI**	

Course Description:

The objective of this course is to introduce the students to the fundamentals of microprocessor & microcontroller interfacing with assembly programming language and enable them to apply these concepts for real world applications.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	15	45	04
Tutorial	01	15	15	

Prerequisite Course(s): Fundamental knowledge of Microprocessors & Microcontrollers.

COURSE CONTENT

Microprocessor & Microcontroller Interfacing **Semester- IV**

Teaching Scheme	Examination Scheme	
Lecture: 3 hours / week	**End Semester Examination (ESE)**	**: 80 Marks**
Tutorial: 1 hour / week	**Paper Duration (ESE)**	**: 03 Hours**
	Internal Sessional Exam (ISE)	**: 20 Marks**

1. Basic I/O Interface

(08 Hours, 16 marks)

a. MSDOS FAT
b. MS DOS Device Drivers Types, Structure of device drivers.
c. 8255 PPI : Internal block diagram, control word and status word, modes of operation, numericals on control word design.

2.

(08 Hours, 16 marks)

a. 8254(PIT) : Internal block diagram, control word format, operating modes, numericals on control word design.

b. 8251(USART) : Architecture and signal description, operating modes, interfacing with 8086 and numericals.
c. TSR programs : concept and implementation.

3. Overall Motherboard Component Logic (08 Hours, 16 marks)

a. Functional block diagram of PC.
b. Motherboard (8086/8088 based) : Motherboard components.
c. Motherboard logic : Reset logic, Interrupt logic, RAM parity logic, NMI logic, Wait state logic, Bus Arbitration logic, RAM & ROM logic, CPU logic, DMA logic, keyboard interface block diagram.
d. Microcomputer Display : Raster scan basics, Overview of character display control system.
e. PC display adapters : CGA,EGA,VGA.
f. Introduction to LCD and Plasma display.

4. 8086 Microprocessor interface (08 Hours, 16 marks)

a. Parallel Printer Interface
b. 7 segment display interface.
c. Disk reading methods: FM , MFM.
d. Internal structure of Floppy disk and hard disk.
e. Floppy Disk Controller : Overview, FDC system interface, Overall operation of floppy disk subsystem, 8272 FDC : internal block diagram and commands.
f. Hard disk controller : HDC commands and device control block.

5. Microcontrollers and Interfacing (08 Hours, 16 marks)

a. Interfacing LEDs and of 7-segment displays.
b. Interfacing keys and keyboard interfacing .
c. Interfacing 0808/0809 ADC.
d. Interfacing DAC 0808.
e. Interfacing stepper motor.

Reference Books:

1. Douglas V. Hall, " Microprocessors and Interfacing : Programming and Hardware", Second edition , Tata McGraw Hill.
2. A. K. Ray & K. M. Bhurchandi, "Advanced Microprocessor and Peripherals – Architecture, Programming and Interfacing", Third edition, Tata Mc Graw Hill.
3. Ray Duncan, "Advanced MS-DOS Programming", Second edition, Microsoft Press.
4. Peter Abel, " IBM PC Assembly language and programming" , Fifth edition, Pearson education/ Prentice Hall of India Pvt. Ltd.
5. B. Govindarajalu, "IBM PC and Clones", Second edition, Tata McGraw Hill.

Data Structures

COURSE OUTLINE

Course Title	Short Title	Course Code
Data Structures	**DS**	

Course Description:

The objective of this course is to introduce the students to the fundamentals of Data Structure with concepts of the C programming language and enable them to apply these concepts for solving real world problems.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**45**	**04**
Tutorial	**01**	**15**	**15**	

Prerequisite Course(s): Fundamental knowledge of C

COURSE CONTENT

Data Structures **Semester - IV**

Teaching Scheme	**Examination Scheme**	
Lecture: 3 hours / week	**End Semester Examination (ESE)**	**: 80 Marks**
Tutorial: 1 hour / week	**Paper Duration (ESE)**	**: 03 Hours**
	Internal Sessional Exam (ISE)	**: 20 Marks**

1. Introduction to Data Structures (08 Hours, 16 marks)

a Introduction of data and data object.
b Data structure and Abstract Data Type(ADT).
c Implementation of different data structures.
d Basic terminologies with data structures, types of data structures.
e Data structure operations.
f Concept of arrays,pointer and structures.

2. Stack and Queue (08 Hours, 16 marks)

a Detailed knowledge of data structure like stack, queue & circular queue.
b Polish notations & interconversions by using stack.
c Use of stack in function call,recursion,tower of Hanoi.

3. Linked Lists (08 Hours, 16 marks)

a Understand the concept of linked list data structure.

b Pros & Cons of array compared with linked list.

c Creation,traversing,searching,insertion,deletion opertions w.r.t. single linked list.

d Pros & cons of single linked list, double linked list

e Polynomial addition using single linked list as well as storing multivariable polynomials using generalised list.

4. Trees (08 Hours, 16 marks)

a Creation,traversing,searching,insertion,deletion opertions w.r.t. binary search tree.

b Concept of threaded binary tree,tree traversals(recursive & non-necursive).

c Concept of Huffman Algorithm.

e Height Balanced Tree(AVL Search Tree).

5. Searching and Sorting (08 Hours, 16 marks)

a Basics of searching techniques.

b Basics of sorting techniques.

c Different sorting algorithms including Bubble, Insertion, Selection,Quick,Merge,Heap,Radix.

d Time and Space complexity of an algorithm with big 'O', '' , 'Ω' notations.

e Best, Worst, and Avgerage case time complexity of each of these algorithms.

Text Books:

1. Seymour Lipschutz, "Data Structures", Schaums Outlines Tata McGraw Hill, 2006.
2. Ellis Horowitz and Sartaj Sahani, "Fundamentals of Data Structures", Galgotia Publication.

Reference Books:

1. G.S.Baluja, "Data Structures through C", Dhanpatrai Publications.
2. Ashok N. Kamthane, "Introduction to Data structures in C", Person Publications, 2007.
3. Aarom Tanenbaum, Yedidyah Langsam, Moshe Augenstein, "Data structures using c", Pearson Publication.
4. Alfred Aho, John Hopcroft, Jeffrey Ullman, "Data Structures and Algorithms",Pearson Publications.
5. E.Balagurusamy,"Data Structures using C",Tata MacGraw Hill Publications.
6. P.S.Deshpande,O.G.Kakde,"C and Data Structures",dreamtech press Publications.
7. Rajesh K.Shukla, "Data Structures using C and C++" ,Willy India Publication.
8. Larry Nyhoff, "ADTs' Data Structures and prolems with C++",Pearson Publications.

Computer Organization

COURSE OUTLINE

Course Title	Short Title	Course Code
Computer Organization	**CO**	

Course Description:

This course introduces the students about the computer. It includes the terms, concepts, architectures, formats and addressing. This course also describes the Memory organization etc.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	**15**	**45**	**03**

Prerequisite Course(s): Introduction to Computer.

COURSE CONTENT

Computer Organization **Semester- IV**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Introduction to system concepts (08 Hours, 16 marks)

a. To introduce students to System Concept.
b. To learn about Instruction format.
c. To learn General addressing Modes.
d. To learn about Expanding op-codes.
e. To learn about Bus Structures.

2. Arithmetic (08 Hours, 16 marks)

a To know how Numbers are represented.
b To learn Multiplication using Booths and Bit-pairing Algorithms.
c To learn Division using Restoring and Non-Restoring Methods.
d To learn addition and Subtraction of signed numbers.
e To learn Floating point System.

3. Processing Unit (08 Hours, 16 marks)

a To design control unit.

b Designing Control unit using hardwired and Micro programmed methods.

c Learning Wilkes Design method.

d To learn Bus organization.

e To learn execution of complete instruction.

4. Memory (08 Hours, 16 marks)

a Memory organization techniques.

b To know cache memory organization.

c To know Virtual memory.

d To learn basic concepts of memory.

e Introduction to SDRAM, RDRAM, DDRSDRAM, Flash memory.

5. System Organization (08 Hours, 16 marks)

a To know concepts system buses.

b To know Daisy chaining, polling.

c Concepts of PCI bus, SCSI bus, Universal Serial Bus.

d RISC and CISC .

Text Book:

1. Hamacher, Vransic, Zaky, "Computer Organization", Fifth edition, McGraw Hill international.

Reference Books:

1. J.P. Hayes, "Computer Architecture and Organization", Third edition, McGraw Hill international.
2. Sajjan Shiva, "Computer Organization Design & Architecture", CRC Press Publication.
3. Tanenbaum, "Structured Computer Organization", Pearson.
4. William Stallings, "Computer Organization and Architecture", Sixth edition, Pearson.
5. Swati Saxena,"Computer Organization" Dhanpat Rai.
6. Murdocca, Heuring, "Computer Architecture & Organization", Second edition, Wiley.
7. Nicholas Carter, "Computer Architecture", Schaum's Outline.

Computer Graphics and Multimedia

COURSE OUTLINE

Course Title	Short Title	Course Code
Computer Graphics & Multimedia	**CGM**	

Course Description:

This course introduces the students about the concepts of user interface with graphics system. It includes the graphics standards, transformations, filling & clipping objects, 2D & 3D as well as multimedia concepts. This course also describes about graphics applications corresponds with scientific work as well as animation, simulation etc.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	15	45	03

Prerequisite Course(s): Engineering Graphics.

1. **Basic Concepts** **(08 Hours, 16 marks)**
   a. Introduction to computer graphics
   b. Graphics Standards
   c. Interactive Computer Graphics
   d. Linear and Circle Generation

2. **Polygons** **(08 Hours, 16 marks)**
   a. Polygons
   b. Types of Polygons
   c. Polygon filling
   d. Scan conversion algorithm
   e. Segments

3. **2D & 3D Geometry** **(08 Hours, 16 marks)**
   a. 2D transformation primitives and concepts
   b. 3 D transformations
   c. 3D viewing transformation
   d. Concept of parallel perspective projections
   e. Viewing parameters

4. **Multimedia** **(08 Hours, 16 marks)**
   a. Multimedia Presentation & Production
   b. Hardware & software requirements
   c. Analog & digital representations
   d. Introduction to text & image presentation.

5. Multimedia Architecture (08 Hours, 16 marks)

a. Multimedia Architecture
b. Multimedia Extensions
c. Distributed multimedia applications
d. Introduction to animation
e. Principles of animation

Text Books:

1. "Computer graphics", ISRD group, THM publications, Eleventh reprint 2012.
2. Ranjan Parekh, "Principles of Multimedia", McGraw Hill.

Reference Books:

1. David F. Rogers, "Procedural Elements for Computer Graphics, Tata McGraw Hill, Second edition.
2. Shirley, Marshner, "Fundamentals of Computer Graphics", Third edition, CRC Publication/ A.K. Peters.
3. Steven Harringtom, "Computer graphics A Programming Approach", MGH.
4. Mukherjee, "Fundamentals of Computer Graphics and Multimedia", PHI.
5. Maurya, "Computer Graphics: with virtual reality system", Wiley India.
6. Donald Hearn and Pauline Baker," Computer Graphics", Pearson LPE, Second edition.
7. Rao and Prasad, "Graphics user interface with X windows and MOTIF", New Age.
8. Foley, Vandam, Feiner, Hughes, "Computer Graphics Pricipals & Practice", Pearson Second edition.

Application Development Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Application Development Lab	**ADL**	

Course Description:

The objective of this course is to introduce the students to the fundamentals of web development. It includes the technologies like HTML, XML, CSS and Scripting Languages.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	01	**15**	**15**	**02**

Prerequisite Course(s): Fundamental knowledge of Computers.

LAB COURSE CONTENT

This course will use advanced techniques in creating documents for the World Wide Web. Emphasis will be placed on HTML, JavaScript, XML and Java.

1 Introduction to HTML (03 Hours)

a. Tags and Elements
b. Separating Heads from Bodies
c. Attributes
d. Basic Text Formatting
e. Presentational and Phrase Elements
f. List
g. Links and Navigation

2 CSS Style Sheet and Scripting Languages (03 Hours)

a. URLs
b. Images, Audio, and Video
c. Tables, Forms and Frames
d. Cascading Style Sheets
e. Page Layout
f. Scripting Language (Java, VB)

3 Introduction to XML (03 Hours)

a. XML Basics

b. XML Elements
c. Working with DTD

4 DTD and Style Sheet (03 Hours)

a. Adding Style, Using Schemas

5 Introduction to Java (03 Hours)

a. Basic Input/output
b. Applet Class
c. Event handling
d. Introduction to AWT: working with windows, Graphics and Text

Reference Books:

1. Jon Duckett, "Beginning HTML, XHTML, CSS, and JavaScript", John Wiley & Sons publication, 2010.
2. Heather Williamson, "XML: The Complete Reference", First edition, Tata McGraw-Hill Education, 2001.
3. Herbert Schildt, "Java: The Complete Reference", Seventh edition, Tata McGraw-Hill Education, 2006.
4. Thomas A. Powell, "HTML & CSS: The Complete reference", Fifth edition, TMH 2010.
5. Elliotte Rusty Harold, "XML 1.1 Bible", Third edition, Willey Publication, 2004.
6. Steven Holzner, "XML: A Beginner's Guide", First edition, TMH, 2009.
7. Herbert Schildt, "Java: A Beginners Guide", Fifth edition, TMH, 2011.
8. Yashavant Kanetkar, "Let Us Java", BPB Publication, 2011.

Data Communication Lab

LAB COURSE OUTLINE

Course Title	Short Title Course Code
Data Communication Lab	**DC**

Course Description:

This laboratory provides students with a comprehensive study of the Data Communication concepts and practical implementation of Data Communication concepts.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	02	15	30	01

Total Semester Credits: 1

Prerequisite Course(s): Fundamental knowledge of Data Communication.

LAB COURSE CONTENT

Outline of Content:

Group A

1. Comparative analysis of different types of network cables with Specifications
   - Study of different types of Network cables – CAT-5, CAT – 6.
   - Study of different cable specifications comparisons.
2. Implementation of Network performance calculator.
   - Simple Program for Calculating Network Performance.
3. Network related commands such as ARP, IPCONFIG, PING, TRACERT, NSLOOKUP, GETMAC, NETSTAT etc.
   - Practical use of Network commands ARP
   - Study of IPCONFIG for IP configurations
   - Study of PING command for finding destination reachable or not.
   - Study of TRACERT command
   - Study of NSLOOKUP command
   - Study of GETMAC to get MAC address.

- Study of NETSTAT to get the network status.

4. I.T Infrastructure planning using Network Connecting Devices.
   - Consider our own college as a case & prepare a planning for I.T. infrastructure.
5. Network Connecting Devices Specifications and configurations.
   - Practical study of Network Connecting device – Repeater.
   - Practical study of Network Connecting device – Switch /HUB.
   - Practical study of Network Connecting device – Router

Group B

1. Implementation of Stop and Wait Protocol
   - Study the working of stop and wait protocol
   - Implementation of simple client and server should be simple
   - Modular approach should be followed.
2. Implementation of Internet checksum
   - Consider a simple example
   - Study it theoretically.
   - Implementation of same .
3. Crimping of cross-wire and straight-through UTP cable to inter-connect two computers.
   - Study of crimping tool.
   - Study of color coding of Network cables.
   - Crimping the cable using Crimping Tool
   - Test the crimping by interconnecting two computers
4. Interconnections of computers in Local Area Network to share resources.
   - Study of concept of LAN & Shared resources.
   - Interconnect computers in LAN
   - Share and make the use of shared resources.
5. Implementation of cyclic redundancy check
   - Study the concept of CRC.
   - Consider Suitable example.

Implement same using modular approach.

Note:

- Concerned faculty should suitably frame 08 practical assignments (Four from PART – A and Four from PART – B) from above list.

- Every student is required to submit the assignments in the form of journal.

Reference Books:

1. Behrouz A Forouzan, “Data Communications and Networking”, Fourth edition: Tata McGraw Hill.
2. P. C. Gupta, “Data Communications”, PHI Publications.
3. William Stallings, “Data & Computer Communications”, Seventh edition: PHI Publication.
4. Leon - Garcia, Indra Widijaja, “Communication Networks Fundamental Concepts and Key Architectures” Second edition: McGraw Hill Education.
5. Achyut Godbole, “Data Communication Networks”, Tata McGraw Hill.
6. Bruce Hartpence, “Packet Guide to Routing and Switching”, O’Reilly.
7. Bruce Hartpence, “Packet Guide to Core Network Protocol” , O’Reilly.
8. James Irvine & David Harle, “Data Communication and Networks: An Engineering Approach”, Wiley Edition.

Microprocessor & Microcontroller Interfacing Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Microprocessor & Microcontroller Interfacing Lab	**MPMCI**	

Course Description:

This laboratory provides students with a comprehensive study of the 8086 and 8051 assembly programming language.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**15**	**30**	**1**

Total Semester Credits: 1

Prerequisite Course(s): Fundamental knowledge of microprocessors & microcontroller along with instruction set and addressing modes.

LAB COURSE CONTENT

Outline of Content:

(**Note:** Any 6 experiments from Group A and any 4 experiments from Group B. Total 10 experiments should be conducted.)

Group A

Assembly language programming for 8086.

1. Program for mouse interfacing.
2. Program for graphics editor.
3. Program for PC to PC communication using serial port.
4. Program for parallel printer interfacing.
5. Program for ADC interfacing with 8086.
6. Program for DAC interfacing with 8086.
7. Program for stepper motor interfacing.
8. Program for printer device driver.

Group B

Assembly language programming for 8051.

1. Program for interfacing LEDs.
2. Program for interfacing 7-segment displays.
3. Program for keyboard interfacing.
4. Program for ADC interfacing.
5. Program for DAC interfacing.

6. Program for stepper motor interfacing.

Guide lines for ESE:-

- ESE will be based on the practical assignments submitted by the students in the form of journal.
- In the ESE, the students may be asked to perform the practical assignment with minor modification.
- Evaluation will be based on the paper work of algorithm, understanding of the logic and the syntax, quality of program, execution of the program, type of input and output for the program.

Reference Books:

1. Douglas V. Hall, " Microprocessors and Interfacing : Programming and Hardware", Second edition , Tata McGraw Hill.
2. A. K. Ray & K. M. Bhurchandi, "Advanced Microprocessor and Peripherals – Architecture, Programming and Interfacing", Third edition, Tata Mc Graw Hill.
3. Ray Duncan, "Advanced MS-DOS Programming", Second edition, Microsoft Press.
4. Peter Abel, " IBM PC Assembly language and programming" , Fifth edition, Pearson education/ Prentice Hall of India Pvt. Ltd.
5. B. Govindarajalu, "IBM PC and Clones", Second edition, Tata McGraw Hill.

Data Structures Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Data Structures Lab	**DS**	

Course Description:

This laboratory provides students with a comprehensive study of the C programming language in data structures. Classroom lectures stress the strengths of C which provide students with the means of writing efficient codes for different data types and data structures.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**15**	**30**	**1**

Total Semester Credits: 1

Prerequisite Course(s): Fundamental knowledge of C.

LAB COURSE CONTENT

Outline of Content:

(Note: Minimum FIVE experiments from the Group A and FIVE experiments from the Group B .)

(Group A)

1. **Implementation of stack using array or linked list.**
   Performing simple operations like push, pop and display with respect to stack.

2. **Implementation of queue using array or linked list.**

   Performing simple operations like insertion and deletion of an element into the queue.

3. **Implementation of circular queue using array or linked list.**
   Performing simple operations like insertion and deletion of an element into the circular queue.
4. **Conversion of infix expression to postfix expression.**
   Performing simple conversions of given infix expression into postfix expression.

5. **Conversion of postfix expression to infix expression**.

Performing simple conversions of given postfix expression into infix expression.

6. **Program for addition of two single variable polynomials using Linked List.**

   Performing the addition of two polynomials using Linked List.

(Group B)

1. **Implementation of double linked list & perform insertion, deletion and searching.**

   Performing the operations on double linked list like insertion, deletion and searching.

2. **Creation of binary tree & perform all non-recursive traversals**.

   Create the binary tree and perform the Inorder,Preorder and Postorder traversal.

3. **Creation of binary search tree & perform insertion, deletion and printing in tree shape.**

   Create the Binary Search tree performing the operations on BST like insertion, deletion and printing in tree shape.

4. **Create a hash table and handle the collision using linear probing with or without replacement**

   Creation of hash Table and handle the collision using linear probing with or without replacement.

5. **Implementation of Quick Sort.**

   Sort the given set of numbers using Quick sort.

6. **Implementation of Radix Sort.**

   Sort the given set of numbers using Radix sort.

7. **Implementation of Merge Sort.**

   Sort the given set of numbers using Merge sort.

8. **Conversion of Infix Expression to Prefix Expression.**

   Performing Simple conversions of given Infix Expression into prefix Expression.

Reference Books:

1. G.S.Baluja, “Data Structures through C”, Dhanpatrai Publications.
2. Ashok N. Kamthane, “Introduction to Data structures in C”,Person Publications,2007.
3. Aarom Tanenbaum,Yedidyah Langsam,Moshe Augenstein, “ Data structures using C”,Pearson Publications.

4. Alfred Aho,John Hopcroft,Jeffrey Ullman, “Data Structures and Algorithms”,Pearson Publications.
5. E.Balagurusamy, “Data structures using C”,Tata McGraw Hill publications.
6. P.S.Deshpande,O.G.Kakde,”C and Data Structures”,dreamtech press publications.
7. Rajesh K.Shukla, “Data Structures using C and C++” ,Willy India Publication.
8. Larry Nyhoff, “ADTs’ Data Structures and prolems with C++”, Pearson Publications.

Guide lines for ESE:-

- ESE will be based on the practical assignments submitted by the students in the form of journal.
- In the ESE, the students may be asked to perform the practical assignment with minor modification.
- Evaluation will be based on the paper work of concept understanding of topic and algorithm, understanding of the logic and the syntax, quality of program, execution of the program, type of input and output for the program.

Computer Graphics and Multimedia Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Computer Graphics & Multimedia	**CGM LAB**	

Course Description:

This laboratory provides students with a comprehensive study of graphics commands , animation & use of multimedia. The practical's make students able for draw different line styles, polygon, circle as well as clipping of polygons & filling of polygons. It also implements 2D & 3D transformations. Because of it students with the means of writing efficient, maintainable, and portable code.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**10**	**20**	**1**

Total Semester Credits: 1

Prerequisite Course(s): Fundamental knowledge of C, C++ & Graphics.

Group A: Computer Graphics

1. Study of various Graphics Commands
2. Line generation using DDA
3. Different Line Style using Bresenham's Algorithm
4. Circle Generation using Bresenham's Algorithm
5. Program for Polygon Filling
6. Program for 2D Transformations (Translation, Rotation and Scaling)
7. Program for Segmentation
8. Program for 3D rotation
9. Program for Parallel Projections
10. Program for Perspective Projection

Group B: Multimedia

1. Program for animation using C/C++.
2. Program using flash.
3. Program using dream viewer.
4. Mini Project based on creating animation using Maya.

Concerned faculty should suitably frame at least 10 practical assignments. Any seven lab assignments from computer graphics & any three from multimedia.

Guide lines for ESE:-

- ESE will be based on the practical assignments submitted by the students in the form of journal.
- Evaluation will be based on the paper work of flowchart and algorithm, understanding of the logic and the syntax, quality of program code, execution of the program code, type of input and output for the program code.
- Simple program codes may be asked based on above syllabus.

Reference Books:

1. David F. Rogers, "Procedural Elements for Computer Graphics, Tata McGraw Hill, Second edition.
2. Shirley, Marshner, "Fundamentals of Computer Graphics", Third edition, CRC Publication/ A.K. Peters.
3. Steven Harringtom, "Computer graphics A Programming Approach", MGH.
4. Mukherjee, "Fundamentals of Computer Graphics and Multimedia", PHI.
5. Maurya, "Computer Graphics: with virtual reality system", Wiley India.
6. Donald Hearn and Pauline Baker," Computer Graphics", Pearson LPE, Second edition.
7. Rao and Prasad" Graphics user interface with X windows and MOTIF", New Age.
8. Foley, Vandam, Feiner, Hughes, "Computer Graphics Principals & Practice", Pearson Second edition.

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Third Year Engineering

(Information Technology)

Faculty of Engineering and Technology

COURSE OUTLINE

Semester – V

W.E.F 2014 – 2015

Annexure - I

TE Semester – V

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Software Engineering*	D	3	---	---	3	20	80	---	---	100	3
Formal Language & Automata Theory*	D	3	---	---	3	20	80	---	---	100	3
Computer Network*	D	3	---	---	3	20	80	---	---	100	3
System Programming*	D	3	---	---	3	20	80	---	---	100	3
Principles of Management*	C	3	---	---	3	20	80	---	---	100	3
Software Engineering Lab*	D	---	---	2	2	---	---	25	25 **(OR)**	50	1
Linux Lab*	D	---	---	2	2	---	---	25	---	25	1
Computer Network Lab*	D	---	---	2	2	---	---	25	25 **(PR)**	50	1
System Programming Lab*	D	---	---	2	2	---	---	25	25 **(OR)**	50	1
Java Programming Lab*	B	1	---	2	3	---	---	50	---	50	2
Industrial Training / EDP / Special Study*	D	---	---	---	---	---	---	25	---	25	2
Total		**16**	**---**	**10**	**26**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA : Internal Continuous Assessment**

*** Common Subjects with TE Comp**

TE Semester – VI

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Operating System*	D	3	--	---	3	20	80	---	---	100	3
Object Oriented Modeling & Design*	D	3	---	---	3	20	80	---	---	100	3
Database Management System*	D	3	---	---	3	20	80	---	---	100	3
E-Commerce	D	3	---	---	3	20	80	---	---	100	3
Management Information System*	C	3	---	---	3	20	80	---	---	100	3
Operating System Lab*	D	---	---	2	2	---	---	25	25 **(OR)**	50	1
Object Oriented Modeling & Design Lab*	D	---	---	2	2	---	---	25	25 **(OR)**	50	1
Database Management System Lab*	D	---	---	2	2	---	---	25	25 **(PR)**	50	1
Web Programming Lab*	B	---	---	2	2	---	---	25	---	25	1
Minor Project*	D	---	---	2	2	---	---	50	---	50	2
Seminar – I*	D	---	---	2	2	---	---	25	---	25	2
Total		**15**	**---**	**12**	**27**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

*** Common Subjects with TE Comp**

Software Engineering

COURSE OUTLINE

Course Title	Short Title	Course Code
Software Engineering	**SE**	

Course Description:
The objective of this course is to introduce students the knowledge of Software Development Life Cycle, application of analysis, design, testing principles and project planning & management concepts to develop quality software economically.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Knowledge of programming languages and data structures.

COURSE CONTENT

Software Engineering **Semester-V**

Teaching Scheme

Lecture: 3 Hours/Week

Examination Scheme

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Introduction to Software Engineering (08Hrs, 16 Marks)

a. Nature of Software
b. Software Process
c. Software Engineering Practice
d. Software Myths
e. Generic Process model
f. Process Assessment and Improvement
g. Perspective Process Models
h. Specialized Process Models
i. Personal and Team Process Models
Agile Process models:
j. Agile process
k. Extreme programming

2. Requirements Engineering (08Hrs, 16 Marks)

Requirements Engineering:
a. Eliciting Requirements
b. Building the Requirements Model
c. Negotiating requirements
d. Validating requirements
e. Requirements Analysis

f. Scenario-Based Modeling
g. Requirements modeling strategies
h. Flow-Oriented Modeling
i. Data modeling Concepts
j. Class based modeling
k. SRS.

3. Design Engineering (08Hrs, 16 Marks)

a. Design Process
b. Design Concepts
c. The Design Model

Architectural Design:

d. Software Architecture
e. Architectural Styles
f. Architectural Design

User Interface Design:

a. Rules
b. User Interface Analysis and Design
c. Interface Analysis
d. Interface Design Steps
e. Pattern Based Design
f. Design Patterns
g. Pattern Based software Design
h. Component Level Design patterns
i. User Interface Design patterns
j. WebApp Design patterns

Introduction to UML Diagrams.

4. Software Testing (08Hrs, 16 Marks)

Testing Strategies:

a. A Strategic approach to Software Testing
b. Strategic Issues
c. Testing Strategy for Conventional Software
d. Testing Strategy for Object-Oriented Software
e. Testing strategies for Web App
f. Validation Testing
g. System Testing

Testing Tactics:

h. Testing Fundamentals
i. White Box Testing
j. Basis Path Testing
k. Control Structure Testing
l. Black Box Testing

5. Software Project Planning & Management Concepts (08Hrs, 16 Marks)

a. Management Spectrum
b. People
c. Product

d. Process
e. Project
f. Critical Practices

Estimation for software project:

g. Project Planning Process
h. Software scope and feasibility
i. Resources
j. Decomposition Techniques
k. Empirical Estimation Models
l. Make/Buy Decision

Project Scheduling:

a. Task set for Software project
b. Defining a task network
c. Scheduling
d. Earned Value Analysis

Product Metrics:

e. A framework for product metrics
f. Software Quality
g. Software Quality Factors

Text Books:

1. Pressman R., "Software Engineering, A Practitioners Approach", 7th Edition, Tata McGraw Hill.

Reference Books:

1. Rajib Mall, "Software Engineering", 3rd Edition, PHI.
2. Pankaj Jalote, "An Integrated Approach to Software Engineering", 3rd Edition, Springer.
3. Sommerville, "Software Engineering", 8th Edition, Pearson.
4. Fairly R. , "Software Engineering", Tata McGraw Hill.
5. Davis A. , "Principles of Software Development", Tata McGraw Hill.
6. Shooman, M.L., "Software Engineering", Tata McGraw-Hill.

Formal Language and Automata Theory

COURSE OUTLINE

Course Title	Short Title Course Code
Formal Language and Automata Theory	**FLAT**

Course Description:
The objective of this course is to introduce the students the knowledge of automata Theory, principles of Grammars, Push down Automata, Turing Machines and enable them to apply these concepts for solving real world problems.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Knowledge of Discrete Structure & Graph Theory and Data Structures.

COURSE CONTENT

Formal Language and Automata Theory **Semester-V**

Teaching Scheme	**Examination Scheme**
Lecture: 3 hours / week	**End Semester Examination (ESE) : 80 Marks**
	Paper Duration (ESE) : 03 Hours
	Internal Sessional Exam (ISE) : 20 Marks

1. Finite State Machines: **(08 Hrs, 16 Marks)**

Mathematical Preliminaries:

a. Sets , Relations and Functions
b. Alphabets, Words / Strings, their Properties and operations
c. Graphs and trees
d. Basic machine

Finite State Machines:

e. State tables, Transition graph
f. Adjacency matrix
g. Description of a Finite automaton
h. Transition Systems
i. Properties of Transition functions
j. Acceptability of a string by a FA
k. Deterministic and Non-deterministic FSM's
l. Equivalence of DFA and NFA
m. Moore and Mealy Models
n. Minimization of Finite Automata
o. FSM with Epsilon moves

2. Regular Expressions: **(08 Hrs, 16 Marks)**

a. Definition, Identities for Regular Expressions
b. Finite Automata and Regular Expressions

   Transition System Containing ^-moves, NDFAs with ^-moves and Regular Expressions, Conversion of Nondeterministic Systems to Deterministic Systems
c. Building RE
d. Construction of Finite Automata Equivalent to a Regular Expression
e. Conversion of RE to FA
f. Converting FA to RE
g. Equivalence of two FA
h. Pumping lemma for regular sets
i. Applications of Pumping lemma
j. Closure properties of Regular sets

(08 Hrs, 16 Marks)

3. Grammars:

a. Definition
b. Derivation trees
c. Leftmost and Rightmost Derivations
d. Ambiguous grammar
e. Removal of ambiguity
f. Chomsky hierarchy
g. Construction of Reduced Grammar
h. Eliminating Useless symbols
i. Eliminating Epsilon productions
j. Eliminating Unit productions

Normal Forms for Context – free Grammars

k. Chomsky Normal Form
l. Greibach Normal Form
m. Reduced Forms – CNF and GNF
n. Reduction to CNF and GNF
o. Pumping Lemma for Context – free Languages
p. Decision Algorithms for Context- free Languages

4. Pushdown Stack Memory Machines & Production Systems **(08 Hrs, 16 Marks)**

Pushdown Stack Memory Machines:

a. Definition, PDM examples
b. Acceptance by PDA
c. Power of PDM
d. Deterministic and Non-deterministic PDM
e. Construction of PDA from CFG
f. Construction of CFG from PDA

Production Systems:

a. Definition, Post canonical system
b. PMT systems
c. Markov algorithm

5. Turing Machine: **(08 Hrs, 16 Marks)**

a. Turing Machine Model
b. Representation of Turing Machines
c. Language Acceptability By Turing Machines
d. Design of Turing Machines
e. Techniques for TM Construction
f. Variants of Turing Machines
g. Composite and Iterated TM
h. Universal TM
i. TM limitations
j. The Halting problem

Text Books -

1. E V Krishnamurthy, S.K.Sen, "Introductory Theory of Computer Science", Second Edition, EWP.
2. John E. Hopcroft, Rajeev Motwani, Jeffery D. Ullman, "Introduction to Automata Theory, Languages and Computation", Third Edition, Pearson.
3. K.L.P.Mishra, N. Chandrasekaran, "Theory of Computer Science Automaton, Languages and Computation", Third Edition, PHI.

Reference Books -

1. Daniel Cohen, "Introduction to computer Theory", Wiley India.
2. John Martin, "Introduction to Languages and the Theory of Computation", TMH.
3. Lewis H., Papadimitriou C., "Elements of Theory of Computation", Second Edition, Pearson.
4. Moret B., "The Theory of Computation", Pearson Education.

Computer Network

COURSE OUTLINE

Course Title	Short Title	Course Code
Computer Network	**CN**	

Course Description:

This course is aimed at introducing the fundamentals of Computer Networking to undergraduate students. The objective of the course is to understand the basics and knowledge about the Computer Network concepts and different protocols.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**14**	**42**	**03**

Prerequisite Course(s): Data Communications.

COURSE CONTENT

Computer Network **Semester-V**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week **End Semester Examination (ESE) : 80 Marks**
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. TCP/IP Protocol Suit, Data Link Layer and Ethernet
(08 Hours, 16 marks)

TCP/IP Protocol Suit: Physical and Data Link Layers, Network Layer, Transport Layer, Application Layer. Addressing: Physical Addresses, Logical Addresses, Port Addresses, Specific Addresses.
Data Link Layer: Framing: Fixed size and variable size framing.
Ethernet: IEEE Standards: Data Link Layer, Physical Layer. Standard ETHERNET: MAC Sublayer, Physical Layer. Changes in the standard: Bridged Ethernet, Switched Ethernet, Full-Duplex Ethernet. Fast Ethernet: MAC Sublayer, Physical Layer. Gigabit Ethernet: MAC Sublayer, Physical Layer, Ten-Gigabit Ethernet.

2. Network Layer: Logical Addressing, Internet Protocol and Address Mapping
(08 Hours, 16 marks)

Logical Addressing: IPv4 Addresses: Address Space, Notations, Classful Addressing, Classless Addressing, Network Address Translation (NAT).
Internet Protocol: IPv4: Datagram, Fragmentation, Checksum, Options. IPv6: Structure, Address Space, Advantages, Packet Format, Extension Headers, Transition from IPv4 to IPv6: Dual Stack, Tunneling, Header Translation.
Address Mapping: Mapping Logical to Physical Address: ARP, Mapping Physical to Logical Address: RARP, BOOTP and DHCP.

3. Network Layer: Error Reporting, Delivery, Forwarding and Unicast 7 Mulicast Routing Protocols (08 Hours, 16 marks)

Error Reporting: ICMP: Types of Messages, Message Format, Error Reporting, Query, Debugging Tools.

Delivery: Direct Versus Indirect Delivery.

Forwarding: Forwarding Techniques, Routing Table.

Unicast Routing Protocols: Optimization, Intra and Interdomain Routing, Distance Vector Routing, Link State Routing, Path Vector Routing.

Multicast Routing Protocols: Source-Based Tree and Group-Shared Tree, MOSPF, Core-Based Tree (CBT).

4. Transport Layer: UDP and TCP

(08 Hours, 16 marks)

Transport Layer: Transport-layer services: Process-to-Process Communication, Addressing: Port Numbers, Encapsulation and Decapsulation, Multiplexing and Demultiplexing, Flow Control and Error Control.

User Datagram Protocol (UDP): User Datagram, UDP Services: Process-to-Process Communication, Connectionless Services, Flow Control and Error Control.

Transmission Control Protocol (TCP): Services, Features, Segment, Connection, Flow Control, Error Control and Congestion Control: open-loop congestion control and closed-loop congestion control.

5. Wireless Networks: 802.11 and Network Security

(08 Hours, 16 marks)

Introduction to Wireless Network: Why Wireless? A Network by Any Other Name.

Overview of 802.11 Networks: IEEE 802 Network Technology Family Tree, 802.11 Nomenclature and Design, 802.11 Network Operations, Mobility Support.

Network Security: Introduction to cryptography, symmetric-key and asymmetric-key cryptography. Symmetric-Key cryptography: Introduction, traditional ciphers, simple modern ciphers: XOR Cipher, Rotation Cipher, Substitution Cipher: S-box, Transposition Cipher: P-box. Asymmetric-Key cryptography: RSA, Diffie-Hellman algorithms.

Text Books:

1. B. A. Forouzan, "Data Communications and Networking", TMH, Fourth Edition.
2. A. S. Tanenbaum, "Computer Networks", Pearson Education, Fourth Edition.
3. Matthew S. Gast, "802.11 Wireless Networks: The Definitive Guide", O'Reilly, Second Edition.

Reference Books:

1. B. A. Forouzan, “TCP/IP Protocol Suite", TMH, Fourth Edition.
2. W.R. Stevens, “Unix Network Programming”, Vol.1, Pearson Education.
3. S. Keshav, “An Engineering Approach to Computer Networking”, Addison Wesley.
4. Comer, “Internetworking with TCP/IP", Vol. 1, Pearson Education, Fourth Edition.
5. W. Stallings, “Data and Computer Communications", Pearson Education, Fifth Edition.

System Programming

COURSE OUTLINE

Course Title	Short Title	Course Code
System Programming	**SP**	

Course Description:
The objective of this course is to introduce the students to the fundamentals of System Programming. In this basic system programs are studied in order to understand the working of system software.

	Hours per week	No. of Weeks	Total Hours	Semester Credits
Lectures	**03**	**14**	**42**	**03**

Prerequisite Course(s): Discrete Structure and Graph Theory, Data Structures.

COURSE CONTENT

System Programming **Semester-V**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week **End Semester Examination (ESE) : 80 Marks**
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Introduction to System Programs and Assembler: (08 Hours, 16 marks)

a. Introduction to system programming, Types of software and application software, System programming and system programs, Need of system software. Assemblers, Loaders, Compilers, Interpreters, Macros, Operating system and formal system, Translators and its types.
b. Assemblers: Structure of assembler, basic function, Machine dependent and machine independent features of assembler, Types of assemblers – single pass, multi-pass, cross assembler.
c. General design procedure of assembler, Design of Pass-I and Pass-II assembler (with reference to 8086 assembler).
d. Operating System:- concept, services, types (brief introduction only).

2. Macro processor & Loader: (08 Hours, 16 marks)

a. Macros and Macro Processors: Definition and function of Macro Processor, Macro expansion, Features of macro facility.
b. Design of macro processor – single pass and two pass macro processor, detailed design of two pass macro processor.
c. Loaders and Linkage Editors: Basic loader functions, Relocation and linking concepts, various loader schemes (Compile and go loader, Absolute loader, Relocating loader, general loading scheme) with their advantages and disadvantages.

3. Loader, Linker & Grammar: (08 Hours, 16 marks)

a. Design of direct linking loaders, specification of problem, specification of data structures, format of databases.
b. Design of a linker, A linker for MS DOS, Linking for overlays.
c. Other loader schemes – Binders, Linking loaders, Overlays, Dynamic binders.
d. Grammar and scanner, Programming language grammar, Derivation, Reduction and Syntax tree, Ambiguity, Regular grammar and Regular expression.

4. Parser and Parsing Techniques (08 Hours, 16 marks)

a. Parsing Techniques: - Concept, Top Down and Bottom up Parsing.
b. Top Down Parsing :- limitations of Top Down Parsing -Recursive descent and Predictive Parsing
c. Bottom Up Parsing:- Concept, Shift Reduce Parser, LR Parser, LALR, SLR Parser
d. Operator Precedence Parser, Syntax directed translation (Concept and introduction only).
e. Introduction to software development tools LEX & YACC.

5. Compiler & Inter Process Communication (08 Hours, 16 marks)

a. Overview of compilation process, Basic functions of complier, Machine dependent and machine independent features of compiler.
b. Types of compilers – single pass, multi-pass, cross compiler and pseudo code compiler,
c. Phase structure of compiler.
d. Introduction to inter process communication in windows(DLL, DDE, OLE, Clipboard:- concept and introduction only).

Reference Books:

1. John J. Donovan, "System Programming", 2nd Edition, TATA Mc GRAW HILL.
2. D. M. Dhamdhere, "System Programming and Operating Systems", Second Revised Edition, TATA Mc GRAW HILL.
3. Aho Alfred V, Sethi Rav and Ullman D, "Compiler Principles Techniques and Tools", 2nd Edition, Pearson Education.

Principles of Management

COURSE OUTLINE

Course Title	Short Title	Course Code
Principles of Management	**POM**	

Course Description:
The objective of this course is to introduce the students to the Knowledge of Functions of Management and Project management, life-cycle of project, its scheduling and total quality management enable them to Understood and gain for further study.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

COURSE CONTENT

Principles of Management **Semester- V**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week **End Semester Examination (ESE) : 80 Marks**
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Basic Concepts of Management (08 Hours, 16 marks)

a. Management :Definition, classification, Characteristics and Importance of management, Principles of Management
b. Management objectives, Types of objectives
c. Functions of managers, Managerial accounting
d. Development of management thoughts : Functional approach to management by Henry Foyal
e. Scientific Management Approach by Taylor, Gilbreth, Gantt
f. Human Relation Approach by Elton Mayo,Follet
g. Schools of management Thoughts
h. Tools of Management science, Managerial economics

2. Functions of Management and Organisations

(08 Hours, 16 marks)

a. Functions of Management: Planning, Organising
b. Staffing - Concept, Nature, Importance, Steps, Concept of Knowledge worker
c. Directing– Concept, Nature, Importance
d. Controlling-Concept, Nature, Importance, Process of controlling Leadership theories, characteristic and styles of leaderships
e. Management by objectives: steps in setting up M.B.O, Problem in the approach of M.B.O., Management of participation, management by exception, quantitative and qualitative objectives
f. Organisation and its Concept: Nature, Importance, Principles, Centralization, Decentralization
g. Organization Structures- Line and Staff, Functional, Organizations.

3. Human Resource Management

(08 Hours, 16 marks)

a. Function and objective Personnel Management
b. Manpower Planning, Selection and Recruitment of Employees
c. Needs & Types of Training, Objective and Benefits of training, Training for Craftsman, supervisor and Executive
d. Motivation and motivators: motivations, perspective: self-motivation
e. Motivation: the carrot and the sticks, kinds of Motivation, Herzberg's motivation, Hygien Theory
f. Personal management: concept, principles of good personal policy
g. Communication in industry, suggestion system, discipline in industry, promotion, transfer, layout and discharge

4. Project and Quality Management

(08ours, 16 marks)

a. Introduction, Project Management Terminology, Concept of project Management
b. Role and Responsibilities of Project Manager
c. Types of project, Project Life Cycle Phase
d. Project Planning, Project Scheduling, Project Monitoring and Control
e. Basic tools and Techniques for Project Scheduling
f. Total quality management: Introduction, factors affecting quality,
g. product quality analysis, product quality analysis, causes of quality failure
h. elements of T.Q.M , requirements of T.Q.M, Aims of T.Q.M., quality circles, ISO 9000

5. Industrial Psychology, Ethics and MIS

(08 Hours, 16 marks)

a. Industrial Psychology: Definition and Concepts, Industrial psychology Vs Personal Management
b. Aims and Objectives of Industrial Psychology, Scope
c. Individual difference in behavior, Group Dynamics
d. Theory X and Y, Working Environmental Conditions, Industrial Fatigue
e. Professional and Business Ethics: Concepts, Ethics and Morals, Business Ethics, Professional Ethics
f. Need and Importance of ethics, Ethical problems and business, Ethical Issues, How to make business ethical
g. Definition, Evolution of MIS, Need/Objective/Functions of an MIS, Need for Information, Qualities of Good information
h. Information as an Organizational Resource, Management Information Categories, Application of MIS

Text Books:

1. T.R.Banga & S.C.Sharma , "Industrial Organization and Management Economics" Twenty-Third Edition, Hanna Publishers.

2. O.P.Khanna, "Industrial Organization and Management Economics", Dhanpat Rai Publications, 2006.

Reference Books:

1. Koontz and Weihrich, "Management –A Global Perspective", Tenth Edition, Mc Graw-Hill International Editions.
2. Tritaphy and Reddy, "Principles of Management", Second edition, TMH.
3. Hill and Steven, "Principles of Management", McGraw Hill, Special Indian Edition, 2007.
4. M.S.Mahajan," Industrial Engineering and Production Management" Dhanpat Rai and Co.
5. W.S.Jawadekar, "Management Information System", TMH.

Software Engineering Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code

Software Engineering **SE**

Course Description:
This laboratory provides students an ability to apply analysis & design concepts to develop quality software economically.

Laboratory	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	02	14	28	01

Prerequisite Course(s) : Knowledge of Object Oriented Concepts and any system programming language.

LAB COURSE CONTENT

The Software Engineering Lab must include any five of following software Mini-Projects covering Problem Definition, Analysis & Design using a CASE Tool and Documentation for each.

1. ATM System
2. Library Management System
3. Inventory Control System
4. Railway Reservation System
5. College Admission System
6. University Result Management System
7. Vehicle Navigation System
8. Hospital Management System
9. Banking System
10. Web based/Online Auction System

Guidelines for ICA:
Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:
The oral examination will be based on the assignments performed by the candidates as part of ICA. Questions will be asked during the oral examination to judge the understanding of the student. It is expected that student knows theoretical (Software Engineering) aspect of the problem.

Reference Books:

1. Timonthy C. Lethbridge and Robert Laganiere, "Object Oriented Software Engineering – A Practical Software Development using UML and JAVA", 2nd Edition, Tata McGraw-Hill.

2. Mike O'Docherty, "Object-Oriented Analysis & Design – Understanding System Development with UML 2.0", Wiley.

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Linux Lab

LAB COURSE OUTLINE

Course Title | Short Title | Course Code
Linux | **Linux**

Course Description:

This laboratory provides students with a basic knowledge of the linux programming environment. So that students able to use basic commands of linux as well as they will able to perform basic operations.

Laboratory	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	02	14	28	01

Total Semester Credits: 01

Prerequisite Course(s): Fundamental knowledge of Operating system.

LAB COURSE CONTENT

Outline of Content:

Teacher should facilitate learning following lab experiments:

Group A

1. **Installation of Linux OS.**
   Installing latest version of Linux. Observing each step of installation and notice the differences.
2. **Study and execution of various Linux Commands.**
   Studying various basic commands of Linux. Use of commands.
3. **Study of vi editor.**
   Studying basic working and use of vi editor.
4. **Configuration of Linux Server (any two)**
   It shows step by step Configuration of various types of servers
   1) Web Server
   2) Mail Server
   3) Proxy Server
   4) Telnet Server
   5) FTP Server
5. **Shell script for finding out factorial of a number.**
   To calculate the Factorial of number.
6. **Shell script for finding out file type and displaying list of a directory.**
   To find out file type and displaying list of directory.
7. **Shell Script for File Handling.**
   Demonstrates the various file operations such as :
   1) Create a File.
   2) Read a File.
   3) Add a record into a File.
   4) Delete a record from File.
   5) Delete a file.
   6) Update a File.

Group B

1 **Write shell script for displaying user process and system related information using environment variables.**
Displays a user process and system related information using environment variables.

2 **Write a shell script to find the largest among the 3 given numbers.**
To find out largest number among 3 given numbers.

3 **Write a shell script to reverse the contents of a String.**
To print contents of string in reverse order.

4 **Write a shell script to print date and time.**
To print date and time along with greetings depend on time.

5 **Shell script to perform arithmetic operations.**
To perform arithmetic operations such as – Addition, Subtraction, Multiplication, Division **.**

Guidelines for ICA:
Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Reference Books:

1. Stevens Richard W, Rago Stephen A "Advanced programming in the unix environment", Pearson 2008.
2. Gopalan N P,Sivaselvan B "Beginners guide to unix", PHI Learning: New Delhi, 2009.
3. Richard Blum, Christine Bresnahan, "Linux Command Line and Shell Scripting Bible, 2nd Ed ", Wiley India, 2011.
4. Dayanand Ambawade, Deven N. Shah, "Linux Lab: Hands on Linux", Dreamtech Press
5. "Linux Administration", Kogent Learning Solutions Inc.
6. Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, "Unix and Linux System Administration Handbook" 4th Edition, Pearson.
7. Neil Matthew, Richard Stones ,"Beginning Linux Programming", 4th Edition, Wiley.
8. K. L. JAMES, "Linux -Learning the Essentials", PHI,2011.

Note:

- Concerned faculty should suitably frame at least **10 practical** assignments **(SIX from PART – A and FOUR from PART – B)** out of the above list.
- Every assignment should include syntax, use of commands/functions used for coding & print out of code with proper comments and output.
- Every student is required to submit the assignments in the form of journal.
- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Computer Network Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Computer Network	**CN**	

Course Description:

This laboratory provides students with a comprehensive study of the Computer Networking and protocols. Classroom lectures stress the strengths of Computer Networks, which provide students with the means of writing efficient, maintainable, and portable code and simulating protocols and networks.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**14**	**28**	**01**

Total Semester Credits: 01

Prerequisite Course(s): Fundamental knowledge of Computers and Data Communication, C, C++ and Java Programming.

LAB COURSE CONTENT
Outline of Content:

(Note: Minimum SIX Experiments from PART A and TWO from PART B.)

PART - A

1. Implementation of Character count/Bit-Stuffing/Byte stuffing framing methods.
2. Implementation of Dijkastra's Shortest Path Network routing algorithm.
3. Implementation of TCP checksum.
4. Socket programming for TCP.
5. Socket programming for UDP.
6. Encryption/Decryption using XOR symmetric-key cryptography algorithm.
7. Encryption/Decryption using RSA asymmetric-key cryptography algorithm.
8. Implementation of RLE data compression algorithm.

PART – B

1. Simulate the Ethernet LAN for wired networks.
2. Simulate the point-to-point wired network.
3. Simulate any Wireless network.

Guidelines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:

ESE will be based on the practical assignments submitted by the students in the form of journal. In the ESE, the students may be asked to perform the practical assignment with minor modification.

Evaluation will be based on the paper work of algorithm, understanding of the logic and the syntax, quality of the program, execution of the program, type of input and output for the program.

NOTE: -

- Concerned faculty should use any network simulator software like NS-2/NS-3/ OPNET/ NetSim/ OMNeT++ to perform **PART-B** assignments.
- Concerned faculty should suitably frame at least **08 practical** assignments **(SIX from PART – A and TWO from PART – B)** out of the above list.
- Every assignment should include, theory, algorithm, print out of code with proper comments and output. Every student is required to submit the assignments in the form of journal.
- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

System Programming Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
System Programming	**SP**	

Course Description:

The objective of this course is to introduce the students to the fundamentals of System Programming. In this basic system programs are studied in order to understand the working of system software.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**14**	**28**	**01**

Total Semester Credits: 01

Prerequisite Course(s): Fundamental knowledge of Discrete Structures and Graph Theory, Data Structures.

LAB COURSE CONTENT
Outline of Content:

1. **Develop an application to simulate pass-I of Two Pass Assembler.**
   To analyse the source program for finding Pseudo–opcode, Machine opcode, Literals and symbols.
2. **Develop an application simulate pass- II of Two pass Assembler.**
   To analyse the output of pass-I to generate the machine operation code.
3. **Develop an application to create simple text editor.**
   Develop a text editor for creation, opening, editing and saving the content into a file.
4. **Develop an application for simulating Lexical Phase of compiler.**
   Develop a Lexical Analyser for generating keywords, symbols, operators and identifires within the source code.
5. **Develop an application for simulating Syntax Analysis Phase of compiler.**
   Develop a Syntax Analyser for generating a Parse tree from source code.
6. **Develop an application for simulating Pass-I of Macro Processor.**
   Develop Pass-I of Macro processor for recognizing macro definition specified within a program.
7. **Develop an application for simulating Pass-II of Macro Processor.**
   Develop Pass-II of an Macro processor for expanding a macro definition specified within a program
8. **Develop an application for simulation of any one of parsing techniques.**
   Develop a parser from the grammar specified within a source code.

Guidelines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:

- ESE will be based on the practical assignments submitted by the students in the form of journal.
- In the ESE, the students may be asked to perform the practical assignment with minor modification.

Note:

- Concerned faculty should suitably frame at least **06 practical** assignments out of the above list.
- Every assignment should include theoretical concept, algorithm, print out of code with proper comments and output.
- Every student is required to submit the assignments in the form of journal.
- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Java Programming Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Java Programming	**JPL**	

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**14**	**28**	**01**

Group-A

1 **Write a program that demonstrates string operations.**

2 **Write a program that demonstrate package creation and use in program.**

3 **Write a program to demonstrate the abstract class and abstract method**.

4 **Write a Java program that illustrates the concepts of Java class that includes**

(a) constructor with and without parameters.
(b) Overloading methods.
(c) Overriding methods

5 **Write a Java program to demonstrate inheritance by creating suitable classes.**

6 **Create a Java package, interface and implement in Java program.**

7 **Write a program to demonstrate**

- Use of implementing interfaces.
- Use of extending interfaces.

Group- B

1 **Write a program to implement the concept of threading.**

2 **Write a program to demonstrate the predefined and User defined exception handling.**

3 **Write a program using Applet**

- to display a message in the Applet.
- for configuring Applets by passing parameters.

4 **Write programs for using Graphics class**

- to display basic shapes and fill them.
- draw different items using basic shapes
- set background and foreground colors.

5 **Write a program in Java that demonstrates JDBC**

6 **Write a program that demonstrates JDBC on applet/application**

Guidelines for ICA:
Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Reference Books:

1. Herbert Schildt, "Java2:The Complete Reference" , Tata Mc GrawHill, 5th edition.
2. E. Balagurusamy , "Programming with Java A primer", 3rd Edition.
3. Horstman Cay and Cornell Gary, "Core JavaTM2", Vol.1, Pearson education.
4. Kathey Sierra and Bert Bates, "Head First Java", SPD Publication.
5. Steven Holzner, "JAVA 2 Programming Black Book", Wiley India.

Note:

- Concerned faculty should suitably frame at least **08 practical** assignments **(FIVE from PART – A and THREE from PART – B)** out of the above list.
- Every assignment should include algorithm, print out of code with proper comments and output.
- Every student is required to submit the assignments in the form of journal.
- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Industrial Training / EDP / Special Study

COURSE CONTENT

Industrial Training / EDP / Special Study **IT/EDP/SS**
Course Title Short Title Course Code

Semester-V **Examination Scheme**
Total Semester Credits: 02 **Internal Continuous Assessment (ICA): 25 Marks**

Industrial Training

- Student shall undergo industrial training for a minimum period of **two weeks** during summer vacations between fourth semester and fifth semester.
- The industry in which industrial training is taken should be a medium or large scale industry
- The paper bound report on training must be submitted by the student in the beginning of Fifth semester along with a certificate from the company where the student took training.
- Every student should write the report separately.
- Institute / Department/T&P Cell have to assist the students for finding Industries for the training.
- Students must take prior permission from Department before joining for Industrial Training.

OR

EDP (Entrepreneurship Development Program)

- Student has to participate in Entrepreneurship Development Program for a minimum period of **One week** during summer vacations between fourth semester and fifth semester.
- Every student must submit the paper bound report based on the program in the beginning of Fifth semester along with a certificate (Course / Program completion) from the program organizers.
- Every student should write the report separately.
- Institute / Department may arrange Entrepreneurship Development Program at their campus.
- Students must take prior permission from Department before attending any Entrepreneurship Development Program.

OR

Special Study

- Student has to submit name of three topics of his interest to the department.
- Special study in a group shall not be allowed.
- The three-member committee appointed by Head of Department shall allot one topic out of the three topics submitted by the student.
- Every student must submit the paper bound report based on special study at the end of Firth semester.
- Department should allot guide to all such students, for monitoring their progress and guide them for literature survey / report writing etc.
- Evaluation of special study shall be done based on presentation made by student, followed by brief question answer session.

Evaluation of Industrial Training / EDP / Special Study

ICA: The Internal Continuous Assessment shall be based on the active participation of the students in the training / EDP / Special study and based on knowledge / skill acquired by the student. The three-member committee appointed by Head of Department shall assess the reports and award marks based on following:

(a) Report	10 marks.
(b) Presentation	10 marks.
(c) Viva-voce at the time of presentation	05 marks.
Total:	**25 marks.**

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Third Year Engineering

(Information Technology)

Faculty of Engineering and Technology

COURSE OUTLINE

Semester – VI

W.E.F 2014 – 2015

Operating System

COURSE OUTLINE

Course Title	Short Title	Course Code
Operating System	**OS**	

Course Description:
The objective of this course is to introduce the students to the concepts of Operating Systems functions, types and their working details.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	**14**	**42**	**03**

Prerequisite Course(s): Computer Organization, System Programming.

COURSE CONTENT

Operating System **Semester-VI**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Operating System Overview

(08 Hours, 16 marks)

a. Introduction: Computer system organization, Architecture, Evolution of OS, Need of OS, User view and System view of OS.
b. Types of Operating System: Batch, Timesharing, Multiprogramming, Multitasking, RTOS, Distributed.
c. Operating System Services and Components: Different OS services and OS components, System calls and its types.
d. Operating System Structures: Monolithic, Layered, Kernel, Microkernel, Virtual Machine.
e. Threads: Overview, Benefits, Models (Introduction Only).

2. Process and Process Management

(08 Hours, 16 marks)

a. Process Concept: The process, Process states, Process Control Block, Context Switching, SPOOLING, CPU & I/O burst.
b. Scheduling: Concept, Objectives, Queuing diagram.
c. Types of Schedulers: Long term Scheduler, Middle term Scheduler, Short term Scheduler.

d. Scheduling Algorithm (For Uniprocessor System): FCFS, SJF (preemptive & non preemptive), Priority (preemptive & non preemptive), Round Robin, MLQ with and without feedback.

e. IPC: Concept and Types.

f. Critical Section: Critical section problem, Solution to critical section problem, Mutual exclusion with busy waiting, TSL, Peterson's solution for two processes, Dijkstra's semaphore.

g. Problem in Concurrent Programming: Producer-Consumer problem, Readers–Writers problem, Dinning Philosopher problem, Monitors.

3. Deadlocks

(08 Hours, 16 marks)

a. Deadlock: System Model, Deadlock Characterization, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

b. Memory Management: Memory Management Requirements.

c. Memory Partitioning: Fixed and Dynamic Partitioning.

d. Memory Allocation: Allocation strategies (First Fit, Best Fit and Worst Fit), Fragmentation, Swapping, Paging and Segmentation.

e. Virtual Memory Management: Background, Demand Paging, Page Replacement (FIFO, LRU, Optimal LRU), Thrashing.

4. Storage Management

(08 Hours, 16 marks)

a. File concept: File Organization, Access Methods and Directory Structure.

b. Allocation of Disk Space: Contiguous allocation, Non-contiguous allocation (chaining and indexing).

c. Disk Scheduling: FCFS, SSTF, SCAN, C-SCAN, LOOK.

5. Secondary Storage Structure, Protection and Security, Introduction to UNIX.

(08 Hours, 16 marks)

a. Disk Management: Disk formatting, Boot block, Bad blocks.

b. Swap Space Management: Swap Space Use, Swap Space.

c. System Protection: Goals of protection, Domain of protection, Threats, Security attacks.

d. Introduction to UNIX: History, System architecture.

e. Internal Representation of File: Inode, Structure of regular file, Super block, Pipes (No Algorithms).

f. Process Control: Process creation, Process States and Transitions, Process system calls (exec, fork).

Text Books:

1. A. Silberschatz, P. B. Galvin, G. Gagne, “Operating Systems Concepts”, 7th/ 8th edition, John Wiley Publications, 2008.
2. William Stalling, “Operating System Internals and Design Principles”, 6th edition, Pearson Publication, 2013.

Reference Books:

1. Maurice J. Bach, “The Design of the Unix Operating System”, 1st edition, PHI.
2. Dhananjay M. Dhamdhere, “Operating Systems-A Concept-Based Approach”, 3rd edition, TMH, 2012.
3. A. S. Tanenbaum, “Modern Operating System”, 2nd edition, Pearson publication”, 2001.
4. H. M. Deitel, P. J. Deitel, D. R. Choffnes, “Operating System”, 3rd edition, Pearson publication, 2013.
5. Rajiv Chopra, “Operating Systems-A Practical Approach”, 1st edition, S. Chand Publication, 2009.
6. Sibsankar Haldar, Alex A. Arvind, “Operating Systems”, 1st edition, Pearson Publication, 2009.

Object Oriented Modeling & Design

Course Title
Object Oriented Modeling and Design

Short Title Course Code
OOMD

Course Description:
The objective of this course is to introduce students the knowledge about Modeling and Design of Software firmware and business processes. It introduces UML 2.0 and its diagrams as a modeling tool for large and complex systems. It also gives understanding of the concepts being modeled in UML.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Knowledge of software engineering and object oriented concepts.

COURSE CONTENT

Object Oriented Modeling and Design **Semester-VI**

Teaching Scheme

Lecture: 3 hours / week

Examination Scheme

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Introduction of Object Oriented Modeling (08 Hrs, 16 Marks)

Introduction:

a. What is object-oriented?
b. What is Object oriented development? : Modeling Concept , Not Implementation , Object- Oriented Methodology , Three Models
c. Object oriented themes

Why We Model:

d. The Importance of Modeling
e. Principles of Modeling
f. Object-Oriented Modeling

4+1 View architecture,

Architectural approaches: Use case driven, Architecture-centric, Iterative and Incremental,

Rational Unified Process:

g. Characteristics of the process

Phases and Iterations:

h. Inception Phase
i. Elaboration Phase
j. Construction Phase
k. Transition Phase
l. Iterations
m. Process Workflows
n. Artifacts
o. Other Artifacts

2. Introduction to UML (08 Hrs, 16 Marks)

a. An Overview of the UML: Visualizing, Specifying, Constructing, Documenting
b. Background , UML Basics

c. Introducing UML 2.0

A Conceptual Model of the UML:

d. Building Blocks of the UML
e. Rules of the UML
f. Common Mechanisms in the UML: Specifications, Adornments, Common divisions
g. Extensibility Mechanisms: stereotypes, tagged values, constraints

Object Constraint Language:

h. OCL Basics, OCL Syntax, Advanced OCL Modeling

3. Class Diagram and Composite Structure Diagram (08 Hrs, 16 Marks)

Object Diagram:

a. **Terms and Concepts:**
Common Properties, Contents, Common Uses
b. **Common Modeling Techniques:** Modeling Object Structures

Class Diagram:

c. Classes, Attributes, Operations, Abstract Classes
d. **Relationships:** Dependency, Association, Aggregation, Composition, Generalization, Association Classes, Association Qualifiers
e. **Advanced Relationships:**
Stereotypes on Dependency, Stereotypes and Constraints on Generalization, Constraints on Association, Realization
f. Interfaces
g. Templates
h. Class Diagram: Common Properties, Contents, Common Uses
i. Common Modeling Techniques : Modeling Simple Collaborations, Modeling a Logical Database Schema
j. Forward and Reverse Engineering

Composite Structures Diagram:

k. Connectors, Ports, Structured classes and Properties

4. Behavioral Diagrams (08 Hrs, 16 Marks)

a. **Use case Diagram**
Names, Use Cases and Actors, Use Cases and Flow of Events, Use Cases and Scenarios, Use Cases and Collaborations, Organizing Use Cases, Common Properties, Contents, Common Uses
b. **Sequence Diagram**
c. **Communication Diagram**
d. **Timing Diagram**
e. **State chart Diagram:**
Behavioral State Machines, States, Composite States, Submachine States, Transitions, Activities, Protocol State Machines ,Pseudo States , Event Processing
f. **Activity Diagram:**
Common Properties, Contents, Action States and Activity States, Transitions, Branching, Forking and Joining, Swimlanes, Object Flow, Common Uses

5. Package Diagram, Component Diagram, Deployment Diagram (08 Hrs, 16 Marks)

Package Diagram:

a. **Terms and Concepts**
Names, Owned Elements, Visibility, Importing and Exporting
b. **Common Modeling Techniques:** Modeling Groups of Elements, Modeling Architectural Views

Component:

c. **Terms and Concepts**
Names, Components and Classes, Components and Interfaces, Kinds of Components

Component Diagram:

d. Common Properties, Contents, Common Uses
e. **Common Modeling Techniques:** Modeling Source Code, Modeling an Executable Release, Modeling a Physical Database, Modeling Adaptable Systems
f. Forward and Reverse Engineering

Deployment:

g. **Terms and Concepts**
Names, Nodes and Components, Connections

Deployment Diagram:

h. Common Properties, Contents, Common Uses
i. **Common Modeling Techniques:** Modeling an Embedded System, Modeling a Client/Server System, Modeling a Fully Distributed System
j. Forward and Reverse Engineering

Text Books:

1. James Rumbaugh , Michael Blaha , William Premerlani, Frederick Eddy, William Lorensen ,"Object- Oriented Modeling and Design", Pearson Education.
2. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Pearson Education.
3. Dan Pilone, Neil Pitman, "UML 2.0 in a Nutshell", SPD ,O'Reilly.

Reference Books:

1. Martin Fowler, "UML Distilled: A Brief Guide to the Standard Object Modeling Language", Third Edition ,Addisioh Wesley.
2. Tom Pender, "UML 2 Bible", Wiley.
3. Meilir Page-Jones, "Fundamentals of Object Oriented Design in UML", Pearson Education.
4. Pascal Roques, "Modeling Software Systems Using UML2", Wiley.
5. Atul Kahate, "Object Oriented Analysis & Design", The McGraw-Hill Companies.
6. Mark Priestley, "Practical Object-Oriented Design with UML", TATA McGraw-Hill.
7. Craig Larman, "Appling UML and Patterns: An introduction to Object–Oriented Analysis and Design and Iterative Development", Pearson Education.
8. Mike O'Docherty, "Object-Oriented Analysis & design understanding system development with UML 2.0", John Wiley and Sons.

Database Management System

COURSE OUTLINE

Course Title
Database Management System

Short Title Course Code
DBMS

Course Description:
The objective of this course is to introduce the students to Learn and practice data modeling using the entity-relationship and developing database designs, apply normalization techniques to normalize the database, learn techniques for controlling the consequences of concurrent data access also understand the needs of Object based Database and Database System Architecture.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Knowledge of data structures.

COURSE CONTENT

Database Management System **Semester-VI**

Teaching Scheme

Lecture: 3 hours / week

Examination Scheme

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1) Introduction to DBMS (08 Hrs, 16 Marks)

a. Database-System Applications
b. Purpose of Database Systems
c. View of Data: Data Abstraction ,Instances and Schemas, data independence
d. Data Models: Relational Model , Entity-Relationship Model ,Object-Based data model, Semistructured Data Model
e. Database Languages
f. Data Storage and Querying
g. Transaction Management
h. Database Architecture
i. Database Users and Administrators

Database Design and E-R Model

j. Overview of the Design Process
k. The Entity Relationship Model: Entity Sets , Relationship Sets, Attributes, Constraints
l. Entity-Relationship Diagram: Basic Structure , Mapping Cardinality, Roles, Weak Entity sets
m. Extended E-R Features: Specialization, Generalization, Attribute Inheritance, Constraints on Generalizations, Aggregation

2) Structured Query Language (08 Hrs, 16 Marks)

a. Introduction to relational Model: structure of relational Databases, Database Schema, Keys, Schema Diagrams
b. Overview of the SQL Query Language
c. SQL Data Definition

d. Basic Structure of SQL Queries
e. Additional Basic Operations
f. Set Operations
g. Null Values
h. Aggregate Functions
i. Nested Subqueries
j. Modification of the Database

Intermediate SQL:

k. Joined Expressions: Join Conditions , Outer Joins
l. Views
m. Integrity Constraints

3) Formal Relational Query Languages (08 Hrs, 16 Marks)

The Relational Algebra:

a. Fundamental Operations:
The select Operation, The Project Operation, The Union Operation, The Set-Difference Operation, The Cartesian-Product Operation, The Rename Operation, Formal definition of Relational Algebra
b. Additional Algebra Operations:
The Set-Intersection Operation, The Natural-Join Operation, The Assignment Operation, Outer Join Operations
c. Extended Relational-Algebra Operations:
Generalized Projection, Aggregation

The Tuple Relational Calculus:

d. Formal Definition
e. Example Queries

The Domain Relational Calculus:

f. Formal Definition
g. Example Queries

Functions and Procedures

Triggers

4) Relational Database Design and Transaction Management (08 Hrs, 16 Marks)

Relational Database Design:

a. Features of Good Relational Designs
b. Atomic Domains and First Normal Form
c. Decomposition Using Functional Dependencies:
Keys and Functional Dependencies, Boyce-Codd Normal Form, BCNF and Dependency Preservation, Third Normal Form
d. Decomposition Using Multivalued Dependencies: Multivalued Dependencies, Fourth Normal Form

Transaction Management:

e. Transaction Concept
f. A simple Transaction Model
g. Transaction Atomicity and Durability

Concurrency Control:

h. Lock-Based Protocols: Locks, Granting of Locks, The Two Phase Locking protocol
i. Timestamp–Based Protocols: Timestamps , The Timestamps-Ordering Protocol

Recovery System:

j. Failure Classification
k. Storage
l. Recovery and Atomicity: Log records, Database Modification, Concurrency Control and Recovery ,Transaction Commit , Using the Log to Redo and Undo Transactions

5) Object–Based Databases and Database- System Architectures (08 Hrs, 16 Marks)
Object–Based Databases

a. Overview,
b. Complex Data Types
c. Structure Types and Inheritance in SQL
d. Table Inheritance
e. Array and Multiset Types in SQL: Creating and Accessing Collection Values, Querying Collection-Valued Attributes
f. Object–Identity and Reference Types in SQL
g. Persistent Programming Languages: Persistence of Objects, Object Identity and Pointers

Database-System Architectures

h. Centralized and Client–Server Architectures
i. Server System Architectures
j. Parallel Systems
k. Distributed Systems

Text Book:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", 6th Edition, McGraw-Hill.

Reference Books:

1. R. Ramkrishnan , J. Gehrke, "Database Management Systems", 3rd Edition, McGraw-Hill.
2. C. J. Date, "Introduction to Database Management Systems", 8th Edition, Pearson.
3. V.K.Jain, " Database Management System", Dreamtech Press (Wiley India).
4. Atul Kahate, "Introduction to Database Management System", 3rd Edition, Pearson.
5. G. K. Gupta, "Database Management Systems", McGraw–Hill.
6. S. K. Singh, "Database Systems Concepts, Design and Applications", Pearson.
7. Bipin Desai, "Introduction to database management systems", Galgotia.

E-Commerce

COURSE OUTLINE

Course Title	Short Title	Course Code
E- Commerce	**E-Com**	

Course Description:

The aim of this course is to equip students with the range of technical and business skills needed to study and understand e-commerce concepts and practices in a business environment. The student gains an overview of all aspects of E-Commerce. The course provides different types of e-commerce, concepts of C2C, P2P, M-Commerce business models. Major security threats in the e-commerce environment along with technology solutions are discussed. Later part of course is devoted to e-commerce payment, marketing communications, ethical issues in e-commerce and online content.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	**15**	**45**	**03**

Prerequisite Course(s): Principles of Management

COURSE CONTENT

E-commerce **Semester-IV**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Introduction to E-Commerce and Business Models

(08 Hours, 16 marks)

I. Introduction to E-Commerce

a. What is E-Commerce
b. The difference between E-commerce and E-business
c. Why study E-Commerce?
d. Eight unique features of E-Commerce technology
e. Types of E-commerce

II. E-commerce Business Models

a. Introduction
b. Eight Key Elements of a Business Model
c. Business Models in Emerging E-commerce Areas

2. Security Issues and Technology Solutions

(08 Hours, 16 marks)

I. Major Security Threats in the E-Commerce Environment

a. Malicious Code
b. Unwanted Programs
c. Phishing and Identity Theft
d. Hacking and Cybervandalism
e. Credit Card Fraud/Theft
f. Spoofing (Pharming) and Spam (Junk) Web Sites
g. Denial of Service (DoS) and Distributed Denial of Service (DDoS) Attacks
h. Sniffing
i. Insider Attacks
j. Poorly Designed Server and Client Software

II. Technology Solution

a. Protecting Internet Communications
b. Securing Channels of Communication
c. Protecting Servers and Clients

3. Management Policies And E-Commerce Payment Systems

(08 Hours, 16 marks)

I. Management Policies, Business Procedures, and Public Laws

a. A Security Plan: Management Policies
b. The Role of Laws and Public Policy

II. E-Commerce Payment Systems

a. Online Credit Card Transactions
b. Digital Wallets
c. Digital Cash
d. Online Stored Value Systems
e. Digital Accumulating Balance Payment Systems
f. Digital Checking Payment Systems
g. Wireless Payment Systems

4. Communication and Online Marketing

(08 Hours, 16 marks)

I. Marketing Communications

a. Online Advertising
b. E-mail Marketing and the Spam Explosion
c. Online Catalogs
d. Social Marketing: Blogs, Social Networks and Games
e. Targeted Marketing: Getting Personal
f. Mixing Offline and Online Marketing Communications

II. Understanding the Costs and Benefits of Online Marketing Communications

a. Online Marketing Metrics: Lexicon
b. How Well Does Online Advertising Work?
c. The Costs of Online Advertising

d. Software for Measuring Online Marketing Results

5. Ethical Issues and Online Content

(08 Hours, 16 marks)

I. Understanding Ethical Issues in E-commerce

a. A Model for Organizing the Issues
b. Basic Ethical Concepts: Responsibility, Accountability, and Liability
c. Analyzing Ethical Dilemmas
d. Candidate Ethical Principles

II. Online Content

a. Content Audience and Market: Where Are the Eyeballs and the Money?
b. Media Industry Structure
c. Media Convergence: Technology, Content, and Industry Structure
d. Online Content Revenue Models and Business Processes
e. Key Challenges Facing Content Producers and Owners

Text Book:

1. Kenneth C. Laudon, Carol Guercio Traver, "E-Commerce - Business, Technology, Society 2008", Fourth Edition, Pearson Education.

Reference Books:

7. Harvey M. Deitel, Paul J. Deitel, Kate Steinbuhler, "E-Business and E-Commerce for Managers", Prentice Hall.
8. Greenstein, Feinnon, " Electronic Commerce", Tata McGraw Hill Edition.
9. Ravi Kalakota, et al, "Electronic Commerce – A Manager's Guide", Addison Wesley Longman.

Management Information System

COURSE OUTLINE

Course Title	Short Title	Course Code
Management Information System	**MIS**	

Course Description:

This course provides an introduction to information systems for business and management. It is designed to familiarize students with organizational and managerial foundations of systems, the technical foundation for understanding information systems, the role of information systems in enhancing business processes and management decision making across the enterprise, and the process of building and managing systems in organizations. The course will focus on topics such as Management of the Digital Firm, Internet and Internet technology, the Electronic Business and Electronic Commerce, the Information Technology (IT) Infrastructure, the Ethical and Security Issues related to Information Systems, and the Enterprise Applications. The course will provide students with information systems knowledge that is essential for creating successful and competitive firms.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Principles of Management.

COURSE CONTENT

Management Information Systems **Semester-VI**

Teaching Scheme
Lecture: 3 hours / week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Information Systems

(08 Hours, 16 marks)

i. Introduction

a) Data Vs Information
b) Functions of Management
c) Managerial Roles
d) Levels of Management
e) Classification of Information System
f) Framework for Information System

ii. Systems

a) System concepts
b) System and their Environments
c) How system works
d) System approach for problem solving

2. E Business Enterprise:

(08 Hours, 16 marks)

i. E Business Technology

a) Introduction to E Business
b) Models of E Business
c) Internet and WWW
d) Security in E Business
e) Electronic Payment System
f) Web Enabled Business Management
g) Enterprise Portal
h) MIS in Web Environment

ii. Organization of Business in Digital Firm

a) E Business
b) E Commerce
c) E Communication
d) E Collaboration
e) Real Time Enterprise

3. Applications To Functional Business Areas

(08 Hours, 16 marks)

i. Operational Information System

a) Accounting / Finance
b) Marketing
c) Production
d) Human Resource

ii. Tactical Information System

a) Accounting / Finance
b) Marketing
c) Production
d) Human Resource

iii. Strategic Information System

a) Accounting / finance
b) Marketing
c) Production
d) Human Resource

4. DSS, EMS And ES:

(08 Hours, 16 marks)

i. Decision Support System

a) Characteristics of Decision Making Process
b) Features of DSS
c) Development of DSS
d) Benefits and Risks of DSS
e) GDSS

ii. Enterprise Management System

a) ERP System
b) ERP Model and Modules
c) Benefits of ERP
d) Supply Chain Management
e) Customer Relationship Management

iii. Expert Systems

a) Characteristics
b) How an Expert System Works
c) Advantages
d) Expert System and DSS
e) Expert Systems and AI.

5. Information Security and Information Technology

(08 Hours, 16 marks)

i. Information Security Challenges in E Enterprise

a) Risks
b) Common Threats
c) Common Controls
d) Protection of information system

ii. IT: Impact on Society

a) Impact of IT on Privacy
b) Ethics
c) Technical Solution for Privacy Protection
d) Intellectual Property
e) Copyright and Patents
f) Impact of IT on the Workplace
g) Impact of quality on Life

Text Books:

1. Robert Schultheis and Mary Sumner, "Management Information Systems The Managers View", 4th Edition Tata McGraw Hill
2. Waman S. Jawadekar, "Management Information Systems", 4th Edition Tata McGraw Hill.

Reference Books:

1. Sahil Raj "Managament Information Systems" PearsonEducation
2. Kenneth C Laudon and Jane Laudon, "Management Information System", Pearson Education
3. James A. O'Brien, "Management Information Systems", Tata McGraw Hill
4. S. Sadagopan, "Management Information System", PHI.

Operating System Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Operating System	**OS**	

Course Description:

This laboratory provides students with a comprehensive study of the operating system functions, its working details and implementation of various algorithms used in the operating systems.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**14**	**28**	**03**

Total Semester Credits: 03

Prerequisite Course(s): C Programming, Basic Knowledge of Linux Operating System.

LAB COURSE CONTENT

Outline of Content:

(Note: Minimum FOUR Experiments each from group A and B)

Group A

1. **Study of Commercial and Open Source Operating Systems (01 each) and Design structure of these of Operating Systems.**
   a. Study the basic structures.
   b. Study the File systems.
   c. Study the Security aspects of Operating Systems.
   d. e. g. Windows OS, Linux OS.
2. **Write a program to implement Command Interpreter using system calls.**
   Implementation of Command Interpreter using various system calls showing working of Command Line Interpreter.
3. **Write a program to implement concept of Threading.**
   Demonstrate the concept of Threading in process. (Without using System Call/ Kernel Functions).
4. **Write a program to implement CPU Scheduling algorithms**
   Demonstrate the working of CPU Scheduling algorithms (any two).
   a. FCFS
   b. SJF(Preemptive & non-preemptive)
   c. Round Robin
   d. Priority(Preemptive & non-preemptive)

5. **Write a program to implement algorithmic solution for Critical Section Problem**
   Demonstrate solution to overcome the critical section problem.

Group B

1. **Write a program to implement Memory Management algorithms – best fit, first fit, worst fit**
   Demonstrate the working of Memory Management algorithms (any two).
   a. First Fit
   b. Best Fit
   c. Worst Fit
2. **Write a program to implement Page Replacement algorithms**
   Demonstrate the working of Page Replacement algorithms (any two).
   a. FIFO(First In First Out)
   b. LRU(Least Recently Used)
   c. Optimal
3. **Write a program to implement Inter process communication**
   Demonstrate the working of Inter Process Communication (any one).
   a. Full Duplex pipes
   b. Half Duplex pipes
4. **Write a program for Banker's algorithm**
   Demonstrate the working of Banker's algorithm.
5. **Write a program to demonstrate disk scheduling algorithms**
   Demonstrate the working of the Disk Scheduling algorithms (any two).
   a. FCFS
   b. SSTF
   c. SCAN
   d. C-SCAN

Guidelines for ICA:
Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guide lines for ESE:-

- ESE will be based on the practical assignments submitted by the students in the form of journal.
- In the ESE, the students may be asked to perform the practical assignment with minor modification.
- Evaluation will be based on the paper work of algorithm, understanding of the logic and the syntax, quality of the program, execution of the program, type of input and output for the program.

Reference Books:

1. A. Silberschatz, P. B. Galvin, G. Gagne, "Operating Systems Concepts", 7th/ 8th edition, John Wiley Publications, 2008.

2. William Stalling, “Operating System Internals and Design Principles”, 6th edition, Pearson Publication, 2013.
3. Maurice J. Bach, “The Design of the Unix Operating System”, 1st edition, PHI.
4. Dhananjay M. Dhamdhere, “Operating Systems-A Concept-Based Approach”, 3rd edition, TMH, 2012.
5. A. S. Tanenbaum, “Modern Operating System”, 2nd edition Pearson publication, 2001.
6. H. M. Deitel, P. J. Deitel, D. R. Choffnes, “Operating System” 3rd edition, Pearson publication, 2013.
7. Rajiv Chopra, “Operating Systems-A Practical Approach”, 1st edition, S. Chand Publication, 2009.
8. Sibsankar Haldar, Alex A. Arvind, “Operating Systems”, 1st edition, Pearson Publication, 2009.

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Object Oriented Modeling & Design Lab

LAB COURSE OUTLINE

Course Title	Short Title Course Code
Object Oriented Modeling and Design	**OOMD**

Course Description:
The objective of this course is to introduce the students to learn how to understand the requirements of a system, its analysis, its scope, good design and good modeling practices and to document them. Students are being able to discuss the pros and cons of system design and issues in modeling large and complex systems. It explores UML 2.0 Basic and advanced concepts and notation for the same & diagrams for modeling different aspects of a system throughout the SDLC lifecycle.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	02	14	28	01

Total Semester Credits: 01
Prerequisite Course(s): Knowledge of software engineering.

LAB COURSE CONTENT
Outline of Content:
(Note: Minimum Six Experiments out of eight)

To meet above objectives teachers will help students choose a following system for modeling. The students will try and identify scope of such a system as realistically as possible. Students will learn to draw, discuss different UML 2.0 diagrams, concepts, notation, advanced notation, forward and reverse engineering aspects. As far as possible draw as many diagrams for one single system, unless they are not applicable for the chosen system in which case other systems may be chosen for specific diagrams.

1. Design ATM system using Structural and Behavioral UML diagram.
2. Design Coffee vending machine using Structural and Behavioral UML diagram.
3. Design College Admission Process using Structural and Behavioral UML diagram.
4. Design Library Management system using Structural and Behavioral UML diagram.
5. Design Hospital Management system using Structural and Behavioral UML diagram.
6. Design Railway Reservation system using Structural and Behavioral UML diagram.
7. Design Online Shopping system using Structural and Behavioral UML diagram.
8. Design Hotel Management system using Structural and Behavioral UML diagram.

Guidelines for ICA:
Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guide lines for ESE:-

- ESE will be based on the practical assignments submitted by the students in the form of journal.

Reference Books:

1. Pascal Roques, "Modeling Software Systems Using UML 2", Wiley.
2. Russ Miles and Kim Hamilton, "Learning UML 2.0, SPD", O'Reilly.
3. Craig Larman, "Applying UML and patterns: An introduction to Object-Oriented Analysis and Design and Iterative Development", Pearson Education.
4. Mike O'Docherty "Object-Oriented Analysis & design understanding system development with UML 2.0", John Wiley and Sons.
5. Jim Arlow, Ila Neustadt, "UML 2 and the Unified Process: Practical Object-Oriented Analysis and Design", 2nd Edition, Addison-Wesley Professional.
6. Mark Priestley, "Practical Object-Oriented Design with UML", TATA McGraw-Hill.

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Database Management System Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Database Management System	**DBMS**	

Course Description:

The objective of this course is to introduce the students to learn and practice Structure Query Language for creation, Manipulation, controlling database, apply normalization techniques to normalize the database also learn different types of Join, view, PL/SQL, Trigger, Stored Procedure, Stored function and enable them to apply these concepts for solving real world problems.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	02	14	28	01

Total Semester Credits: 01

Prerequisite Course(s): knowledge of Data Structures

LAB COURSE CONTENT

Outline of Content:

(Note: Group A is Mandatory and Minimum Three experiments from Group B.)

GROUP A

1. Creating a sample database using any client server RDBMS (Oracle/ Open Source Database) package using SQL DDL queries. This will include constraints (Primary key, Foreign key, Unique, Not Null, and Check) to be used while creating tables.
2. SQL DML queries: Use of SQL DML queries to retrieve, insert, delete and update the database created in experiment No. 1.
3. SQL Queries: The queries should involve SQL feature such as aggregate functions, group by, having, order by the database created in experiment No. 1.
4. SQL Queries: The queries should involve Set Operations and Set Comparisons the database created in experiment No. 1.
5. Screen design and Report generation: Sample forms and reports should be generated using any front end tools.

GROUP B

1. Write a program to demonstrate different types of JOIN.
2. Write a program to demonstrate use of Trigger.
3. Write a program to demonstrate view.
4. Write a program to demonstrate PL/SQL block.
5. Write a program to demonstrate stored function.
6. Write a program to demonstrate stored procedure.

Guidelines for ICA:
Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guide lines for ESE:-

- ESE will be based on the practical assignments submitted by the students in the form of journal.
- In the ESE, the students may be asked to perform the practical assignment with minor modification.
- Evaluation will be based on the paper work understanding of the logic and the syntax, quality of the program, execution of the program, type of input and output for the program.

Reference Books:

1. Rick F. Van der Lans, "Introduction to SQL", Pearson education.
2. B. Rosenzweig, E. Silvestrova, "Oracle PL/SQL by Example", Pearson education.
3. Steven Feuerstein, "Oracle PL/SQL Programming", SPD, O'Reilly.
4. Dr. P. S. Deshpande, "SQL& PL/SQL for Oracle 10g Black Book", Dreamtech Press
5. M. McLaughlin, "Oracle Database 11g PL/SQL Programming", TMH.
6. J. J. Patrick, "SQL Fundamentals", Pearson Education.

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Web Programming Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Web Programming	**WPL**	

LAB COURSE CONTENT

Teacher should facilitate learning following lab experiments:

(Part A)

1. **Develop a complete web page using HTML basic tags, CSS, Table and Layout**
   - A simple web page that includes basic tags such as head, body, text formatting tags, lists, paragraph, image tags, css, table and layout etc.
2. **Design a page web using JavaScript to demonstrate, if statement, if...else statement and Switch statement**
   - A simple web page that include JavaScript statements such as if, if...else and switch.
3. **Design a page web using JavaScript to demonstrate, Alert box Alert box with line breaks, Confirm box and Prompt box**
   - A simple web page that include JavaScript alert box, alert box with line breaks, confirm box and prompt box.
4. **Design a page web using JavaScript to demonstrate, Call a function ,Function with an argument, Function that returns a value**
   - A simple web page that include JavaScript call a function, function with arguments, function that return a value.
5. **Design a page web using JavaScript to demonstrate, For loop, While loop, Do While loop, Break a loop, Break and continue a loop**
   - A simple web page that include JavaScript for loop, while loop , do while loop, break a loop, break and continue a loop.
6. **Design a page web using JavaScript to demonstrate, Acting to the onclick event, Acting to the onmouseover event, onblur , onchange, ondblclick, onkeydown, onkeypress, onkeyup, onresize, onunload**
   - A simple web page that include JavaScript events like onclick, onmouseover, onblur, onchange, ondblclick, onkeydown, onkeypress, onkeyup, onresize, onunload etc.
7. **Design a page web using JavaScript to demonstrate, Sort an array (alphabetically and ascending), Sort numbers (numerically and ascending), Sort numbers (numerically and descending)**
   - A simple web page that include JavaScript to sort an array alphabetically and ascending, sort numbers numerically and ascending and sort numbers numerically and descending.
8. **Design a page web using PHP to demonstrate, variables, echo/print, data types, string functions and operators**
   - A simple web page that include PHP variables, echo/print, data types, string functions and operators.
9. **Design a page web using PHP to demonstrate, if-else-elseif, switch, for loop, while loop, functions and arrays**
   - A simple web page that include PHP if-else-elseif, switch, for loop, while loop, functions and arrays.
10. **Design a page web using PHP to demonstrate, form handling, form validation and form URL/E-mail**
    - A simple web page that include PHP form handling, form validation and form URL/E-mail**.**

(Part B)

1 **Web server installation and configuration**
   - Installation and configuration of any web server like IIS, Apache, WAMP, XAMP etc.

2 **Design a page web using PHP to demonstrate, date, file, file upload, cookies and sessions**
   - A simple web page that include PHP date, file, file upload, cookies and sessions.

3 **Design a page web using PHP to demonstrate, MySQL connect, create DB/Table, insert into, select, where, order by, update and delete**
   - A simple web page that include PHP MySQL connect, create DB/Table, insert into, select, where, order by, update and delete.

4 **Design a Website with the help of HTML and JavaScript with not less than 15 full size pages for a selected topic (Commercial, Institute, Portal or decided jointly by the student and teacher)**
   - Design a website on the above listed topics with the help of HTML and JavaScript.

5 **Design a Website with the help of HTML and PHP for a selected topic (Banking, Commercial, Institute, Portal or decided jointly by the student and teacher)**
   - Design a website on the above listed topics with the help of HTML and PHP.

Guidelines for ICA:
Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Reference Books:

1. "Web Technologies HTML, JavaScript, PHP, Java, JSP, XML and AJAX", Black Book, Kogent Learning Solutions Inc., dreamtech press, 2014.
2. Chris Bates, "Web Programming: Building Internet Applications", Third Edition, Wiley India, 2012.
3. Jon Duckett, "Beginning HTML, XHTML, CSS, and JavaScript", John Wiley & Sons publication, 2010.
4. Thomas A. Powell, "HTML & CSS: The Complete reference", Fifth edition, TMH 2010.

Note:
- Concerned faculty should conduct at least 07 practical assignments from part A and 03 from part B out of the above list.
- Every assignment should include print out of program with proper comments and output.
- Every student is required to submit the assignments in the form of journal.
- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Minor Project

COURSE CONTENT

Minor Project **MIP**

Course Title Short Title Course Code

Semester-VI

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**10**	**20**	**02**

Examination Scheme
Internal Continuous Assessment (ICA): 50 Marks

- Every student shall undertake the Minor Project in semester VI.
- Each student shall work on an approved project, a group of **05 students (maximum)** shall be allotted for the each minor project.
- Minor project may involve design or investigation of a technical problem that may take design, experimental or analytical character or combine element of these areas. The project work shall involve sufficient work so that students get acquainted with different aspects of design or analysis.
- Each student is required to maintain separate log book for documenting various activities of minor project.
- The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of minor project. Maximum four minor project groups shall be assigned to one teaching staff.
- Assessment of the project for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-A.**
- Before the end of semester, student shall deliver a seminar and submit the seminar report (paper bound copy)in following format:
    - Size of report shall be of minimum 25 pages.
    - Student should preferably refer minimum five reference books / magazines/standard research papers.
    - Format of report
        - Introduction.
        - Literature survey.
        - Theory (Implementation, Methodology, Applications, Advantages, Disadvantages. etc)
        - Future scope.
        - Conclusion.

Assessment of Minor Project

Name of the Project: _____

Name of the Guide: _____

Table-A

SN	Exam Seat No	Name of Student	Project Selection	Documentation	Design /Simulation/Logic	PCB/hardware/programming	Result Verification	Presentation	Total
			5	10	10	10	10	5	50

Seminar-I
COURSE CONTENT

Seminar-I **S-I**
Course Title Short Title Course Code
Semester-VI

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**10**	**20**	**02**

Examination Scheme
Internal Continuous Assessment (ICA): 25 Marks

1. For Seminar-I every student will individually study a topic assigned to him / her and submit a report and shall deliver a short lecture / Seminar on the topic during the term.
2. The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Seminar-I. Seminar shall be related state of the art topic of his choice approved by the committee.
3. Seminar topic should not be repeated and registration of the same shall be done on first come first serve basis.
4. Topic of Seminar shall be registered within a two week from commencement of VI Semester and shall be approved by the committee.
5. Maximum six seminar supervision shall be allotted to each teacher.
6. Before the end of semester, student shall deliver a seminar and submit the seminar report (paper bound copy).

7. **ASSESSMENT OF SEMINAR-I**

Assessment of the Seminar-I for award of ICA marks shall be done by the guide and a departmental committee jointly, as per the guidelines given in **Table- B**

Title of Seminar: _____
Name of Guide: _____

Table-B

SN	Exam Seat No	Name of Student	Topic Selection	Literature survey	Report writing	Depth of understanding	Presentation	Total
			5	5	5	5	5	25

North Maharashtra University, Jalgaon
New Syllabus with effect from Year 2008-09
BE (Information Technology)
Term I

Sr. No	Subject	Teaching Scheme per Week			Examination Scheme				
		L	T	P	Paper Hr.	Paper	TW	PR	OR
1	Elective I	4	-	2	3	100	25	-	25
2	Enterprise Resource Planning	4	-	-	3	100	25	-	-
3	Advanced Unix Programming *	4	-	2	3	100	25	25	-
4	Object Oriented Modeling and Design *	4	-	2	3	100	25	-	25
5	E-Commerce	4	-	-	3	100	-	-	-
6	Seminar	-	-	2	-	-	25	-	-
7	Project I			2		-	25	-	25
	Total	20	0	10		500	150	25	75
	Grand Total	**30**			**750**				

Elective I
1. Operational Research * 2. Embedded Systems *
3. Image Processing *

BE IT
Term II

Sr. No	Subject	Teaching Scheme per Week			Examination Scheme				
		L	T	P	Paper Hr.	Paper	TW	PR	OR
1	Elective II	4	-	2	3	100	25	-	25
2	Data Warehousing and Mining *	4	-	2	3	100	25	-	25
3	Software Metrics and Quality Assurance *	4	-	2	3	100	25	-	25
4	Internet Security	4	-	2	3	100	25	-	-
5	Industrial Visit / Case Study		-			-	25	-	-
6	Project II		-	6	-	-	100	-	50
	Total	16	0	14		400	225		125
	Grand Total	**30**			**750**				

Elective II
1. Artificial Intelligence and Neural Networks 2. Mobile Network *
3. Information Retrieval

* Common subject with BE Computer

NORTH MAHARASHTRA UNIVERSITY, JALGAON

BE (COMPUTER ENGINEERING / IT)
(w.e.f. 2008-09)

TERM – I

Elective – I
Operation Research

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25
Oral: 25

Unit – I **(10 Hrs. 20 Marks)**

Introduction to Operation Research – Modeling in operation research, principles of modeling, Main phases of operation research, scope, role of operation research in decision making, linear programming, model formulation, graphical method, simplex method, advantages of Linear Programming.

Unit – II **(10 Hrs. 20 Marks)**

Dynamic Programming - Introduction ,Basic concepts and applications, characteristics of dynamic programming approach, special techniques of Linear programming, Transportation problems, North – West corner rule, Least cost method, Vogel's approximation method, Balanced and unbalanced problems, Assignment problems, Hungarian method, balanced and unbalanced problems, traveling sales man problem.

Unit – III **(10 Hrs. 20 Marks)**

Project Planning Using PERT/CPM : Phases of project management, construction of network or arrow diagrams, time estimates, earliest expected time, latest allowable time and slack, critical path computations for PERT, calculations on CPM networks various floats for activities, critical path, Difference between CPM and PERT , Project time Vs project cost, use of CPM/PERT in project management.

Unit – IV **(10 Hrs. 20 Marks)**

Replacement Model – Deterministic and probabilistic considerations, Replacement of old equipment by the most efficient by the sudden failure items, failure trees, examples of failure trees, sequencing model Terminology and notations, Principles assumptions, Solution of sequencing problems, Processing of n jobs through two machines, Processing n jobs through three machines, Two jobs through m machines, Processing n jobs through m machines .

Unit – V **(10 Hrs. 20 Marks)**

Decision theory and game theory: Decision trees, classes of decision model, decision under certainty, uncertainty and risk.

Game Theory: Theory concept characteristics, maximum and minimum principles saddle points, dominance, basic concept, terminology of two persons zero sum game, MXZ and ZX games subgames methods, graphical method.

Reference Books:

1. N. D. Vohra, Quantitative Techniques in Management, TMH
2. Taha H. A., Operation Research – An Introduction PHI
3. S. D. Sharma, Operation Research, Kedarnath Ramnath Compay
4. N. G. Nair, Operation Research, Dhanpat Rai
5. Prem kumar Gupta, D. S. Hira, Operation Research, S. Chand & Company
6. L. S. Srinath, PERT and CPM Principles & Applications, EWP

Term work:

Assignment based on:

1. Implementation of Linear Programming Model

2. Implementation of Simplex Method
3. Implementation of Dynamic Programming
4. Implementation of transportation model
5. Implementation of assignment model
6. Implementation of Traveling Sales man problem
7. Implementation of sequencing model
8. Implementation for replacement model
9. Game playing with min / max search
10. Program for decision tree

Any Five Lab Assignment should be framed by concern staff member based on above list.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

BE (COMPUTER ENGINEERING / IT)
(w.e.f. 2008-09)

TERM – I

Elective – I
Embedded Systems

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25
Oral: 25

Unit – I **(10 Hrs. 20 Marks)**

Embedded system Introduction

Introduction to Embedded System, History, Design challenges, optimizing design metrics, time to market, applications of embedded systems and recent trends in embedded systems, embedded design concepts and definitions, memory management, hardware and software design and testing, communication protocols like SPI, SCI, I2C, CAN etc

Unit – II **(10 Hrs. 20 Marks)**

System Architecture

Introduction to ARM core architecture, ARM extension family, instruction set, thumb Instruction set, Pipeline, memory management, Bus architecture, study of on-chip peripherals like I/O ports, timers, counters, interrupts, on-chip ADC, DAC, RTC modules, WDT, PLL, PWM, USB etc.

Unit – III **(10 Hrs. 20 Marks)**

Interfacing and Programming

Basic embedded C programs for on-chip peripherals studied in system architecture. Need of interfacing, interfacing techniques, interfacing of different displays including Graphic LCD (320X240), interfacing of input devices including touch screen etc, interfacing of output devices like thermal printer etc., embedded communication using CAN and Ethernet, RF modules, GSM modem for AT command study etc.

Unit – IV **(10 Hrs. 20 Marks)**

Real time Operating System Concept

Architecture of kernel, task scheduler, ISR, Semaphores, mailbox, message queues, pipes, events, timers, memory management, RTOS services in contrast with traditional OS. Introduction to uCOSII RTOS, study of kernel structure of uCOSII, synchronization in uCOSII, Inter-task communication in uCOSII, memory management in uCOSII, porting of RTOS.

Unit – V **(10 Hrs. 20 Marks)**

Embedded Linux

Introduction to the Linux kernel, Configuring and booting the kernel, the root file system, Root file directories, /bin, /lib etc., Linux file systems, Types of file system: Disk, RAM, Flash, And Network. Some debug techniques- Syslog and strace, GDB, TCP/IP Networking- Network configuration, Device control from user space- Accessing hardware directly, Multi processing on Linux and Inter Process Communication- Linux process model and IPCs, Multithreading using pThreads - Threads vs. Processes and pThreads, Linux and Real-Time- Standard kernel problems and patches.

Reference Books:

1. Rajkamal, “Embedded Sytems “, TMH.
2. David Simon, “Embedded systems software primer”, Pearson
3. Steve Furber, “ARM System-on-Chip Architecture”, Pearson
4. DR.K.V.K.K. Prasad, “Embedded /real time system”, Dreamtech
5. Iyer,Gupta, “Embedded real systems Programming“, TMH

Laboratory exercise

- Integrated Development Environment Overview (Project creation, down load & debug)
- Study of JTAG Debugger/on-board debugger-emulator.
- ARM Instructions execution (Barrel Shifter, LDR/STR, SMT/LDM)

Term Work:

Group - A

1) Writing basic C-programs for I/O operations
2) C-Program to explore timers/counter
3) C-programs for interrupts
4) Program to demonstrate UART operation

Group - B

5) Program to demonstrate I2C Protocol.
6) Program to demonstrate CAN Protocol.

Group - C

7) Program to interface LCD
8) Program to interface Keyboard and display key pressed on LCD
9) Program to interface stepper motor

Group - D

10) Program to demonstrate RF communication
11) Program to implement AT commands and interface of GSM modem
12) Implementation of USB protocol and transferring data to PC.
13) Implementation of algorithm /program for the microcontroller for low power modes.
uCOSII /Embedded Linux RTOS Examples

Group - E

14) Interfacing 4 x 4 matrix keyboards and 16 x 2 character LCD display to microcontroller / microprocessor and writing a program using RTOS for displaying a pressed key.
15) Writing a scheduler / working with using RTOS for 4 tasks with priority. The tasks may be keyboard, LCD, LED etc. and porting it on microcontroller/ microprocessor.

Group - F

16) Implement a semaphore for any given task switching using RTOS on microcontroller board.
17) Create two tasks, which will print some characters on the serial port, Start the scheduler and observe the behavior.

Group – G

18) RTOS based interrupt handling using Embedded Real Time Linux.
19) Program for exploration of (Process creation, Thread creation) using Embedded Real Time Linux.

Group – H

20) Program for exploring Message Queues using Embedded Real Time Linux.
21) Ethernet Based Socket Programming using Embedded Real Time Linux.

Note: 1) At least one practical should be performed from each group.
2) Two practicals should be performed using the JTAG debugger/on-board Debugger-emulator.

Term work will be based on above list.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
BE (COMPUTER ENGINEERING / IT)
(w.e.f. 2008-09)

TERM – I

Elective – I
Image Processing

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hrs./ Week	Theory Paper: 100 Marks (03 Hrs.)
Practical: 2 Hrs./ Week	Term Work: 25
	Oral: 25

Unit – I **(10 Hrs. 20 Marks)**

Introduction - What is digital image processing?, Fundamental steps in digital image processing, A simple Image formation model, Image sampling and quantization , Representing Digital Images, Basic relationship between pixels,

Image Enhancement in the spatial domain: Basic Gray level transformations, Histogram Processing(Equalization, Matching), Basics of spatial filtering, Smoothing spatial filters, Sharpening spatial filters.

Unit – II **(10 Hrs. 20 Marks)**

Image Enhancement in the frequency domain: Fourier Transform and Frequency domain, Filtering in the frequency domain, Basics of filtering in the frequency domain, Basic filters and their properties, Smoothing Frequency domain filters, Sharpening Frequency domain filters, Homomorphic Filtering
Properties of 2 D Fourier Transform, The Convolution and Correlation Theorems

Unit – III **(10 Hrs. 20 Marks)**

Image Restoration: Model Of Image Restoration/ Degradation Process, Noise Models, Restoration in the presence of Noise- Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Filtering Techniques to restore image.

Image Compression- Compression models- Lossy Compression- Lossless Compression.

Unit – IV **(10 Hrs. 20 Marks)**

Color Image Processing : Color Fundamentals, Color Models, Converting Colors from different color models, Gray Level to Color Transformations, Color Transformations, Color Slicing, Color Image Smoothing.

Morphological Image Processing
Basic Concepts, Dilation, Erosion, Thinning, Thickening, Pruning, Gray level Morphology

Unit – V **(10 Hrs. 20 Marks)**

Segmentaion- Edge linking and Boundary detection, Thresholding, Region Based Segmentation, Histogram Analysis,

Application of Image Processing,

Introduction to Content Based Image Retrieval.

Reference Books:

1. R.C. Gonzalez, R.R. Woods, Digital Image Processing Person Education, Pearson Education
2. B. Chanda, D.Datta Mujumdar, “Digital Image Processing And Analysis”, PHI ,
3. William Pratt, “Digital Image Processing”, John Willey & Sons
4. Anil Jain, “Fundamentals Of Digital Image Processing”, PHI

Term work:

1. Develop C/C++ code to create a simple image and save the same as bitmap image in .bmp file.
2. Develop C/C++ code to implement basic gray level transformations(Any One)
3. Develop C/C++ code to perform basic image enhancement operations
4. Develop C/C++ code to implement image histogram processing (Equalization or Matching)
5. Develop C/C++ code to find basic relationship between pixels.(Any One)
6. Develop C/C++ code to implement image compression (any one algorithm)
7. Implement gray scale thresholding to blur an image.
8. Implement C/C++ code to implement an algorithm for edge detection.
9. Implement C/C++ code to implement image morphological operations.(Any One)

The term work will be based on any 5 assignments from above list.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

BE (Information Technology)
(w.e.f. 2008-09)

TERM – I

Enterprise Resource Planning

Teaching Scheme:
Lectures: 4 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25

Unit – I **(10 Hrs. 20 Marks)**

Introduction to ERP, Evolution of ERP, What is ERP? Reasons for the growth of ERP, Scenario and justification of ERP in India, Evaluation of ERP, Various modules of ERP, Advantages of ERP, An overview of Enterprise, Integrated Management of Information, Business Modeling ERP for Small Business, ERP for Make to Order Companies

Unit – II **(10 Hrs. 20 Marks)**

Business Process Mapping for ERP Module Design, Hardware Environment and its selection for ERP implementation, ERP and Related Technologies, Business Process Reengineering (BPR), Management Information Systems (MIS), Executive Information Systems (EIS), Decision Support System (DSS), Supply Chain Management (SCM)

Unit – III **(10 Hrs. 20 Marks)**

ERP Modules: Introduction, Finance, Plant Maintenance, Quality Management, Materials Management, ERP Market: Introduction, SAP AG, Baan Company, Oracle Corporation, People Soft, JD Edwards, World Solutions Company, System Software Associates, Inc. (SSA), QAD, A comparative assessment and selection of ERP packages and modules

Unit – IV **(10 Hrs. 20 Marks)**

ERP Implementation Lifecycle, Issues in implementing ERP packages, Pre-evaluation Screening, Package Evaluation, Project Planning Phase, Gap Analysis, Reengineering, Configuration, Implementation, Team Training, Testing, Going Live, End-user Training, Post-implementation (Maintenance mode)

Unit – V **(10 Hrs. 20 Marks)**

Vendors, Consultants and Users, In-house Implementation – Pros and Cons, Future directions in ERP,

New Markets, New Channels, Faster Implementation Methodologies, Business Models and BAPIs, Convergence on Windows NT, Application platforms, New Business Segments, More features, Web Enabling, Market Snapshots.

Reference Books:

1. S. Sadagopan, "ERP – A Managerial Perspective", Tata McGraw Hill
2. Alexis Leon, "Enterprise Resource Planning", Tata McGraw Hill
3. Vinod Kumar Garg, N.K Venkitakrishna, "ERP Concepts and Practice", PHI
4. Henandez, "The SAP R/3 Handbook", 2nd ED., Tata McGraw Hill

Term Work:

It should contain at least 6 lab assignments covering the above syllabus.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

BE (COMPUTER ENGINEERING / IT)
(w.e.f. 2008-09)

TERM – I

Advanced Unix Programming*

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25
Practical: 25

Unit – I **(10 Hrs. 20 Marks)**

UNIX System Overview – Introduction, UNIX Architecture, Logging In, Files and Directories, Input and Output, Programs and Processes, Error Handling, User Identification, Signals, Time Values, System Calls and Library Functions.

File I/O – Introduction, File Descriptors, open Function, creat Function, close Function, lseek Function, read Function, write Function, I/O Efficiency, File Sharing, Atomic Operations, dup and dup2 Functions, sync, fsync, and fdatasync Functions, fcntl Function, ioctl Function, /dev/fd.

Files and Directories – Introduction, stat, fstat, and lstat Functions, File Types, Set-User-ID and Set-Group-ID, File Access Per missions, Ownership of New Files and Directories, access Function, umask Function, chmod and fchmod Functions, Sticky Bit, chown, fchown, and lchown Functions, File Size, File Truncation, File Systems, link, unlink, remove, and rename Functions, Symbolic Links, symlinkand readlink Functions, File Times, utime Function, mkdirand rmdir Functions, Reading Directories, chdir, fchdir, and getcwd Functions, Device Special Files, Summary of File Access Per mission Bits.

Unit – II **(10 Hrs. 20 Marks)**

System Data Files and Information – Introduction, Password File, Shadow Passwords, Group File, Supplementary Group Ids, Implementation Differences, Other Data Files, Login Accounting, System Identification, Time and Date Routines.

Process Environment – Introduction, main Function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables, setjmp and longjmp Functions, getrlimit and setrlimit Functions.

Process Control – Introduction, Process Identifiers, fork Function, vfork Function, exit Functions, wait and waitpid Functions, waitid Function, wait3 and wait4Functions, Race Conditions, exec Functions, Changing User IDs and Group IDs, Interpreter Files, system Function, Process Accounting, User

Identification, Process Times.

Unit – III **(10 Hrs. 20 Marks)**

Signals – Introduction, Signal Concepts, signal Function, Unreliable Signals, Interrupted System Calls, Reentrant Functions, SIGCLD Semantics, Reliable-Signal Terminology and Semantics, kill and raise Functions, alarm and pause Functions, Signal Sets, sigprocmask Function, sigpending Function, sigaction Function, sigsetjmp and siglongjmp Functions, sigsuspend Function, abort Function, system Function, sleep Function, Job-Control Signals, Additional Features.

Advanced I/O – Introduction, Nonblocking I/O, Record Locking, STREAMS, I/O Multiplexing, 2 poll Function, Asynchronous I/O, readv and writev Functions, readn and written Functions, Memory-Mapped I/O.

Unit – IV **(10 Hrs. 20 Marks)**

Threads – Introduction, Thread Concepts, Thread Identification, Thread Creation, Thread Termination, Thread Synchronization.

Thread Control – Introduction, Thread Limits, hread Attributes, Synchronization Attributes, Reentrancy, Thread-Specific Data, Cancel Options, Threads and Signals, Threads and fork, Threads and I/O.

Daemon Processes – Introduction, Daemon Characteristics, Coding Rules, Error Logging, Single-Instance Daemons, Daemon Conventions, Client-Server Model.

Unit – V **(10 Hrs. 20 Marks)**

Interprocess Communication – Introduction, Pipes, popen and pclose Functions, Coprocesses, FIFOs, XSI IPC, Message Queues, Semaphores, Shared Memory, Client-Server Properties.

Network IPC: Sockets – Introduction, Socket Descriptors, Addressing, Connection Establishment, Data Transfer, Socket Options, Out-of-Band Data, Nonblocking and Asynchronous I/O.

Advanced IPC – Introduction, STREAMS-Based Pipes, Unique Connections, Passing File Descriptors, An Open Server, Version 1, An Open Server, Version 2.

Reference Books:

1. W. Richard Stevens and Stephen A. Rago, Advanced Programming in the UNIX Environment, 2/E, Pearson Education
2.W. Richard Stevens, Unix Network Programming - Interprocess Communications, Volume 2, 2/E, Pearson Education

Term Work:

Concerned staff members should suitably frame the term work (at least 6) based on above syllabus and implementation of Unix commands using library functions as well as implementation of shell scripts.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

BE (COMPUTER ENGINEERING / IT)
(w.e.f. 2008-09)

TERM – I

Object Oriented Modeling and Design

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practicals: 2 Hrs./Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25 Marks
Oral: 25 Marks

Unit – I **(10 Hrs. 20 Marks)**

Review of Object Modeling, New Paradigms, Object Oriented Thinking, UML Concepts: Overview of UML.
UML 2.0 New Features.
Rational Unified Process emphasizing Inception, Elaboration, Construction, Transition Phases. 4+1 View architecture, Architectural approaches: Use case Centric, Architecture driven, Iterative approach, OO Concepts Review.

Unit – II **(10 Hrs. 20 Marks)**

Introduction to UML. UML MetaModel. Extensibility mechanisms like stereotypes, tagged values, constraints and profiles. OCL. Overview of all diagrams in UML 2.0.

Unit – III **(10 Hrs. 20 Marks)**

Object diagrams, CRC method, Review of OO concepts. Class diagrams, Classes and Relationships, Interfaces and ports, Templates, Active Objects, Advanced relationships generalization, association, aggregation, dependencies. Composite structure diagrams including composite structures, collaborations.

Unit – IV **(10 Hrs. 20 Marks)**

Interaction diagrams. Interaction Overview diagrams including interactions, signals, exceptions, regions, partitions, Sequence diagrams, Communication diagrams.
State Machine diagrams, States, encapsulation of states, transitions, submachine, state generalization. Timing diagrams, Activity diagrams, Activities, sub activities, signals, exceptions, partitions, regions.

Unit – V **(10 Hrs. 20 Marks)**

Support for modeling Architecture in UML. Package diagrams, Component diagrams, Deployment diagrams. Applications of UML in embedded systems, Web applications, commercial applications.

Reference Books:

1. Grady Booch, James Rumbaugh, Ivar Jacobson “Unified Modeling Language User Guide”, Addison-Wesley
2. Joseph Schmuller “SAMS Teach yourself UML in 24 Hours”, Third edition.
3. Martin Fowler, “UML Distilled: A Brief Guide to the Standard Object Modeling Language”, Third Edition (Paperback) ,Addision Wesley
4. Dan Pilone, Neil Pitman “UML 2.0 in a Nutshell”, O'Reilly
5. Rambaugh, “Object Oriented Modeling and Designing”. PHI
6. Bouch. “Object Oriented Analysis and Design with Applications”. Addison Wesley.
7. Schah, “Introduction to OOAD with UML and Unified Process”, TMH

Term Work:

Concerned staff members should suitably frame the term work at least 5 assignments based on above

syllabus. Each assignment must consider definition, analysis, design and modeling of a project.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

BE (Information Technology)
(w.e.f. 2008-09)

TERM – I

E-Commerce

Teaching Scheme:
Lectures: 4 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)

Unit – I **(10 Hrs. 20 Marks)**

Overview of electronic commerce- Introduction, Definition of Electronic Commerce, Electronic Business, Potential benefits of electronic commerce, Impact of Electronic Commerce on business model, Overall Business and E-commerce goal congruence, The impact of electronic commerce security, Implications for the Accounting profession.

Unit – II **(10 Hrs. 20 Marks)**

Electronic Commerce and the role of Independent Third parties – Introduction, Consulting practices and Accountants Independence, CPA Vision Project, New assurance services identified by AICPA, The Elliott committee and the Cohen Committee, Impact of electronic commerce on the traditional assurance function, Third party assurance of Web based electronic commerce.

Unit – III **(10 Hrs. 20 Marks)**

EDI, Electronic commerce and the Internet – Introduction, traditional EDI Systems, data transfer and standards, Financial EDI, EDI Systems and the internet, Impact of EDI- Internet applications on the accounting profession. PGP Email, Encryption Software.

Unit – IV **(10 Hrs. 20 Marks)**

Risks of Insecure Systems – Introduction, Internet Associated Risks, Social Engineering, Risk associated with Business transaction data transferred between Trading and Partners. Risk associated with Viruses and malicious code overflows, Implications for the accounting profession. Fire walls security issues, Authentication.

Unit – V **(10 Hrs. 20 Marks)**

Electronic Commerce Payment Mechanism – Introduction, The SET Protocol, Magnetic Strip cards, smart cards, Electronic checks, Electronic cash.

Reference Books:

1. Greenstein, Feinnon, " Electronic Commerce", Tata McGraw Hill Edition
2. Ravi Kalakota, et al, " Electronic Commerce – A Manager's Guide", Addison Wesley Longman.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

BE (Information Technology)
(w.e.f. 2008-09)

TERM – I

Seminar

Teaching Scheme:
Practical: 2 Hrs./ Week

Examination Scheme:
Term Work: 25 Marks

1. For seminar every student will individually study a topic assigned to him / her and submit a report and shall deliver a short lecture / Seminar on the topic at the end of term.
2. Selection of topic should be done by students in consultation with concerned guide
    a. Topic should be related to branch but it should be extended part of the branch (latest and advance topic).
    b. The topic should be such that the student can gain latest knowledge. Student should preferably refer at least one research paper
3. Seminar topic should not be repeated in the department and registration of the same should be done on first come first served basis
4. Seminar report should be submitted in paper bound copy prepared with computer typing
    a. Size of report depends on advancement of topic.
    b. Student should preferably refer minimum 5 reference books / magazines.
    c. Format of content
        i. Introduction.
        ii. Literature survey.
        iii. Theory
            1. Implementation
            2. Methodology
            3. Application
            4. Advantages, Disadvantages.
        iv. Future scope.
        v. Conclusion.
5. ASSESSMENT OF SEMINAR for TERM WORK
    Title of seminar : _____
    Name of guide : _____

Sr. No.	Exam Seat No.	Name of Student	Assessment by examiners					Grand Total
			Topic Selection	Literature Survey	Report Writing	Depth of understanding	Presentation	
			5	5	5	5	5	25

6. Assessment of Literature survey will be based on
    a. collection of material regarding history of the topic,
    b. implementation,
    c. recent applications.

7. Assessment of Depth of understanding will be based on
    a. Questioning by examiners.
    b. Questioning by students.
    c. What the student understands i.e. conclusion regarding seminar.

8. Assessment of presentation will be based on;
    a. Presentation time (10 minutes)
    b. Presentation covered (full or partial)
    c. Way of presentation
    d. Questioning and answering (5 minutes)
9. Examiners should be a panel of two one of them must be guide. Examiner must have experience at least 3 years. Examiners will be appointed by HOD in consultation with Principal.

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BE (Information Technology)
(w.e.f. 2008-09)

TERM – I

Project - I

Teaching Scheme:	**Examination Scheme:**
Practical: 2 Hrs./ Week	Term Work: 25
	Oral: 25

1. Every student individually or in a group (group size is of 3 students. However, if project complexity demands a maximum group size of 4 students, the committee should be convinced about such complexity and scope of the work) shall take a project in the beginning of the (B.E. first Term) seventh term in consultation with the guide and the project must be completed in the (B.E. Second Term) eighth term.

2. The project proposal must be submitted in the institute in the beginning of the (B.E. first Term) seventh term. While submitting project proposal care is to be taken that project will be completed within the available time of two term i.e 2 Hrs per week for (B.E. first Term) seventh term and 4 Hrs per week for (B.E. Second Term) eighth semester (total time become 12*2 + 12*4 = 72 Hrs per project partner). The final title of the project work should be submitted at the beginning of the (B.E. Second Term) eighth semester. .

3. Project title should be precise and clear. Selection and approval of topic:
   Topic should be related to real life or commercial application in the field of Information Technology

   OR

   Investigation of the latest development in a specific field of Information Technology

   OR

   Commercial and Interdisciplinary projects should be encouraged. The examination will be conducted independently in respective departments.

4. The group should maintain a logbook of activities. It should have entries related to the work done, problems faced, solution evolved etc., duly signed by guide.
5. The group is expected to complete details system/problem definition, analysis, design, etc. in (B.E. first Term) seventh term, as a part of term work in the form of a joint report. Project report must be submitted in the prescribed format only. No variation in the format will be accepted.

6. One guide will be assigned at the most three project groups.
7. The guides should regularly monitor the progress of the project work.
8. Assessment of the project for award of term work marks shall be done by the guide and a departmental committee (consisting of minimum two teachers with experience more than three years) as per the guidelines given in the following table.

A) ASSESSMENT OF PROJECT I TERMWORK B.E. FIRST TERM

NAME OF THE PROJECT: _____
NAME OF THE GUIDE: _____

Sr No	Exam Seat No	Name Of Student Marks	Assessment by guide (70%)					Assessment by Departmental committee (30%)			Grand Total	Out of 25 Marks
			Literature survey	Topic Selection	Docum-entation	Attendance	Total	Evaluation (10%)	Pres-ntaion (20%)	Total		
			10	05	15	05	35	05	10	15	50	25

Sign of Guide Sign. of Committee Members Sign. of H. O. D.

9. The guide should be internal examiner for oral examination (If experience is greater than three years).
10. The external examiner should be from the related area of the concerned project. He should have minimum of five years of experience at degree level / industry.
11. The evaluations at final oral examination should be done jointly by the internal and external examiners.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

BE (Information Technology)
(w.e.f. 2008-09)

TERM – II

Elective – II
Artificial Intelligence and Neural Networks

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25
Oral: 25

Unit – I **(10 Hrs. 20 Marks)**

Introduction to Artificial Intelligence:
Definition, AI Problems, AI Technique ,Turing test, Problem as a state space search, production system, water jug problem, Problem characteristics, breadth first search, depth first search, Properties of internal Representation, Heuristic search techniques, Best first search, OR graph, AND-OR graph , A* and AO* Algorithms, Means and ends analysis.

Unit – II **(10 Hrs. 20 Marks)**

Knowledge Representation using Predicate Logic:
Predicate calculus, Predicates and Arguments, ISA hierarchy, Frame notation, Resolution,
Knowledge Representation using Non-monotonic Logic:
TMS (Truth Maintenance System), Knowledge representation, Semantic Net, Frames, Conceptual dependency, Script.

Unit – III **(10 Hrs. 20 Marks)**

Planning:
Types of planning, Block world, strips, Implementation using goal stack, Nonlinear planning with goal stacks, Hierarchical planning, List commitment strategy.
Perception:
Robot architecture, Vision, Representing and recognizing scenes, Constraint determination, Trihedral and Nontrihedral figures labeling, Waltz algorithm.

Unit – IV **(10 Hrs. 20 Marks)**

Introduction to Neural Network:
Biological Neuron, Artificial Neuron, Characteristics of Neural Network, Neural Network Architectures, Learning in Neural Networks, Various learning Methods and Learning Rules, Single layer Perceptron , Applications of Neural Networks for Pattern Recognition, Classification and Clustering.

Unit – V **(10 Hrs. 20 Marks)**

Multilayer and Recurrent Neural Network:
Multilayer Perceptron: - Introduction, different activation functions, Error Back Propagation Algorithm, Introduction and working of counter propagation network .
Introduction to Hopfield/Recurrent Networks, Associative and Bidirectional Associative Memory.

Reference Books:

1. Elaine Rich, K. Knight, “Artificial Intelligence". TMH.
2. Eugene Charniak, Drew McDermott, "Introduction to Artificial Intelligence".
3. J.M.Zurada, “Introduction to Artificial Neural Networks”, Jaico Publishing House.
5. Robert J. Schalkoff, “Artificial Neural Networks”, McGraw-Hill
6. Philip D.Wasserman “Neural Computing:- theory and practice”.
7. Eugene Charniak, Drew McDermott, "Introduction to Artificial Intelligence".

Term Work:

1. Design and Implement Water Jug Problem.
2. Implementation of Unification Algorithm.

3. Implementation of Dynamic database.
4. Implementation of Waltz algorithm.
5. Implementation of single perceptron training algorithm.
6. Application development using Neural Network.
7. Development of Intelligent Perception System.

Any five lab assignments should be framed by concern staff member based on above list.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

BE (Computer Engineering / Information Technology)
(w.e.f. 2008-09)

TERM – II

Elective – II
Mobile Network

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25
Oral: 25

Unit – I **(10 Hrs. 20 Marks)**

Introduction – PCS Architecture, Cellular Telephony, Cordless Telephony and Low-tier PCS, Third Generation wireless system

Mobility Management – Handoff, Inter - BS handoff, Intersystem handoff, Roaming management, Roaming management under SS7 and Roaming management for CT2.

Handoff Management – Detection and Assignments, Handoff detection, Strategies for handoff detection, Mobile controlled handoff, Network controlled handoff, Mobile assisted handoff, Handoff failure, Channel assignment, Non- prioritized scheme and Reserved channel scheme, Queuing priority scheme, Sub rating scheme, Implementation issues, Hard handoff – MCHO link transfer, MAHO/NCHO link transfer, Sub rating MCHO link transfer, Soft handoff – adding new BS, dropping a BS.

Unit – II **(10 Hrs. 20 Marks)**

GSM Overview – GSM Architecture, location tracking and call setup, Security, Data Services – HSCSD, GPRS, Unstructured supplementary service data.
GSM Network Signaling – GSM MAP service frame work, MAP protocol machine, MAP dialogue.
GSM Mobility management – GSM location update, Mobility databases, Failure restoration, VLR Identification algorithm, VLR Overflow control.

Unit – III **(10 Hrs. 20 Marks)**

GSM short message service – SMS architecture, SMS protocol hierarchy, Mobile originated messaging, Mobile terminated Messaging.
International Roaming for GSM – International GSM call setup, Reducing the International call delivery cost
GSM Operations, Administration, and Maintenance – Call recording functions, Performance Measurement and Management, Subscriber and Service data Management.
Mobile number portability – Fixed network number portability, Number portability for Mobile networks, Mobile number portability mechanism.

Unit – IV **(10 Hrs. 20 Marks)**

VoIP Service for mobile networks – GSM on the Net, iGSM wireless VoIP solution, iGSM procedures and Message flows.

General Packet Radio Services – Architecture, Network nodes, Interfaces, Procedures, Billing, Evolving from GSM to GPRS.

Unit – V **(10 Hrs. 20 Marks)**

Wireless Application Protocol – WAP Model, WAP Gateway, WAP Protocol – WDP, WTLS, WTP, WSP, WAE, Mobile station Application execution environment.

Third Generation Mobile Services – Paradigm shifts in 3G Systems, W-CDMA, cdma 2000, Improvements on core network, Quality of service in 3G, Wireless Operating System for 3G Handset.

Paging Systems – Paging Network Architecture, User Access Interface – Telocator Alphanumeric Input Protocol (TAP), Telocator Message Entry Protocol (TME), Intersystem Interface.

Wireless Local Loop – WLL Architecture, WLL technologies.

Reference Books:

1. Yi-Bing Lin and Imrich Chlamtac "Wireless and Mobile Network Architecture", Wiley Publication.
2. Kasera Sumit, Narang Nishit, "3G Networks: Architecture, Protocols and Procedures", TMH

Term Work:

1. Setting up wireless network with and without infrastructure support.
2. Configuring Access Point with bridging mode (Point to Point and Point to Multi Point).
3. Configuring Routing between wired and wireless Networks.
4. Configuring Security in wireless network with and without infrastructure support.
5. At least 3 lab assignments based on above syllabus using any network simulator such as NS2, OPNET, OMNET etc.

Concerned staff members should suitably frame the term work (at least 6) based on above syllabus. Oral will be conducted based on the above syllabus and the term work submitted in the form of journal.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

BE (Information Technology)
(w.e.f. 2008-09)

TERM – II

Elective – II
Information Retrieval

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25
Oral: 25

Unit – I **(10 Hrs. 20 Marks)**

Background: traditional methods, classification systems, classification of documents, cataloguing, types of catalogues, indexing, types of collections, user requirements

Automatic text analysis: Introduction, Generating document representatives – conflation, Indexing, Index term weighting, Probabilistic indexing, Discrimination and/or representation, Automatic keyword classification, Normalization

Unit – II **(10 Hrs. 20 Marks)**

Automatic classification: Introduction, Measures of association, Classification methods, The cluster hypothesis, The use of clustering in information retrieval, Single-link, The appropriateness of stratified hierarchic cluster methods, Single-link and the minimum spanning tree, Implication of classification methods

Unit – III **(10 Hrs. 20 Marks)**

Search strategies: Introduction, Boolean search, Matching functions, Serial search, Cluster

representatives, Cluster-based retrieval, Interactive search formulation, Feedback

Unit – IV **(10 Hrs. 20 Marks)**

Retrieval: user requirements, performance of information systems, manual and automatic methods compared, Retrieval of relevant information in a world-wide web environment, Information retrieval on WWW, advances in searching

Unit – V **(10 Hrs. 20 Marks)**

Retrieval Strategies: Boolean retrieval, Vector space retrieval, Probabilistic retrieval

Reference Books:

1. Korfhage, R.R. "Information Storage and Retrieval", John Wiley & Sons
2. Kowalski, G. "Information retrieval systems: theory and implementation", Kluwer
3. Charles T. Meadow "Text Information Retrieval Systems", Academic Press
4. Salton, G. and McGill, M.J. "Introduction to modern information retrieval", McGraw-Hill
5. Frakes and Baeza-Yates, "Information Retrieval: Data Structures and Algorithms" Prentice-Hall

Term Work:

It should contain at least 6 lab assignments covering the above syllabus.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

BE (COMPUTER ENGINEERING/IT)
(w.e.f. 2008-09)

TERM – II

Data Warehousing and Mining

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25
Oral: 25

Unit – I **(10 Hrs. 20 Marks)**

Evolution of database technology, What is data mining?, Data Mining Applications, Steps in Knowledge Discovery, Architecture of typical data mining System, Data mining- On What kind of data, Data mining Functionalities, Classification of data mining systems, Major Issues in Data Mining.

What is Data Warehouse? Difference between Operational Database systems and Data Warehouse (OLTP and OLAP), Why Separate Data Warehouse?

A Multidimensional Data Model, Schemas for Multidimensional Databases: Stars, Snowflakes, and Fact Constellations. Measures, Concept Hierarchies, OLAP Operations in the Multidimensional Data Model.

Unit – II **(10 Hrs. 20 Marks)**

Data Warehouse Architecture, Process of Data Warehouse design, A Three tier Data Warehouse Architecture., Types Of OLAP servers.

Data Preprocessing: Why Preprocess Data? Data Cleaning Techniques, Data Integration and Transformation, Data Reduction Techniques, Discretization and Concept Hierarchy Generation for numeric and categorical data.

Data mining Primitives, A Data Mining Query Language.

Unit – III **(10 Hrs. 20 Marks)**

Concept Description: What is Concept Description? Data Generalization and Summarization-Based Characterization, Attribute Oriented Induction, Analytical Characterization: Attribute Relevance Analysis, Methods, Mining Descriptive Statistical Measures in Large Databases.

Mining Association Rules: Association Rule Mining, Market Basket Analysis, Association Rule classification, Mining Single-Dimensional Boolean Association Rules from Transactional Databases,

The Apriori Algorithm, Mining Multilevel Association Rules, Constraint-Based Association Mining.

Unit – IV **(10 Hrs. 20 Marks)**

Classification and Prediction: What is Classification and Prediction? Data Classification Process, Issues Regarding Classification and Prediction., Classification by Decision Tree Induction, Bayesian Classification, , Classification by Back propagation, A Multilayer Feed Forward Neural Network, Classification Based on Association Rule Mining, Other Classification Methods

Cluster Analysis: What is Cluster Analysis? Types of Data in Cluster Analysis, A Categorization of Clustering Methods, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Model Based Clustering Methods.

Unit – V **(10 Hrs. 20 Marks)**

Cluster Analysis: What is Cluster Analysis? Types of Data in Cluster Analysis, A Categorization of Clustering Methods, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Model Based Clustering Methods

Mining Complex Types Of Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Mining Multimedia Databases, Mining Text Databases, Mining the World Wide Web.

Reference Books:

1. Han and Kamber, “Data Mining: Concepts and Techniques”, Morgan Kaufmann Publishers
2. Alex and Berson, “Data warehousing, Data Mining and OLAP”, TATA McGraw Hill

Term Work:

1. Develop a application to construct a multidimensional data model (Star, Snowflake or Fact constellations)
2. Develop a application to perform OLAP operations.
3. Develop a application to implement data preprocessing techniques.
4. Develop a application to implement data integration techniques.
5. Develop a application to implement data generalization and summarization techniques
6. Develop a application to extract association mining rules.
7. Develop a application for classification of data.
8. Develop a application for implementing one of the clustering technique.
9. Study of commercial data mining tools.

Any 6 laboratory assignments should be framed by concern staff member based on above list.

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(w.e.f. 2008-09)

TERM – II

Software Metrics and Quality Assurance

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25
Oral: 25

Unit – I **(10 Hrs. 20 Marks)**

Software Measurements: Measurement in Software Engineering, Scope of Software Matrices, The representational theory of measurements, Measurement and Models, Measurements Scales and scale types, Meaningfulness in measurement, Classifying software measures, Applying the framework, Software measurement validation.

Unit – II **(10 Hrs. 20 Marks)**

Measuring internal product attributes: Size- Aspects of software size, Length, Reuse, Functionality, Complexity.

Measuring internal product attributes: Structure- Types of structural measures, Control-flow structure, Modularity and information flow attributes, Data structure, Difficulties with general "complexity" measures.

Measuring internal product attributes: Modeling software quality, Measuring aspects of quality.

Unit – III **(10 Hrs. 20 Marks)**

Software Reliability: Basics of reliability theory, software reliability problem, parametric reliability growth models, predictive accuracy, importance of operational environment.

Good estimates, cost estimation: problems and approaches, models of effort and cost, problem with existing modeling methods, dealing with problems of current estimation methods, implication for process predictions.

Unit – IV **(10 Hrs. 20 Marks)**

Software documentation, Standards, Practices, Conventions and metrics, The software inspection process, The walkthrough process, Audit process, Document verification, The ISO 9000 Quality Standards, Comparison of the ISO 9000 model with SEI's CMM.

Unit – V **(10 Hrs. 20 Marks)**

Cleanroom Software Engineering: The cleanroom approach, Functional Specification, Cleanroom design, Cleanroom testing.

Reengineering: Business process reengineering, Software reengineering, Reverse reengineering, Reconstructing, Forward engineering, The economics of reengineering.

Reference Books:

1. Flanton, Pfleeger, "Software Metrics- A Rigorous and Practical Approach", Thompson Learning
2. Mordechai Ben-menachem/Garry S.Marliss, "Software Quality", Thompson Learning
3. Roger S. Pressman, "Software Engineering- A Practitioner's Approach", TMH
4. Swapna Kishore and Rajesh Naik, "ISO 9001:2000 for Software Organizations", TMH

Term Work:

Concerned staff members should suitably frame the term work at least 5 assignments based on above syllabus.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

BE (Information Technology)
(w.e.f. 2008-09)

TERM – II

Internet Security

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25

Unit – I **(10 Hrs. 20 Marks)**

Security Basics – Define information security as process. Anti virus Software, Accesses controls, smart cards, biometrics, intrusion detection, policy management Encryption, physical security mechanism. Type of attacks – assess attacks modification attacks, Denial of services attacks repudiation attacks.

Unit – II **(10 Hrs. 20 Marks)**

Hackers techniques – Hackers motivations, historical hacking techniques, advanced techniques. Identification – Malicious code, Method of untargeted hackers, Methods of targeted hacker. Information security services, confidentiality, integrity, availability, accountability, Understanding of laws of India and U.S. Understanding privacy, civil issues.

Unit – III **(10 Hrs. 20 Marks)**

Policy- importance various policies, creating policy, Deploy policy, using effectively policy. Management Risk – risk, identification of risk , measure risk

Information security Process. Conduct an assessment, develop policy, implementation of security conduct training and audit.

Unit – IV **(10 Hrs. 20 Marks)**

Information security, Best practices administrative, technical security university, make use of ISO 17799. Firewalls – types configuration, Rule set. Encryption- private key, public key, digital signature, understand key management, trust in system, Intrusion detection.

Unit – V **(10 Hrs. 20 Marks)**

Unix security issues, setup a system. User management system management, Windows 2000/windows2003 server issues set up system, manage users ,manage the system, use active directory.

Reference Books:

1. Roberta Bragg, Mark Rhodes, Keith Strassberg, “Network Security- The complete Reference”, TMH
2. Eric Maiwald , “Network security a Beginner’s guide”
3. Basics of n/w security, firewalls and VPN , PHI
4. Tanenbaum, “Computer Networks”, PHI

Term Work:

Any five lab assignments should be framed by concern staff member based on above syllabus.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

BE (Information Technology)
(w.e.f. 2008-09)

TERM – II

Industrial Visit / Case Study

Teaching Scheme: -

Examination Scheme:
Term Work: 25

EDUCATION TOUR / TECHNICAL VISITS / CASE STUDY AND ITS EVALUATION

1. During (B.E. First Term / Second Term) seventh and / or eighth terms or during vacation between (B.E. First Term / Second Term) seventh and eighth terms, every student; shall visit minimum two industries, factories arranged by colleges and accompanied by teachers. There shall be at least one teacher for a group of 20 students and at least one non-teaching staff accompanied with the students.

2. The colleges should obtain appropriate certificates of visit from the concerned organizations just after the visits.

3. Students should submit written report about the visits individually at the end of (B.E. Second Term) eighth term.

4. The report should contain information about the following points:

   (a) The organization - activities of organization and administrative setup technical personnel and their main duties.
   (b) The project / industry brief description with sketches and salient technical information.
   (c) The work / processes observed with specification of materials, products, equipments etc. and role of engineers in that organization.
   (d) Suggestions (if any) for improvement in the working of those organizations.

5. The evaluation of the report of technical visits will be made by panel of two teachers appointed by principal based on following points:

   (a) Coverage aspect: All above points should be covered.
   (b) Detailed observations: System / Process / Product explained with data, diagram specifications.
   (c) Quality of presentation: Report should be very objective and should consist of clear and systematic organization of topics and information.
   (d) Viva - voce: A viva -voce shall be conducted on the technical visit report by the teachers to assess the specific knowledge gained by the students for technical applications.

6. The case study should include the study problem in Computer Engineering branch.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

BE (Information Technology)
(w.e.f. 2008-09)

TERM – II

Project - II

Teaching Scheme:	**Examination Scheme:**
Practical: 6 Hrs./ Week	Term Work: 100
	Oral: 50

1. The Project group in (B.E. first Term) seventh term will continue the project work in (B.E. Second Term) eighth term and complete project.
2. The group should maintain a logbook of activities. It should have entries related to the work done, problems faced, solution evolved etc., duly signed by guide.
3. The guides should regularly monitor the progress of the project work.
4. The project work along with project report should be submitted as part of term work in (B.E. Second Term) eighth term on or before the last day of the (B.E. Second Term) eighth term.
5. Project report must be submitted in the prescribed format only. No variation in the format will be accepted.
6. Assessment of the project for award of TW marks shall be done by the guide and a departmental committee (consisting of minimum two teachers with experience more than three years) as per the guidelines given in the following table.

B) ASSESSMENT OF PROJECT II TERMWORK (B.E. SECOND TERM)

NAME OF THE PROJECT: _____
NAME OF THE GUIDE: _____

Sr. No	Exam. Seat No	Name Of Students Marks	Assessment by guide (70%)						Assessment by department (30%)			Grand Total
			Fabrication /software / actual work	Execution of project	Project report	Scope/ Cost / Utility	Attende-nece	Total	Evaluation (10%)	Prese-ntaion (20%)	Total	
			20	10	20	10	10	70	10	20	30	100

Sign of Guide Sign. of Committee Members Sign. of H. O. D.

7. The guide should be internal examiner for oral examination (If experience is greater than three years).
8. The external examiner should be from the related area of the concerned project. He should have minimum of five years of experience at degree level / industry.
9. The evaluation at final oral examination should be done jointly by the internal and external examiners.
10. The Project work should be kept in department for one academic year after University Examination.

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Second Year Engineering

(Mechanical Engineering)

Faculty of Engineering and Technology

COURSE OUTLINE

SEMESTER – III

W.E.F 2013 – 2014

SE Semester - III

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
		Theory		PR	Total						
		TH Hr/W	Tut Hr/W	PR Hr/W	Total	ISE	ESE	ICA	ESE	Total	
Fluid Mechanics	D	3	1	---	4	20	80	---	---	100	4
Engineering Thermodynamics	B	3	---	---	3	20	80	---	---	100	3
Strength of Materials	D	3	1	---	4	20	80	---	---	100	4
Material Science and Metallurgy	D	3	---	---	3	20	80	---	---	100	3
Manufacturing Engineering -I	D	3	---	---	3	20	80	---	---	100	3
Soft Skills - III	C	1	---	2	3	---	---	50	---	50	2
Engineering thermodynamics-Lab.	B	---	---	2	2	---	---	50	---	50	1
Fluid Mechanics Lab.	D	---	---	2	2	---	---	25	25	50	1
Material Science and Metallurgy Lab.	D	---	---	2	2	---	---	25	25	50	1
Workshop Practice -III	D	---	---	2	2	---	---	25	25	50	1
Total		16	2	10	28	100	400	175	75	750	23

ISE: Internal Sessional Examination **ESE:** End Semester Examination **ICA:** Internal Continuous Assessment

SE Semester - IV

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
		Theory		PR	Total						
		TH Hr/W	Tut Hr/W	PR Hr/W	Total	ISE	ESE	ICA	ESE	Total	
Engineering Mathemathics -III	A	3	1	---	4	20	80	---	---	100	4
Theory of Machines -I	D	3	---	---	3	20	80	---	---	100	3
Applied Thermodynamics	D	3	1	---	4	20	80	---	---	100	4
Basic Electrical Drives and Controls	D	3	---	---	3	20	80	---	---	100	3
Manufacturing Engineering -II	D	3	---	---	3	20	80	---	---	100	3
Machine Drawing Lab.	B	1	---	2	3	---	---	50	---	50	2
Basic Electrical Drives and Controls Lab.	D	---	---	2	2	---	---	50	---	50	1
Applied Thermodynamics Lab.	D	---	---	2	2	---	---	25	25	50	1
Theory of Machines -I Lab	D	---	---	2	2	---	---	25	25	50	1
Workshop Practice- IV	D	---	---	2	2	---	---	25	25	50	1
Total		16	2	10	28	100	400	175	75	750	23

ISE: Internal Sessional Examination **ESE:** End Semester Examination **ICA:** Internal Continuous Assessment

Course Outline

Fluid Mechanics	**FM**
Course Title:	Short Title Course Code
Branch - Mechanical / Automobile Engineering	**Year – Second Year**

Course Description: This course introduces undergraduate students to Fluid Mechanics. The background required includes a sound knowledge of Mathematics (Calculus), Engineering Mechanics and Physics of first year Level. The course aims at imparting knowledge of Fluid properties and analysis of forces inside the fluid.

Teaching Scheme:

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	3	14	42	4
Tutorial	1	14	14	

Examination scheme:

End semester exam (ESE)	80 Marks	Duration : 03 hours
Internal Sessional exam (ISE)	20 Marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Mathematics (Calculus) and Engineering Mechanics at first year level.

Outline of Content: This course contains:

UNIT-1

1.	Fluid properties & Hydrostatic	No. of Lectures – 12, Marks: 16
	a	Fluid properties & its definitions, definition of fluid, Viscosity, Bulk modulus of elasticity, Vapour pressure, Surface tension, Capillarity, Manometers (No numerical on manometers)
	b	Pascal's law, Hydrostatic law its derivation
	c	Total pressure & Centre of pressure on vertical, horizontal, inclined, curved surface its derivation
	d	Concept Of buoyancy & flotation Meta centre, metacentric height its derivation. Stability, unstability, equilibrium of floating & submerged body

UNIT-2

2.	FLUID KINEMATICS AND DYNAMICS	No. of Lectures – 08, Marks: 16
	a	Types of flow, Definition of steady, Unsteady, Uniform, Non uniform, Laminar, Turbulent, Compressible, incompressible, rotational, Irrotational flow, 1D-2D flows, Stream line, Streak line, Path line, concept of Velocity, potential & stream function flow net (no numerical treatment)
	b	Continuity equation for steady, Unsteady, Uniform, Non uniform, Compressible incompressible,2D Euler's equation, Bernoulli's equation along a stream line for incompressible flow
	c	Practical applications of Bernoulli's equation - Pitot tube, Venturi meter, Orifice meter.

UNIT-3

3.	VISCOUS AND BOUNDARY LAYER FLOW	No. of Lectures – 08, Marks: 16
	a	Introduction to flow of viscous fluid through circular pipes, two parallel plates derivation
	b	kinetic and momentum energy correction factor (only theory no numerical)
	c	Power absorbed in viscous flow, viscous resistance to journal bearing, footstep bearing, collar bearing.
	d	Introduction to boundary layer flow, laminar and turbulent boundary layer, laminar sub layer, boundary layer thickness, displacement thickness, momentum thickness, separation of boundary layer. (No numerical treatment)

UNIT-4

4.	Dimensional analysis and Flow through Pipes **No. of Lectures – 07, Marks: 16**	
	a	Introduction to dimensional analysis, dimensional homogeneity, methods of dimensional analysis- Rayleigh's method, Buckingham's π-theorem, dimensionless numbers. (No numerical treatment)
	b	Loss of energy in pipes, loss of energy due to friction, minor energy losses, concept of HGL and TEL, flow through syphon, flow trough pipes in series or compound pipes, equivalent pipe, parallel pipes, branched pipes.
	c	Power transmission through pipes. Water hammer phenomenon (No numerical on water hammer)

UNIT-5

5.	**CENTRIFUGAL AND RECIPROCATING PUMP** **No. of Lectures – 07, Marks: 16**	
	a	Introduction to main parts of centrifugal pump, working & construction of centrifugal pump, types of impellers, types of casings, priming.
	b	Work done on centrifugal pump, various heads and efficiencies of centrifugal pump, minimum starting speed of a centrifugal pump, multistage centrifugal pump, principles of similarity applied to centrifugal pump.
	d	Specific speed, NPSH, cavitations in pumps.
	e	Introduction to main parts of Reciprocating pump, construction & working of Reciprocating pump, classification of Reciprocating pump, slip of reciprocating pump, air vessels. (No numerical on Reciprocating pump)

References

1. Introduction to Fluid Mechanics and Fluid Machines, S.K. Som and G. Biswas, Tata McGraw Hill Education Publishing Company Limited, 2007.
2. Fluid Mechanics, F.M. White, McGraw-Hill, 2005.
3. Fluid mechanics and Hydraulic machines, Dr. R. K. Bansal , Laxmi Publication, Delhi, 2005
4. Fluid Mechanics and Machines, Kotharduraon and Rudramoorthy, New Age Internationals, 2007
5. Hydraulics And Fluid Mechanics Including Hydraulics Machines, Dr. P.N.Modi , Dr. S.M. Seth, Standard Book House / Rajsons Publications p ltd, Delhi, 2011.
6. Fluid Mechanics, Mohanty A.K., Prentice Hall of India, 2005.
7. Fluid Mechanics, Streeter, Tata McGraw Hill (SI).
8. Fluid Mechanics and Hydraulic Machines, S C Gupta, Pearson Publication.

Course Outline

Engineering Thermodynamics	**ET**	
Course Title	Short Title	Course Code

Mechanical / Automobile Engineering	**Second Year**	**Second**
Branch	Year	Semester

Course Description:

The course aims at imparting knowledge of basic Thermodynamics. The background required includes a sound knowledge of Mathematics (Calculus), Physics and Chemistry at Higher Secondary Level. The objectives of the course are to understand thermodynamics concepts, its laws, and their applications and gas/vapor processes.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	3	14	42	3

Examination scheme:

End semester exam (ESE)	80 Marks	Duration : 03 hours
Internal Sessional exam (ISE)	20 Marks	20 Marks

Prerequisite Course(s): Fundamental knowledge of Physics, Chemistry and Engineering Mathematics.

Outline of Content: This course contains:

1	**Introduction to Engineering Thermodynamics No. of Lectures – 9, Marks: 16**	
	a	Scope and applications of thermodynamics, System, surroundings, boundary, control volume, types of system, unit and dimensions.
	b	Macroscopic and Microscopic view point, Thermodynamic Properties, Path function, Point function,
	c	State and Equilibrium, Process, Cycle, Quasi-static process and its significance.
	d	Energy, Flow Energy, Potential energy, Kinetic energy, Heat transfer, sign convention. Numerical.
	e	Work transfer, shaft work, displacement work, power. Numerical.
	f	Zeroth law of thermodynamics, temperature, temperature scales
	g	Numerical on temperature measurement.
	h	Pressure, Absolute and gauge pressure, simple manometer, Bourdon's pressure gauge.
2	**First Law of Thermodynamics No. of Lectures – 8, Marks: 16**	
	a	Joule's experiment, internal energy as a property, 1^{st} law of thermodynamics
	b	First Law applied to closed system undergoing a process/ a cycle, PMM-I
	c	Numerical on application of 1^{st} law to closed system.
	d	Enthalpy and internal energy of an ideal gas, specific heat, Cv and Cp.
	e	Principles of conservation of mass and energy, steady state steady flow process, continuity equation.
	f	Steady flow energy equation (SFEE), applications of SFEE.
	g	Significance of $-\int vdP$, relation between $\int Pdv$ and $-\int vdP$,
	h	Numerical on application of 1^{st} law to steady flow systems.
3	**Second Law of Thermodynamics No. of Lectures – 8, Marks: 16**	
	a	Limitations of First Law, thermal reservoir, heat engine & its efficiency, Refrigerator and Heat pump, Coefficient of Performance.
	b	Statements of second law, Equivalence of statements of second law, PMM-II
	c	Numerical on application of 2^{nd} law.
	d	Reversibility and Irreversibility, Causes of irreversibility, Carnot cycle, Reversed Carnot cycle, their analysis.
	e	Carnot theorem, Absolute temperature scale
	f	Numerical on Carnot cycle, Carnot theorem and temperature scales.
	g	Entropy – Introduction, Law for two isentropic path, Entropy as property,

		Clausius theorem. (No numerical)
	h	Clausius statement, Clausius inequality, Entropy principle
4	**Properties of Ideal Gases** **No. of Lectures – 8, Marks: 16**	
	a	Ideal gas, Laws for an ideal gas, Equation of state, Universal gas constant Characteristic gas constant, Relation between Cp, Cv and R.
	b	Numerical on above syllabus.
	c	Ideal Gas Processes, their presentation on p-v, T-S plane, Analysis for Heat transfer, Work transfer, change in Internal Energy, enthalpy and Entropy – Isobaric, Isochoric and Isothermal processes.
	d	Numerical on above gas processes.
	e	Reversible Adiabatic process, presentation on p-v, T-S plane, Analysis for Heat transfer, Work transfer, and change in Internal Energy, enthalpy and Entropy.
	f	Reversible Polytropic process, presentation on p-v, T-S plane, Analysis for Heat transfer, Work transfer, and change in Internal Energy, enthalpy and Entropy.
	g	Numerical on above gas processes.
	h	Numerical on cyclic gas processes.
5	**Properties of Steam** **No. of Lectures – 8, Marks: 16**	
	a	Pure substance, Phases of pure substances, Phase change diagrams (p-v, p-T, T-s) for water substance at standard atmospheric pressure, sensible heat and latent heat of steam.
	b	Terminology: dry, superheated, wet steam, saturation temperature, critical point and triple point, use of steam table.
	c	Numerical using steam table.
	d	Numerical using Mollier diagram.
	e	Measurement of dryness fraction by using separating and throttling calorimeter. Numerical.
	f	Vapor processes- sketch on P-V, T-S, H-S diagrams, analysis for property changes, heat and work transfer.
	g	Numerical on steam processes
	h	Numerical on steam processes

References:

1	Engineering thermodynamics, P K Nag; Tata McGraw Hill.
2	Thermodynamics, C P Arora;Tata McGraw Hill.
3	Fundamentals of classical thermodynamics, G J Van Wylen, Richard E Sonntag; Wiley.
4	Engineering thermodynamics, Y V C Rao; Universities Press.
5	Engineering thermodynamics, J B Jones and R E Dugan; PHI.
6	Thermodynamics, 6th Edition, Yunus Cengel and M A Boles; Tata McGraw Hill.
7	Basic Engineering Thermodynamics, A. Venkatesh; Universities Press.
8	Basic Thermodynamics" by Dr. Ganesan, Tata McGraw Hill.

Course Outline

Strength of material **SOM**

Course Title: Short Title Course Code

Branch - Mechanical / Automobile Engineering **Year – Second Year**

Course Description: This course introduces undergraduate students to Strength of material. The background required includes a sound knowledge of Mathematics (Calculus), Engineering Mechanics and Physics of first year Level. The course aims at imparting knowledge of strength of materials.

Teaching Scheme:

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	3	14	42	4
Tutorial	1	14	14	

Examination scheme:

End semester exam (ESE)	80 Marks	Duration : 03 hours
Internal Sessional exam (ISE)	20 Marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Mathematics (Calculus) and Engineering Mechanics at First year level.

Outline of Content: This course contains:

UNIT-1

1.	Introduction to Strength of material	No. of Lectures – 12, Marks: 16
	a	Concept of stress and strain (linear, lateral, shear and volumetric),Hook's law, Poisson's ra modulus of elasticity, modulus of rigidity, stress-strain diagram for ductile and brittle materials, factor of safety and working stress, concept of 3-D stress state, bulk modulus, in relation Between elastic modulus.
	b	Axial force diagram, stress-strain, deformations in determinate homogeneous and composite bars of following types. 1) Prismatic 2) Linearly varying 3) Stepped section under concentrated loads and self-weights.
	c	Axial stresses and strain in determinate members –axial stress, strain and deformation in following indeterminate, homogeneous and composite bars. 1) Prismatic 2) Linearly varying 3) Stepped section under concentrated loads, self-weights.
	d	Temperature stresses & strain for Prismatic, Linearly varying & composite bars

UNIT-2

2.	PRINCIPLE STRESSES AND STRAINS	No. of Lectures – 08, Marks: 16
	a	Introduction to Normal and shear stress on any oblique plane, concept of principle plane.
	b	Derivation of expression for principle stresses and planes and plane of max. Shear stress, position of principle plane and plane of max. Shear,
	c	Graphical solution using Mohr's circle of stresses.
	d	Combined effect of shear and bending in beams.
	e	Strain energy and impact-concept of stain energy, derivation and use of expression for deformation of axially loaded members under gradual, sudden and impact loads. Strain energy due to self-weight.

UNIT-3

3.	SHEAR FORCE AND BENDING MOMENT DIAGRAM No. of Lectures – 07, Marks: 16	
	a	Introduction to different types of beams, different types of supports & loads.
	b	Concept and definition of shear force and bending moment in determinant beams due to concentrated loads, UDL, UVL and couple.
	c	Relation between SF, BM and intensity of loading, construction of shear force and bending moment diagram for cantilever, simple and compound beams, defining critical and maximum value and position of point of contra flexure.
	d	Construction of BMD and load diagram from SFD, Construction of load diagram and SFD from BMD.

UNIT-4

4.	BENDING STRESSES No. of Lectures – 07, Marks: 16	
	a	Theory of simple bending, assumptions in bending theory, Derivation of flexural formula
	b	Area center and moment of inertia of common cross section (regular section, T-section, channel section, I-section) with respect to centroidal and parallel axis, bending stress distribution diagram, moment of resistance and section modulus calculations.
	c	Direct and bending stresses in short column with eccentric point loads, concept of core section, middle third rule.
	d	Shear stresses: - Concept, derivation of shear stress distribution formula, shear stress distribution diagram for common cross section, maximum and average shear stresses, shear connection between flange and web.

UNIT-5

5.	TORSION IN CIRCULAR SHAFTS No. of Lectures – 08, Marks: 16	
	a	Stresses, strains and deformations in solid and hollow shafts, homogeneous and composite circular cross-sections subjected to torsion.
	b	Derivation of torsion equation. Stress due to combined torsion, bending and axial force on shafts.
	c	Thin and thick walled pressure vessels: - Stress, strain and deformation in thin wall seamless cylindrical and spherical vessel due to internal fluid pressure, change in volume, constants, effects of additional compressible and incompressible fluid injected under pressure.

REFERENCES

1) Timoshenko, Mechanics of Materials, CBS Publisher &Distributor.
2) Ramamruthum, Strengths of Materials, Dhanpat Rai Publication.
3) Junnarkar & Advi, Mechanics of Structure, Charorar Publication House, ANAND.
4) Bear &Johnson, Mechanics of Materials.
5) Shigley J.E., Mechanical Engineering Design.

Course Outline

Material Science and Metallurgy **MSM**

Course Title Short Title Course Code

Branch - Mechanical / Automobile Engineering **Year – Second Year**

Course Description:

This course provides the introduction of the fundamentals of Material Science and Metallurgy to undergraduate students. The objective of the course is to understand the basic principles of material science and metallurgy. It includes mechanical testing to determine mechanical properties. It also includes various heat treatments, introduction of furnaces and various engineering materials and their applications.

Teaching Scheme:

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	3	14	42	3

Examination scheme:

End semester exam (ESE)	80 Marks	Duration : 03 hours
Internal Sessional exam (ISE)	20 Marks	

Prerequisite Course(s): Fundamental knowledge of Engineering Chemistry and Physics

Outline of Content: This course contains:

1 Nature of Metals and Alloys No of Lect – 8, Marks: 16

a Relationship between Structure-Property-Processing-Performance. Elastic and plastic deformation and its mechanism i.e. slip and twinning.

b Relation of crystal structure with plastic deformation i.e. effects of BCC,FCC or HCP structure on plastic deformation.

c Dislocation theory of slippage, strain hardening.

d Crystal defects and their effects on plastic deformation i.e. description of point, line and surface defects.

e Plastic deformation in polycrystalline metals.

f Cold working- recovery, recrystllisation, grain growth and hot working.

g Strengthening mechanisms in metals - solid solution strengthening, Strain hardening.

h Dispersion and precipitation hardening, phase transformation.

2 Properties of Metals and Testing No of Lect – 8, Marks: 16

a Tension test, engineering and true stress-strain curves, evaluation of properties, ductility, brittleness and toughness.

b Types of engineering stress-strain curve, compression test.

c Hardness testings- Brinell hardness Test, Poldi hardness Test, Rockwell hardness Test , Vickers hardness Test.

d Durometers, microhardness. Relation among the various hardness test and hardness to tensile strength.

e Impact test- charpy and izod impact test.

f Fatigue and creep test.

g Non-destructive test of metals-dye penetrant test, magnetic particle test.

h Ultrasonic testing, radiography and eddy current testing.

3 Ferrous Metals and its Alloys No of Lect – 8, Marks: 16

a Iron, allotropy, cooling curves and volume changes of iron.

b Iron-carbon equilibrium dig., critical temperatures, various phase reactions, solubility of carbon in iron.

	c	Microstructures of slowly cooled steels.
	d	Non - equilibrium of cooling of steels.
	e	Cast Irons- types like gray cast iron, nodular cast iron.
	f	Austempered cast iron, white cast iron, malleable C .I .
	g	Effects of various parameters on structure and properties of C.I. like carbon equivalent, cooling rate during eutectic reaction and alloying additions.
	h	Properties, compositions, applications and specifications of C.I.

4 Heat Treatments No of Lect – 8, Marks: 16

	a	Introduction and principles of heat treatment of steels, processing heat treatments for steels like full annealing, normalizing, process and stress relief anneal, spheroidization. Heat treatments for non-ferrous metals.
	b	Strengthening heat treatments for steels, isothermal transformation diagram.
	c	Tempering of martensite, continuous cooling transformations.
	d	Jominy test for hardenability and its considerations. Quench media, austempering and martempering.
	e	Surface hardening of steels- flame, induction , laser and electron beam hardening
	f	Pack, gas and liquid carburizing, nitriding ionnitriding.
	g	Heat treatment furnaces and atmospheres, classification of furnaces.
	h	Heat treatment and energy and controlled atmospheres.

5 Alloy Steels and Advanced Materials No of Lect – 8, Marks: 16

	a	Alloy steels – Limitation of plain carbon steels, effects of major alloying elements in steels.
	b	Classification of alloying elements, examples of alloy steels.
	c	Stainless steels –classification ,heat treatment of stainless steels.
	d	Tool steels-classification, cold work and hot work tool steels.
	e	High speed tool steels , heat treatment of high speed tool steel, special purpose tool steels.
	f	Introduction of Advanced materials- types and properties of composite materials.
	g	High temperature materials.
	h	Engineering ceramics.

Reference Books:

1. Degarmo's "Materials and processes in manufacturing", by J.T. Black,Ronald A. Kosher, Willey student edition.
2. "Material Science and Metallurgy for Engineers", by V.D.Kodgire, Everest Publishing House. Pune
3. "Introduction to Engineering Materials", by B. K. Agrawal, Tata Mcgraw Hill, New Delhi.
4. "An Introduction to Physical Metallurgy", by S.H. Avner, Tata Mcgraw Hill, New Delhi.
5. "Fundamentals of modern manufacturing materials, processesand systems" , by Mikell P. Groover, Wiley student edition, New Delhi.
6. "Material Science and Metallurgy", by Parashivamurthy K. I., Pearson Publication
7. "Material Science and Metallurgy", by U. C. Jindal, Pearson Publication
8. "Introduction to Materials Science for Engineers", by James F. Shackleford & Madanapalli K. Muralidhara, Pearson Publication
9. "A textbook of Material Science and Metallurgy", by O. P. Khanna, Dhanpat Rai Publication
10. "Metallurgy", by A.S.Gholap and Dr. M.S. Kulkarni, "Nirali Prakashan.

Course Outline

Manufacturing Engineering-I **ME-I**
Course Title Short Title Course Code

Branch - Mechanical / Automobile Engineering **Year – Second Year**

Course Description:
This course provides the basic knowledge of manufacturing processes. Course includes fundamentals of casting processes, Metal forming processes, Welding and joining processes, Metal removing processes, Powder metallurgy.

Teaching Scheme:

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	3	14	40	3

Examination scheme:

End semester exam (ESE)	80 Marks	Duration : 03 hours
Internal Sessional exam (ISE)	20 Marks	

Prerequisite Course(s): This course is aimed at introducing the Manufacturing processes to undergraduate students. The background expected familiar with Workshop Practice I & II.

Outline of Content: This course contains:

1	**Fundamental of Casting**		**No. of Lect – 8, Marks: 16**
	a	Introduction to Casting process	
	b	Casting terminology	
	c	Pattern and sand casting	
	d	Solidification and Molten metal problems	
	e	Melting furnaces	
2	**Metal forming processes**		**No. of Lect – 8, Marks: 16**
	a	Introduction to metal forming processes	
	b	Rolling processes	
	c	Forging processes	

	d	Extrusion methods
	e	Drawing processes
3	**Welding and joining processes**	**No. of Lect – 8, Marks: 16**
	a	Introduction to welding and joining processes
	b	Welding joints
	c	Fusion welding
	d	Pressure welding
	e	Riveting, Soldering and brazing
4	**Metal removing processes**	**No. of Lect – 8, Marks: 16**
	a	Introduction to Lathe machine
	b	Lathe Machine operations
	c	Milling machine operations
	d	Drilling operations
	e	Grinding operations
	f	Finishing operations operations
5	**Powder metallurgy**	**No. of Lect – 8, Marks: 16**
	a	Introduction to Powder metallurgy
	b	Powder manufacturing process
	c	Powder testing and evaluation
	d	Powder Metal production
	e	Secondary operations

Reference Books

1. Materials and processes in manufacturing , J T Black, Ronald A. Kosher, De Garmos, , Wiley student edition
2. Manufacturing technology , P. N. Rao , vol-I & II McGrow Hill publications
3. A Textbook of Production Engineering , P. C. Sharma, , S. Chand & Company. Ltd.
4. A Textbook of Production Technology , P. C. Sharma, S. Chand & Company. Ltd.
5. Process and Material of Manufacturing, S. Chand Publication. Roy A Lindberg, prentice Hall of india pvt ltd,
6. Elements of Workshop Technology Volume I&II , Hajara Choudhari, Bose S.K.
7. Manufacturing Technology –S. K. Garg- Fire wall media ltd.

8. Fundamental of modern manufacturing, Mikell P groover, Wiely asia student edition
9. Manufacturing process and system, Phillip C Ostawald, jairo Munoz, wiely India.
10. Manufacturing Technology, D.K. Singh, Pearson New Delhi.
11. Manufacturing process Vol-I, H. S. Shah, Pearson New Delhi.
12. Manufacturing Engineering and Technology, Serope Kalpakjian, Pearson New Delhi.
13. Manufacturing Processes, Serope Kalpakjian, Pearson New Delhi.

Soft Skills – III

COURSE OUTLINE

Course Title	Short Title	Course Code
Soft Skills – III	**SK-III**	

Course Description: Through this course we have tried to prepare the students for the industry. Most companies test mathematical and logical ability through an aptitude test. This subject aims at working on these skills of a student through strategies formulae and practice exercises.

Lecture	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
	1	**14**	**14**	**2**

Prerequisite Course(s): Fundamental knowledge of High School Mathematics.

COURSE CONTENT

Soft Skills – III **Semester-III**

Teaching Scheme **Examination Scheme**

Lecture: 1 hour / week **Internal Continuous Assessment (ICA): 50 Marks**

Unit-I: Arithmetic-1 **No. of Lect. – 3, Marks: 10**

a. Basic Formulae

i. Divisibility Rules
ii. Speed Maths
iii. Remainder Theorem
iv. Different Types of Numbers
v. Applications

b. HCF, LCM and Linear Equations

i. HCF – Successive Division and Prime Factorization Methods

ii. LCM – Successive Division and Prime Factorization Methods
iii. Applications
iv. Linear Equations – Elimination Method
v. Substitution Method
vi. Applications

c. Averages and Mixtures

i. Concept of Average
ii. Faster Ways of Finding It
iii. The Allegation Method
iv. Applications

Unit-II: Arithmetic–II **No of Lect. – 3, Marks: 10**

a. Percentages

i. Concept of Percentage
ii. Working with Percentages
iii. Applications

b. Profit and Loss

i. Difference between Cost and Selling Price
ii. Concept of Profit Percentage and Loss Percentage
iii. Applications

c. Time and Work

i. Basic Time and Work Formula
ii. Relation between Time and Work
iii. Applications

Unit-III: Arithmetic–III **No of Lect. –3, Marks: 10**

a. Permutations and Combinations

i. Sum Rule of Disjoint Counting
ii. Product Rule of Counting
iii. Concept of Factorial

iv. Permutations
v. Linear Permutations
vi. Combinations
vii. Circular Permutations
viii. Applications

b. Probability

i. Definition and Laws of Probability
ii. Mutually Exclusive Events
iii. Independent Events
iv. Equally Likely Events
v. Exhaustive Events
vi. Cards
vii. Dice
viii. Applications

c. Time and Distance

i. Speed
ii. Conversion Factors for Speed
iii. Average Speed
iv. Moving Bodies – Passing, Crossing and Overtaking
v. Relative Speed
vi. Boats and Streams
vii. Applications

Unit-IV: Non-Verbal Reasoning **No of Lect. 2,** **Marks: 10**

a. Analogies

i. Examples
ii. Applications

b. Classification

i. Examples
ii. Applications

c. Sequences

i. Examples
ii. Applications

Unit-V: Analytical Reasoning **No of Lect. – 3, Marks: 10**

a. Analytical Puzzles

i. Classification Puzzles
ii. Ordering Puzzles
iii. Assignment Puzzles
iv. Applications

b. Letter and Number Series

i. Different Types of Letter Series
ii. Different Types of Number Series
iii. Mixed Series

c. Coding and Decoding

i. Letter Coding
ii. Number Coding
iii. Mixed Coding
iv. Odd Man Out
v. Applications

Guide lines for ICA:
ICA will be based on credit tests and assignments submitted by the student in the form of journal.

Reference Books:

1. R. S. Aggarwal, "Quantitative Aptitude", S. Chand Publication, New Delhi, 2012.
2. R. S. Aggarwal, "A Modern Approach to Verbal Reasoning", S. Chand Publication, New Delhi, 2012.
3. R. S. Aggarwal, "A Modern Approach to Non-Verbal Reasoning", S. Chand Publication, New Delhi, 2012.

Lab - Course Outline

Engineering Thermodynamics Lab	**ET Lab**
Course Title	Short Title & Course Code

Mechanical / Automobile Engineering	**Second Year**	**Second**
Branch	Year	Semester

Course Description:

This lab includes performance and study practical related to Engineering Thermodynamics.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1
			Total Semester Credits:	1

Evaluation Scheme:

Internal Continuous Assessment (ICA)	50 Marks

Prerequisite Course(s): 11th Physics, 12th Physics

Outline of Content:

This practical contains

Any EIGHT of the following performance practical	
01	**Study and Demonstration of Pressure measuring devices.** Study the principle, construction and working of pressure measurement devices. Demonstrate construction and working of pressure measurement devices practically. Student Activity: Discuss relative merits and demerits of above devices.
02	**Study and Demonstration of Temperature measuring devices.** Study the principle, construction and working of Temperature measuring devices. Demonstrate construction and working of Temperature measuring devices practically. Student Activity: Discuss relative merits and demerits of above devices.
03	**Study and Demonstration of Centrifugal Pump.** Study the principle, construction and working of Centrifugal Pump. Demonstrate construction and working of Centrifugal Pump practically. Student Activity: Discuss application of 1st law to Centrifugal Pump.
04	**Study and Demonstration of Joule's paddle wheel experiment.** Study the Joule's paddle wheel experiment. Demonstrate of Joule's paddle wheel experiment practically. Student Activity: Discuss conclusion of Joule's paddle wheel experiment.
05	**Determination of Dryness fraction using separating throttling calorimeter.** Study the separating throttling calorimeter. Demonstrate of construction, working and determination of dryness fraction using separating throttling calorimeter practically. Student Activity: Discuss merits and demerits of separating throttling calorimeter
06	**Determination and Verification of SFEE for Nozzle.** Study application of SFEE to nozzle. Demonstrate of application of steady flow energy equation to nozzle practically. Student Activity: Verify SFEE using nozzle.
07	**Determination of actual Coefficient of performance of House hold refrigerator.** Study 2nd law of thermodynamics using house hold refrigerator. Demonstrate of application of 2nd law to house hold refrigerator practically. Student Activity: Verify second law using house hold refrigerator.

08	**Numerical Assignment on Unit III (Minimum five Problems)**
09	**Numerical Assignment on Unit IV. (Minimum five Problems)**
10	**Numerical Assignment using steam table/Mollier chart on Unit V. (Minimum five Problems)**

Note: any EIGHT practical from Engineering Thermodynamics Lab shall be conducted during 14 weeks available during semester.

Guide lines for ICA:-

ICA will be based on practical assignments submitted by the student in the form of journal. Evaluation will be based on paper work.

Lab - Course Outline

Fluid Mechanics — Course Title
FM — Short Title & Course Code

Branch - Mechanical / Automobile Engineering
Year – Second Year

Course Description:

This lab includes different fluid mechanics practical's .The course aims at imparting knowledge of Fluid properties and analysis of forces inside the fluid.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation Scheme:

Internal Continuous Assessment (ICA)	25 Marks	50 Marks
End Semester exam (ESE) (Practical)	25 Marks	

Prerequisite Course(s): The background required includes a sound knowledge of Mathematics (Calculus), Engineering Mechanics and Physics of first year Level.

Outline of Content: This course contains

1. Experiment on Red wood viscometer
2. Experiment on Reynolds's apparatus
3. Experiment on Bernoulli's theorem
4. Experiment on flow measurement by orifice meter
5. Experiment on flow measurement by venturi meter
6. Experiment on determination of metacentric height of a floating body
7. Trial on centrifugal pumps
8. Experiment on determination of major and minor losses for flow through pipes
9. Study of sharp edged circular orifice / mouthpieces
10. Study of velocity distribution in boundary layer and its thickness.
11. Study of Manometers.

Note: Lab file should contain at list EIGHT experiments from above mentioned list.

ESE (Practical Examination)

• The Practical Examination will comprise of performing the experiment and viva on the Practical's.

Lab - Course Outline

Material Science and metallurgy **MSM LAB**

Course Title Short Title & Course Code

Branch - Mechanical / Automobile Engineering **Year – Second Year**

Course Description:

This lab includes the practicals related to different testing machines. It also includes preparation and study of different microstructures and introduction of furnace.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation Scheme:

Internal Continuous Assessment (ICA)	25 Marks
End Semester exam (ESE) ORAL	25 Marks

Prerequisite Course(s): Engineering Chemistry and Engineering Physics

Outline of Content:
This practical contains

S. No.	Group A
1	Tensile test, to compare tensile strength, yield point and ductility of three metallic materials.
2	Brinell or Poldi hardness test on steel, cast iron, brass.
3	Vickers hardness test on steel, cast iron, brass.
4	Rockwell and Rockwell superficial hardness measurement.
5	Izod or Charpy impact test to compare impact values of cast iron and mild steel or alluminium and brass.
6	Erichsen Cupping Test
7	Measurement Non-destructive tests: Dye penetrant test, Magnetic particle testing , ultrasonic testing ,eddy current test.(any two)

S. No.	Group B
8	Micro Specimen Preparation and use of metallurgical microscope
9	Study and drawing microstructure of mild steel, medium carbon, eutectoid steel, hypereutectoid steel .
10	Demonstration of Annealing,Normalising and Hardening of medium carbon steel specimens and measurements of hardness and drawing icrostructures.
11	Jominy Hardenability test.
12	Study and drawing microstructure of white, malleable, gray and ductile cast iron or any four non-ferrous metals.
13	Observe and record the microstructures of heat affected zones of fusion welded joint.

Note: The student should maintain a journal keeping record of <u>any four</u> experiments from <u>group A</u> and <u>group B</u> each.

Guide lines for ESE:-

ESE will be based on practical assignments submitted by the student in the form of journal.

Evaluation will be based on paper work.

Lab - Course Outline

Workshop Practice III **WP-III**

Course Title Short Title & Course Code

Branch - Mechanical / Automobile Engineering **Year – Second Year**

Course Description:

Workshop Practice III covers the basic knowledge and practices on conventional lathe machine in machine shop I (Turning shop), various welding joints and welding processes in welding shop, pattern making practices in carpentry shop and casting practices in foundry shop in order to improve the practical skill of students in different workshops.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation Scheme:

Internal Continuous Assessment (ICA)	25 Marks
End Semester exam (ESE) (ORAL)	25 Marks

Prerequisite Course(s): WP-I, WP-II, Engineering Drawing, Engineering Materials.

Outline of Content:

This practical contains

1. **Carpentry shop**

Preparation and manufacturing of solid wooden pattern for foundry shop involving Wood Turing lathe machine.

2. **Foundry Shop**

Mould making Practice: Preparation of mould of above pattern, casting from this mould. Actual weight calculation, yield & casting of item should be performed.

3. **Welding Shop**

One job on welding (fabrication) preparing a component comprising welding joints such as shoe rack, book rack, stands for flower pots, house hold applications, stools etc.(Group of 4 to 5 Students)

4. **Machine shop-I (Turning Shop)**

One job (by each Student) consisting of Turning, Thread Cutting (Internal, External), Facing, Plain turning, Taper turning, Step Turning, chamfering, Grooving, Drilling, boring, Reaming, Knurling etc. operations.

Note:

1. Candidates are required to finish the job to the following limits

   Machine Shop: + 0.5mm or -0.5mm

   CNC Machine: +0.01mm or -0.01mm
2. Workshop book to be submitted comprising of Job drawing, process sheet for a given job along with the sketches of tools used for operations.
3. CNC Programming restricted to class only.

Reference Books:

1. Element of Workshop Technology Volume I and II -Hajara Chaudhary and Bose S.K., Asia Publishing House.

2. Production Technology Volume I and II –P.N.Rao, Tata McGraw Hill Publication.

3. Production Technology- R.K.Jain, Khanna Publications.

4. Production Technology- P.C.Sharma, Khanna Publication.

5. Workshop Technology-Chapman W.A.J., ELBS Publication.

6. Production Technology- HMT, Tata McGraw Hill Publication.

Course Outline

Engineering Mathematics-III **EM-III**
Course Title Short Title Course Code

Course Description:
This course provides the elementary level knowledge of Linear Differential Equations, Transforms, Statistics and Probability Distributions. Course includes solution of n^{th} order linear differential equations, solution of one and two dimensional heat equation, Laplace transform, Fourier transform, and probability distribution and basic of vector differentiation.

	Hours per Week		No. Of Weeks		Total Hours		Semester Credits
Lecture	3		14		40		4
Tutorial	1	1	14	14	14	14	

Examination scheme:

End semester exam (ESE)	80 Marks	Duration : 03 hours
Internal Sessional exam (ISE)	20 Marks	20 Marks

Prerequisite Course(s): Engineering Mathematics-I, Engineering Mathematics-II.

Outline of Content: This course contains:

1.	**Linear Differential Equations No of Lect – 8, Marks: 16**	
	a	Introduction to nth order Linear Differential Equation, Auxiliary Equation, Complimentary Functions
	b	Solution of nth order L.D.E using General Method
	c	Particular Integral using short cut Methods
	d	Solution of 2^{nd} order L.D.E using Variation Parameter Methods
	e	Solution of Cauchy's D.E.
	f	Solution of Legendre's D.E

2.	**Applications of Linear Differential Equations and Partial Differential equations No of Lect – 8, Marks: 16**	
	a	Mathematical Model of mass spring system and its solution
	b	Introduction to One Dimensional Heat Flow equation and its solution using method of separation of variables
	c	Introduction to Two Dimensional Heat Flow equation and its solution using method of separation of variables

3.	**Laplace Transform No of Lect – 8, Marks: 16**	
	a	Definition of Laplace Transform, Existence of Laplace Transform, Laplace Transform of standard Functions.
	b	Theorems and properties of Laplace transform and its use.
	c	Inverse Laplace Transform of standard functions.
	d	Properties of Inverse Laplace Transform and its use.
	e	Laplace Transform of Unit Step Functions.
	f	Solution of Differential equations using Laplace Transform .

4.	**Statistics and Probability distributions** **No of Lect – 8, Marks: 16**	
	a	Introduction to Mean, Mode, Median standard deviation, Variance, Coefficient of Variation.
	b	Moments, Skewness and Kurtosis.
	c	Correlation and Regression.
	d	Introduction to Binomial, Poisson's Distributions
	e	Introduction to Normal Distributions

5.	**Fourier Transform and Vector Differentiation** **No of Lect – 8, Marks: 16**	
	a	Introduction to Fourier Integral theorem Fourier Transforms, Fourier Cosine Transforms, Fourier Sine Transform and their inverse.
	b	Gradient of Scalar point function.
	c	Directional Derivatives of scalar point functions
	d	Divergence and curl of vector field
	e	Solenoidal and Irrotational vecor fields

Reference Books:

1. H.K. Dass - Advanced Engineering Mathematics (S. Chand Publication) New Delhi, 2008.
2. Erwin Kreyszig - Advanced Engineering Mathematics (Wiley Eastern Ltd.) Tenth Edition.
3. B.S. Grewal - Higher Engineering Mathematics, Khanna Publication, Delhi, 42nd Edition,2012.
4. Wylie C.R. & Barrett - Advanced Engineering Mathematics - Mc Graw Hill, 6th Revised edition ,1995.
5. B.V. Raman - Engineering Mathematics - Tata Mc- Graw – Hill, 2007.
6. A Text Book of Engineering Mathematics, By N. P. Bali, Laxmi Publication,2004 .

Course Outline

Theory of Machines-I **TOM-I**

Course Title Short Title Course Code

Branch - Mechanical / Automobile Engineering **Year – Second Year**

Course Description:

This course provides the elementary level knowledge of Theory of Machines. Course includes introduction to kinematics of machines and mechanisms, various methods of velocity and acceleration analysis of plane mechanisms. Friction and friction devices are also included in the syllabus. One unit on belt, rope and chain drives cover the necessary details of these power transmitting devices.

Teaching Scheme:

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	3	14	42	3

Examination scheme:

End semester exam (ESE)	80 Marks	Duration : 03 hours
Internal Sessional exam (ISE)	20 Marks	

Prerequisite Course(s): Knowledge of vector algebra and Engineering Mechanics.

Outline of Content:

This course contains:

1	**Simple Mechanisms**	**No. of Lectures – 9, Marks: 16**
	a	Introduction, Kinematics, Kinetics, Static & Dynamics, Machine, Kinematic link or element, Type of links, Structure, Difference Between a Machine and a structure, Types of Constrained Motions, Classification of Kinematic Pairs.
	b	Kinematic Chain, Types of Joints in a Chain, Types of Kinematic Chains, Mechanism, Number of Degrees of Freedom for Plane Mechanisms, Application of Kutzbach Criterion to Plane Mechanisms, Grubler's Criterion for Plane Mechanisms.
	c	Inversion of Mechanism, Four Bar Chain or Quadric Cycle Chain, Inversions of Four Bar Chain, Single Slider Crank Chain, Inversions of Single Slider Crank Chain, Double Slider Crank Chain, Inversions of Double Slider Crank Chain(no numerical treatment)
	d	Introduction, Relative & Absolute velocity, Velocity of a point on a link by Instantaneous Centre of Rotation (ICR) method, Properties of ICR, Location of ICRs, Space and Body Centrodes
	e	Kennedy's or Three Centers in Line Theorem, ICR method for different Mechanisms
	f	Relative Velocity Method, Relative Velocity of Two Bodies Moving in Straight Lines, Motion of a Link, Velocity of a Point on a Link by Relative Velocity Method, Velocities in a Four bar mechanism, Slider Crank Mechanism & other inversions, Rubbing Velocity at a Pin Joint, Mechanical Advantage
2	**Acceleration in Mechanisms**	**No. of Lectures – 8, Marks: 16**
	a	Introduction to Linear, Angular, Centripetal, Tangential acceleration, Acceleration Diagram for a Link, Acceleration of a Point on a Link,

		Acceleration in the Four bar Mechanisms
	b	Acceleration in the Slider Crank Mechanism and other inversions
	c	Introduction to Coriolis Component of Acceleration, magnitude and direction, Coriolis Component of Acceleration for different mechanisms
	d	Klien's Construction, different cases of slider crank mechanisms
3	**Inertia Forces in Reciprocating Parts No. of Lectures – 8, Marks: 16**	
	a	Introduction, D-Alembert's Principle, Analytical Method for Velocity and Acceleration, Forces on the Reciprocating Parts of an Engine
	b	Equivalent Dynamical System, Determination of Equivalent Dynamical System of Two Masses by Analytical Method, Correction Couple, Analytical Method for Inertia Torque
	c	Mechanisms with Lower Pairs, Pantograph, Straight Line Mechanism, Approximate Straight Line Motion Mechanisms, Steering Gear Mechanism
	d	Universal or Hooke's Joint, Double Hooke's Joint
4	**Friction No of Lectures – 9, Marks: 16**	
	a	Introduction, Types of Friction, Friction Between Lubricated Surfaces, Limiting Friction, Laws of Solid Friction, Laws of Fluid Friction, Coefficient of Friction, Limiting Angle of Friction, Angle of Repose, Friction of a Body Lying on a Rough Inclined Plane, Efficiency of Inclined Plane
	b	Screw friction, Terminology of screw, Screw Jack, Torque requirements, Efficiency, Friction of a V-thread
	c	Friction in Journal Bearing- Friction Circle, Friction of Pivot and Collar Bearing, Flat Pivot Bearing, Conical Pivot Bearing, Trapezoidal or Truncated Conical Pivot Bearing, Flat Collar Bearing
	d	Friction Clutches, Single Disc or Plate Clutch, Multiple Disc Clutch, Cone Clutch, Centrifugal Clutch
5	**Belt, Rope and Chain Drives No. of Lectures – 8, Marks: 16**	

	a	Introduction, Selection of a Belt Drive, Types of Belt Drives, Types of Belts, Material used for Belts, Types of Flat Belt Drives, Velocity Ratio, Slip of Belt, Creep of Belt
	b	Length of an Open Belt Drive and Cross Belt Drive, Power Transmitted, Ratio of Driving Tensions, Angle of Contact, Centrifugal Tension, Condition For the Transmission of Maximum Power, Initial Tension
	c	V-belt drive, Advantages and Disadvantages, Driving Tensions for V-belt,Rope Drive, Fiber Ropes, Advantages, Sheave for Fiber Ropes, Wire Ropes
	d	Chain Drives, Kinematic of Chain Drive, Classification, Advantages and Disadvantages, Terminology, Chain Speed and Angular Velocity of Sprocket, Length of Chain

Reference Books:

1. Theory of Machines, S. S. Rattan, Tata McGraw Hill, New Delhi.
2. Theory of Mechanisms & Machines, Jagdish Lal, Metropolitan Book Co.
3. Theory of Machines, Longman's Green & Co., London.
4. Theory of Machines, W. G. Green, Blackie & Sons, London
5. Theory of Machines, V.P. Singh, Dhanpat Rai & Co.
6. Theory of Machines and Mechanisms, Shigley, J.E and Uicker, J.J, McGraw-Hill International Book Co.
7. Mechanisms and Machines theory, Rao J.S. and Dukkipati R.V, Wiley Eastern Ltd.
8. The Theory of Machines through solved problems by J.S.Rao. *New age international publishers.*
9. *A text book of Theory of Machines by Dr.R.K.Bansal. Laxmi Publications (P) Ltd.*
10. Theory of Machines by Sadhu Singh, Pearson Publication

Course Outline

Applied Thermodynamics	**AT**	
Course Title	Short Title	Course Code
Mechanical/Automobile Engineering	**Second Year**	**Second**
Branch	Year	Semester

Course Description:

This course imparts knowledge of Applied Thermodynamics to undergraduate students. The background required includes a sound knowledge of course in Engineering Thermodynamics and use of Steam tables. The objectives of the course are to understand various real-life applications of basic Thermodynamics including Reciprocating and rotary Air compressors, Boilers, Steam power plant, etc.

Teaching Scheme:

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	3	14	42	4
Tutorial	1	14	14	

Examination scheme:

End semester exam (ESE)	80 Marks	Duration : 03 hours
Internal Sessional exam (ISE)	20 Marks	20 Marks

Prerequisite Course(s):

Fundamental knowledge of Physics and Engineering Thermodynamics.

Outline of Content: This course contains

1	**Boiler and Boiler Performance**	**No. of Lectures – 8, Marks: 16**
	a	Steam Power Plant layout, Classification and selection of boilers, Stocker fired boiler.
	b	Modern boilers with various fossil fuels, IBR act, Energy conservation opportunities, waste heat recovery boiler.
	c	Boiler performance - Equivalent evaporation, boiler efficiency (direct and indirect Method).
	d	Numerical on boiler performance.
	e	Heat balance for a boiler.
	f	Numerical on boiler Heat balance.
	g	Boiler Draught, Natural & Artificial draught, losses, Condition for maximum discharge through chimney.
	h	Numerical on draught.
2	**Vapor Power Cycle and Steam Condenser**	**No. of Lectures – 8, Marks: 16**
	a	Fundamentals of Vapor Processes, Steam power cycles- Carnot Cycle, Rankine cycle.
	b	Analysis of Rankine cycle for work ratio, efficiency, Power output, specific steam consumption, heat rate. Comparison of Rankine and Carnot cycle.
	c	Numerical on Rankine cycle
	d	Methods to improve Rankine cycle efficiency - Regeneration, Reheating, Co-generation. (Elementary treatment)
	e	Numerical on reheat Rankine cycle, regenerative Rankine cycle.
	f	Condenser, classification of condenser, Necessity of condenser, Vacuum measurement, Condenser efficiency, Vacuum efficiency, Calculation of cooling water required.
	g	Air leakage and its effect on condenser performance, Air extraction pump,

		cooling towers.
	h	Numerical on condenser performance.
3	**Compressible Flow and Steam Nozzle**	**No. of Lectures – 8, Marks: 16**
	a	Compressible fluid flow, Static and Stagnation properties, numerical.
	b	Sonic velocity, Mach number, type of nozzles and diffusers.
	c	One dimensional steady isentropic flow through nozzles and diffusers, Critical pressure ratio, maximum discharge, choked flow.
	d	Numerical on flow through nozzles and diffusers.
	e	Effect of variation in back pressure on nozzle characteristics, Effect of friction and nozzle Efficiency.
	f	Numerical on Effect of friction and nozzle Efficiency.
	g	Super saturated flow, Fanno line, Rayleigh lines (No numerical).
	h	Normal and oblique shock losses. (No numerical)
4	**Reciprocating Air Compressor**	**No. of Lectures – 8, Marks: 16**
	a	Introduction, use of compressed air, terminology used in compressor, Classification of compressors.
	b	Construction and working of single stage compressor, Thermodynamic analysis of reciprocating air compressor without clearance volume, Isothermal Efficiency, Double acting Compressor.
	c	Numerical of reciprocating air compressor without clearance.
	d	Effect of clearance, analysis of reciprocating air compressor with clearance volume, volumetric efficiency, FAD, Actual Indicator diagram.
	e	Numerical of reciprocating air compressor with clearance.
	f	Improvements in volumetric efficiency, multistage compression, Condition for minimum work of compression, Intercooler, after cooler, heat rejected.
	g	Numerical on reciprocating air compressor.
	h	Numerical on reciprocating air compressor.

5	**Rotary air Compressor**	**No. of Lectures – 7, Marks: 16**
	a	Introduction, classification of rotary compressors; construction, working, analysis and application of roots blower.
	b	Construction, working, analysis and application of vane type compressor
	c	Construction, working, analysis and application of screw type compressor
	d	Introduction, classification of fans and blowers, Fan characteristics.
	e	Construction and working of centrifugal fan and axial flow fan.
	f	Numerical only on fan.
	g	Numerical only on fan.

References:

1	Thermodynamics: an Engineering Approach, Y A Cengel and M A Boles, Tata McGraw Hill.
2	Applied Thermodynamics for Engineering Technologists, T. D. Eastop and A. McConkey, Pearson Education India
3	Power Plant Engineering, P K Nag, Tata McGraw Hill.
4	Power Plant Technology, M. M. El-Wakil, Tata McGraw Hill.
5	Thermal Engineering, R K Rajput, Laxmi Publication New Delhi.
6	Steam & Gas Turbines & Power Plant Engineering, R. Yadav, Central Publishing House, Allahabad
7	Engineering Thermodynamics, P.K. Nag, Tata McGraw Hill
8	Course in Thermal Engineering, C. P. Kothandaraman, Domkundwar, Domkundwar S, Dhanpat Rai & Company (P) Limited.

Course Outline

Basic Electrical Drives & Controls **BEDC**

Course Title Short Title Course Code

Branch - Mechanical / Automobile Engineering **Year – Second Year**

Course Description:

This course provides the elementary level knowledge of Basic Electrical Drives & Controls. Course includes introduction to Electric power measurement, Electric Energy measurement, Illumination DC Machines. The course also introduces students to concept of Single phase & three phase transformers & Three Phase Induction Motor, Single phase Induction motors & Synchronous Generator**,** Special purpose machines, Sensors, Robotics, DAS and Relays.

Teaching Scheme:

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	3	14	42	3

Examination scheme:

End semester exam (ESE)	80 Marks	Duration : 03 hours
Internal Sessional exam (ISE)	20 Marks	

Prerequisite Course(s): Elements of Electrical and Electronics Engineering

.

Outline of Content: This course contains:

1	**Electric power measurement, Electric Energy measurement, Illumination No of Lect – 8, Marks: 16**	
	a	Three phase power measurement by single watt meter method, two Watt meter method, three watt meter method.
	b	Effect of load power factor on wattmeter reading. Measurement of reactive power by one wattmeter method.
	c	Single phase energy meter (construction and working).
	c	Various term related to illumination, types
	d	Requirement of good lighting scheme, special purpose lighting.
2	**DC Machines,Special purpose machines No of Lect – 9, Marks: 16**	
	a	Constructional, Working principle of D.C.generator, Types of D.C. generator EMF Equation of D.C. Generator (Theoretical concept only).
	b	Working principle of D.C.Motor, back EMF, EMF Equation Types of D.C.Motor, and torque equation for D.C.Motor.
	c	Characteristics of Shunt, series, compound motors, methods for speed control of D.C. Shunt and series motor & applications of DC motor.
	d	Explain the necessity of starter and types.
	e	Principle, working and application of stepper motor, servo motor.
3	**Single phase & Three phase transformers & Three Phase Induction Motor No of Lect – 9, Marks: 16**	
	a	Working Principle & Construction of Single phase transformer & derive EMF equation. Efficiency of Transformers & condition for maximum efficiency of Transformer
	b	Types of Transformer connection star / star, delta / delta, star / delta, delta / star connections, V-V and Scott connections.
	c	Constructional features of induction motor and Working principle of three phase induction motor, types
	d	Define slip and derive torque equation , explain torque slip characteristics, power stages
	e	Explain different types of starters and applications of induction motors.

4	**Single phase Induction motors & Synchronous Generator** **No of Lect – 8 Marks: 16**	
	a	Principle of operation, types, and applications.
	b	Constructional features (Salient and Non-salient) of alternators and principle of operation.
	c	Pitch Factor or Chording Factor & Distribution Factor or winding factors, EMF equation.
	d	Alternator on load, concept of synchronous reactance and impedance, Phaser diagram of loaded alternator.
	e	Voltage regulation of alternator by Direct loading method and synchronous impedance method.
5	**Sensors, Robotics,DAS and Relays** **No of Lect – 8, Marks: 16**	
	a	Proximity sensors, Light sensors,
	b	Hall effect sensors, Ultrasonic sensors.
	c	Robotics, Block diagram and operation of Data acquisition system.
	d	Electromechanical control relays, solid state relays, Timing and Latching relays.

References:

1	B L Theraja and A K Theraja, "A Text book of Electrical Technology- Vol-I", S. Chand, 1ST Edition, 2001
2	B L Theraja and A K Theraja, "A Text book of Electrical Technology- Vol-II", S. Chand, 1ST Edition, 2001
3.	Ashfaq Husain, Fundamental of Electrical Engineering,Dhanpat Rai & co.
4	Electrical machines D P Kothari and I J Nagrath, Tata McGraw Hill, Third Edition
5	Electrical Machinery S.K. Bhattacharya TTTI Chandigad
6	Electrical Technology Edward Hughes Pearson Education
7	Art and Science of Utilization of Electrical Energy H Pratap Dhanpat Rai and Co, Third Edition

Course Outline

Manufacturing Engineering-II **ME-II**
Course Title Short Title Course Code

Branch - Mechanical / Automobile Engineering **Year – Second Year**

Course Description:
This course provides the basic knowledge of Advance manufacturing processes. Course includes fundamentals of metal cutting, Design of jigs and fixtures, Sheet metal working, Gear manufacturing and CNC machine, Unconventional machining processes.

Teaching Scheme:

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	3	14	40	3

Examination scheme:

End semester exam (ESE)	80 Marks	Duration : 03 hours
Internal Sessional exam (ISE)	20 Marks	

Prerequisite Course(s): This course is aimed at introducing the Manufacturing processes to undergraduate students. The background expected familiar with Workshop Practice I & II and Manufacturing Engineering-I.

Outline of Content: This course contains:

1	**Theory of metal cutting**	**No. of Lect – 8, Marks: 16**
	a	Introduction to single point cutting tool
	b	Angle & forces of single point cutting tool
	c	Tool life & Tool wear
	d	Measurement of cutting forces
	e	Cutting power
2	**Design of jigs and fixtures**	**No. of Lect – 8, Marks: 16**
	a	Introduction to jigs and fixtures
	b	Design principle
	c	Clamping
	d	Drill bushes
	e	Fixtures
3	**Sheet metal working**	**No. of Lect – 8, Marks: 16**
	a	Introduction to press tools
	b	Design of dies
	c	Selection of die and presses
4	**Gear manufacturing and CNC machine**	**No. of Lect – 8, Marks: 16**
	a	Introduction to broaching
	b	Gear manufacturing
	c	Introduction to Numerical controls and machine centers
5	**Unconventional machining processes**	**No. of Lect – 8, Marks: 16**
	a	Mechanical Processes
	b	Thermal processes
	c	Electrochemical machining
	d	Electric discharge machining

Reference Books:

1. Workshop technology – Raghuwanshi vol-1 &2, Dhanpatrai , New delhi.
2. Workshop technology – Hajra Choudhary vol-1 &2, Media promoters, Mumbai
3. Plastic technology- W.J. Patton

4. Manufacturing technology (Foundary forming & welding) P. N. Rao, McGraw Hill publications, New Delhi
5. Manufacturing science- Ghosh and Malik
6. P. C. Sharma, A Textbook of Production Engineering by - S. Chand & Company. Ltd.
7. P. C. Sharma, A Textbook of Production Technology by - S. Chand & Company. Ltd.
8. Production Technology- R K Jain, Khanna, publication.
9. Materials and processes in manufacturing , J T Black, Ronald A. Kosher, DeGarmos, Wiley student edition
10. Fundamental of modern manufacturing , Mikell P groover, , Wiely asia student edition
11. Manufacturing process and system , Phillip C Ostawald, jairo Munoz, , wiely india
12. Manufacturing Technology, D.K. Singh, Pearson New Delhi.
13. Manufacturing process Vol-I, H. S. Shah, Pearson New Delhi.
14. Manufacturing Engineering and Technology, Serope Kalpakjian, Pearson New Delhi.
15. Manufacturing Processes, Serope Kalpakjian, Pearson New Delhi.

Course Outline

Machine Drawing	**MD**
Course Title	Short Title & Course Code
Branch - Mechanical Engineering	**Year – Second Year**

Course Description:

This course provides the elementary level knowledge of Machine Drawing. Course includes introduction to machine drawing, dimensioning, elements of production drawing, types of fits, surface roughness, conventional representation of machine components, riveted joints and welded joints. The course also introduces students to study sequences of preparing the assembly drawing and bill of materials.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours
Lecture	1	14	14

Prerequisite Course(s): Knowledge of Engineering Graphics

Outline of Content:

This course contains:

1	**Introduction to Machine Drawing** **No. of Lectures – 1**
	Introduction to Machine Drawing, Types of Machine Drawing, Sheet layout and Sketching - Sheet layout – Sheet sizes, Margin, Border lines, Title block , Scale and Scale drawing , Sketching and its materials.
2	**Dimensioning** **No. of Lectures – 1**
	Dimensioning terms and notations, General rules for dimensioning, placing of dimensions, methods of dimensioning common features such as diameters,radii,position of holes, curved surfaces, key way, taper features, etc.
3	**Assembly Drawing** **No. of Lectures – 3**
	Introduction, Types of Assembly drawing, Accepted norms to be observed for assembly drawing, Sequences of preparing the assembly drawing, Bill of materials.
4	**Elements of Production Drawing** **No of Lectures – 2**
	Introduction to Geometric tolerances and Dimensional tolerances, Representation of Geometric tolerances and Dimensional tolerances on a drawing.
5	**Fits** **No. of Lectures – 2**
	The Indian standard system of limits and fits, Types of fits, Selection of fits, Hole basis system and Shaft basis system.
6	**Surface Roughness** **No. of Lectures – 2**
	Terminology for surface roughness, Machining symbols, Roughness symbols, values, and grades recommended by BIS, Representation of Surface Roughness on drawing.
7	**Conventional Representation of machine Components** **No. of Lectures – 1**
	Screw Threads, springs, Gears, Bearings, etc.
8	**Riveted joints and Welded joints** **No. of Lectures – 2**

	Introduction to Riveting, Forms and proportion of rivet heads, Types of riveted joints, Introduction to welded joints, Representation of welded joints.

Reference Books:

1. Machine Drawing, N. D. Bhatt, Chorotar Publishing House, Anand, India.
2. Mechanical Engineering Design, J. E. Shingle & C. R. Mischke,Tata McGraw Hill Publications, New Delhi.
3. Machine Drawing, N. Sidheswar & Kannaiah, Tata McGraw Hill Publications, New Delhi.
4. Machine Drawing, N. D. Junnarkar, Pearson Education.

Lab Course Outline

Machine Drawing Lab	**MD LAB**
Course Title	Short Title & Course Code
Branch - Mechanical Engineering	**Year – Second Year**

Course Description:

This lab includes drawing sheets related to assembly and details of a machine unit such as couplings, bearings, lathe parts, screw jack, vices, valves, etc. The course also introduces students to study sequences of preparing the assembly drawing and bill of materials.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	2	14	28	2

Examination scheme:

Internal Continuous Assessment (ICA) 50 Marks

Prerequisite Course(s): Knowledge of Engineering Graphics

Outline of Content:

This lab contains

Machine Drawing Lab

Sheet No. 1 and 2- Assembly and details of a machine unit.

This project consisting of a full imperial size sheets each involving assembly drawing with a part list, overall dimensions, and detailed drawing of couplings, bearings, lathe parts, screw jack, vices, valves, etc. manufacturing tolerances, surface finish symbols, and geometric tolerances should be specified so as to make it a working drawing.

Sheet No. 3 and 4- Assembly and details of a machine unit.

This project consisting of a full imperial size sheets each involving assembly drawing with a part list, overall dimensions, and detailed drawing of couplings, bearings, lathe parts, screw jack, vices, valves, etc. manufacturing tolerances, surface finish symbols, and geometric tolerances should be specified so as to make it a working drawing.

Assignment:

It should contain all the machining symbols, tolerances and welding symbols, etc. on A4 size sheet.

Note: All the four sheets and assignment must be completed during 14 weeks available during semester.

Guide lines for ICA:

ICA will be based on four drawing sheets and assignment submitted by the student in the form f journal.

Reference Books:

1. Machine Drawing, N. D. Bhatt, Chorotar Publishing House, Anand, India.
2. Mechanical Engineering Design, J. E. Shingle & C. R. Mischke,Tata McGraw Hill Publications, New Delhi.
3. Machine Drawing, N. Sidheswar & Kannaiah, Tata McGraw Hill Publications, New Delhi.
4. Machine Drawing, N. D. Junnarkar, Pearson Education.

Lab - Course Outline

Basic Electrical Drives & Controls **BEDC LAB**

Course Title Short Title & Course Code

Branch - Mechanical / Automobile Engineering **Year – Second Year**

Course Description:

This lab includes elementary level knowledge of Basic Electrical Drives & Controls by study the practicals.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation Scheme:

Internal Continuous Assessment (ICA) 50 Marks

Prerequisite Course(s): Elements of Electrical and Electronics Engineering

Outline of Content:

This practical contains

Basic Electrical Drives & Controls

1) Speed control of DC Shunt motor by armature control and flux control methods.
2) Load test on DC Shunt Motor.
3) Load test on DC Series Motor.
4) Measurement of active power in a three phase balanced inductive load using two wattmeter methods.
5) Regulation of an alternator by synchronous impedance method.
6) Regulation of an alternator by Direct Loading method.
7) Load Test on three Phase Induction Motor
8) Study of D.C. Motor Starters & Three Phase Induction Motor Starter.

Note: All the eight experiments must be completed during 15 weeks available during semester.

Lab - Course Outline

Applied Thermodynamics Lab	**AT LAB**	
Course Title	Short Title & Course Code	
Mechanical/Automobile Engineering	**Second Year**	**Second**
Branch	Year	Semester

Course Description:

This lab includes performance practical and study practical related to Applied Thermodynamics.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation Scheme:

Internal Continuous Assessment (ICA)	25 Marks
End Semester exam (ESE) (Oral)	25 Marks

Prerequisite Course(s):

11^{th} standard Physics, 12^{th} standard Physics, Engineering Thermodynamics.

Outline of Content:
This Lab contains

Following **THREE** performance practical	
01	Determination of heating value of a solid / liquid fuel using Bomb Calorimeter.
02	Exhaust gas analysis using Gas Analyzer OR Orsat Apparatus.
03	Determination of Isothermal and Volumetric efficiency of reciprocating air compressor.
Any FIVE of the following study practical	
04	Study of boiler draught.
05	Study of High pressure boiler.
06	Study of Steam condensers and cooling towers.
07	Study of Steam Nozzles and diffusers.
08	Study of Steam Power Plant.
09	Visit to any thermal power plant, prepare a detailed visit report.
10	Evaluation of Boiler efficiency by Direct and Indirect Method (Through Numerical).

Note:

FIVE Compulsory Assignment on **EACH** unit shall be included in the journal. Each assignment should have at least **FIVE** solved numerical. These assignments should be thoroughly conducted over tutorial sessions under teacher guidance.

Guide lines for ESE:-

End Semester Examination (ESE) **(Oral Exam)** will be based on practical and assignment submitted by the student in the form of journal.

Evaluation will be based on paper work.

Lab – Course Outline

Theory of Machines-I	**TOM-I LAB**
Course Title	Short Title & Course Code

Branch - Mechanical / Automobile Engineering **Year – Second Year**

Course Description:

This lab includes drawing sheets related to velocity and acceleration analysis of various mechanisms. Experiments on determination of mass moment of inertia and slip & creep in belt drive are also included. In addition two assignments, one on inversions of mechanisms and one on study of various clutches are also added.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation Scheme:

Internal Continuous Assessment (ICA)	25 Marks
End Semester exam (ESE) ORAL	25 Marks

Prerequisite Course(s): Engineering Mathematics, Physics

Outline of Content:

This practical contains

Theory of Machines-I Lab

1. **Drawing sheets on ICR method (2 problems), relative velocity and acceleration method (4 problems) and Klein's construction (2 problems)**
2. **To study the various inversions of kinematic chains. (Assignment)**
3. **To determine slip and creep for a belt-pulley combination.**
4. **To determine mass moment of inertia of compound pendulum.**
5. **To determine mass moment of inertia of rigid body by using bifilar or trifilar suspension method.**
6. **To study the different types of clutches.(Assignment)**

Note: All the six experiments must be completed during 15 weeks available during semester.

Guide lines for ESE:-

ESE will be based on practical assignments submitted by the student in the form of journal. Evaluation will be based on paper work.

Lab - Course Outline

Workshop Practice IV	**WP-IV**
Course Title	Short Title & Course Code
Branch - Mechanical / Automobile Engineering	**Year – Second Year**

Course Description:

Workshop Practice IV covers the basic knowledge and practices on conventional machines like Lathe, Milling, Drilling, Shaper, and Grinding Machines in machine shop II as well as CNC machines like CNC Lathe, CNC Milling in CNC shop along with CNC Job development and programming in order to improve the practical skill of students in different workshops.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation Scheme:

Internal Continuous Assessment (ICA)	25 Marks
End Semester exam (ESE) (Practical)	25 Marks

Prerequisite Course(s): WP-I, WP-II, WP-III, Engineering Drawing, Engineering Materials.

Outline of Content:

This practical contains

1. **Machine shop-II**

One composite job by each student involving different machining operations on Lathe, Milling, Drilling, Shaper, Grinding Machines

2. **CNC Lathe**

One job for programming and manufacturing on CNC lathe machine for each student consisting operations like Turning, Thread Cutting (Internal or External), Facing, Plain turning, Taper turning, Step Turning, Chamfering, Grooving, Drilling etc. operations.

3. **VMC (CNC Milling)**

One job for programming and manufacturing on VMC, CNC Milling machine for each student performing drilling, tapping, milling etc

Note:

4. Candidates are required to finish the job to the following limits

   Machine Shop: + 0.5mm or -0.5mm

   CNC Machine: +0.01mm or -0.01mm
5. Workshop book to be submitted comprising of Job drawing, process sheet for a given job along with the sketches of tools used for operations.
6. CNC Programming restricted to class only.

Guide lines for ESE:-

End Semester Examination (ESE) **(Practical Examination)** will be based on above mention practical list in CNC shop and conventional machine shop which will perform by students during the current semester. The students must be performing the practical in front of the examiner. The workshop instructors will only provide the raw material, tools, and equipments to students and also arrange the set up required for conducting workshop practical in CNC shop and conventional machine shop.

Reference Books:

1. Element of Workshop Technology Volume I and II -Hajara Chaudhary and Bose S.K., Asia Publishing House.

2. Production Technology Volume I and II –P.N.Rao, Tata McGraw Hill Publication.

3. Production Technology- R.K.Jain, Khanna Publications.

4. Production Technology- P.C.Sharma, Khanna Publication.

5. Workshop Technology-Chapman W.A.J., ELBS Publication.

6. Production Technology- HMT, Tata McGraw Hill Publication.

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Third Year Engineering

(Mechanical Engineering)

Faculty of Engineering and Technology

Course Outline

Semester- V &VI

TE Semester - V

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
		Theory		PR	Total						
		TH Hr/W	Tut Hr/W	PR Hr/W	Total	ISE	ESE	ICA	ESE	Total	
Heat Transfer	D	3	---	---	3	20	80	---	---	100	3
Internal Combustion Engine	D	3	---	---	3	20	80	---	---	100	3
Machine Design - I	D	3	---	---	3	20	80	---	---	100	3
Theory of Machine - II	D	3	---	---	3	20	80	---	---	100	3
Industrial Safety and Engineering	C	3	---	---	3	20	80	---	---	100	3
Heat Transfer Lab.	D	---	---	2	2	---	---	25	25	50	1
Internal Combustion Engine Lab.	D	---	---	2	2	---	---	25	---	25	1
Machine Design - I Lab.	D	---	---	2	2	---	---	25	25	50	1
Theory of Machine - II Lab.	D	---	---	2	2	---	---	25	25	50	1
Computer Graphics Lab.	B	1	---	2	3	---	---	50	---	50	2
Ind Training /EDP/ Special Study	D	---	---	---	---	---	---	25	---	25	2
Total	16	---	10	26	100	400	175	75	750	23	

TE Semester - VI

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
		Theory		PR	Total						
		TH Hr/W	Tut Hr/W	PR Hr/W	Total	ISE	ESE	ICA	ESE	Total	
Machine Design - II	D	3	--	---	3	20	80	---	---	100	3
Numerical Analysis and Computational Methods	D	3	---	---	3	20	80	---	---	100	3
Metrology and Quality Control	D	3	---	---	3	20	80	---	---	100	3
Turbomachinery	D	3	---	---	3	20	80	---	---	100	3
Project and Business Management	C	3	---	---	3	20	80	---	---	100	3
Machine Design - II	D	---	---	2	2	---	---	25	25	50	1
Turbomachinery	D	---	---	2	2	---	---	25	25	50	1
Metrology and Quality Control	D	---	---	2	2	---	---	25	25	50	1
Programing in C++	B	---	---	2	2	---	---	25	---	25	1
Minor Project	D	---	---	2	2	---	---	50	---	50	2
Seminar-I	D	---	---	2	2	---	---	25	---	25	2
Total	15	---	12	27	100	400	175	75	750	23	

ISE: Internal Sessional Examination **ESE:** End Semester Examination **ICA:** Internal Continuous Assessment

Note : Out of 3 practical ESE heads, at least 1 head should be practical**.**

Course Outline

Heat Transfer HT

Course Title: Short Title Course Code

Branch - Mechanical / Automobile Engineering **Year – Third Year**

Course Description: This course introduces undergraduate students to Heat Transfer. The background required includes a sound knowledge of Mathematics (Calculus), Engineering Thermodynamics, Applied Thermodynamics and Fluid Mechanics of second year Level. The course aims at imparting knowledge of Heat Transfer and modes of Heat Transfer.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	**3**	14	40	3
Practical	**2**	14	28	1

Examination scheme:

End semester exam (ESE) 80 Marks Duration: 03 hours

Internal Sessional exam (ISE) 20 Marks

Purpose of Course: Degree Requirement

Prerequisite Course(s): Mathematics (Calculus) at first year level and Engineering Thermodynamics, Applied Thermodynamics and Fluid Mechanics at Second Year Level.

Outline of Content: This course contains:

UNIT-I

1.	**Heat Conduction**	**No. of Lectures - 8 Marks : 16**
	a	Concepts and Mechanism of heat flow: Steady and unsteady state heat transfer, Modes of heat transfer, their physical mechanism.
	b	Laws of heat transfer, thermal conductivity, heat transfer coefficient, radiation heat transfer coefficient.
	c	Isotropic and an-isotropic materials, Insulation materials, Thermal resistance and thermal conductance.
	d	Generalized one dimensional heat conduction equation and reduction to Fourier, Poisson and Laplace equations, Boundary conditions, Steady state heat conduction without heat generation in plane wall, cylinder and sphere, Thermal contact resistance, critical thickness of insulation on cylindrical bodies.

UNIT-II

2.	**Heat Transfer in Extended Surfaces**	**No. of Lectures - 8 Marks : 16**
	a	Steady state heat conduction with heat generation in plane and composite wall, hollow cylinder, hollow sphere.
	b	Extended Surface: Types of fins, governing equation for pin fin for infinite long fin and fin with negligible heat loss, Fin performance, fin efficiency, fin effectiveness, overall fin effectiveness, approximate solution of fins.
	c	Error in temperature measurement by thermometer.

UNIT-III

3.	**Convection Heat Transfer**	**No. of Lectures - 8 Marks : 16**
	a	Principle of heat convection: mechanism, natural and forced convection.
	b	Non Dimensional Numbers, Dimensional analysis for Natural and Forced Convection.
	c	convection boundary layers: laminar, turbulent, momentum and energy equation, Laminar flow over bodies, turbulent flow inside circular and non-circular ducts, Reynolds Colburn analogy for flow over flat plate and flow inside

		tube, coefficient of friction and friction factor
	d	Heat transfer in fully developed flow, Natural convection over vertical planes, use of empirical correlation for convection, Principle of condensation and boiling (No numerical treatment).

UNIT-IV

4.	**Radiation Heat Transfer**	**No. of Lectures - 8 Marks : 16**
	a	Thermal radiation: Concept, Black body radiation, Spectral and total emissive power, Stefan Boltzmann law, Radiation laws.
	b	Irradiation and radiosity, Surface absorption, reflection and transmission, emissivity.
	c	Radiation view factor, Properties of view factor, (*No numerical treatment on view factor*), radiation heat exchange between two diffuse gray surface, radiation shield.

UNIT-V

5.	**Heat Exchangers**	**No. of Lectures - 8 Marks : 16**
	a	Classification of heat exchangers, temperature distribution in parallel, counter flow arrangement, condenser and evaporator, Overall heat transfer coefficient, fouling factor.
	b	Log-mean temperature difference method and NTU –effectiveness method of analysis for rating and sizing of heat exchangers.
	c	Requirement of good heat exchanger and heat exchanger and design and selection, practical applications, heat pipe.

- **Note-** Use of Heat transfer data book is allowed in the examination.
- **Note for paper setter:**

Paper setter should provide the required data for numerical problems in question paper itself.

Experiment must be set simultaneously and the no. of student in each group working on a setup should not exceed 05 (five) student.

References

1. J.P.Holman 1992 “Heat Transfer”Mc Graw Hill VII Edition.
2. P.Kothandaraman”Fundamentals of Heat and Mass Transfer”.
3. R.K.Rajput”Heat and Mass Transfer”, S.Chand & Company Ltd., New Delhi.
4. D.S.Kumar “Heat and Mass Transfer” D.S.Kumar S.K.Kataria & Sons, Delhi.
5. P.K.Nag “Heat Transfer” Tata McGraw Hill Publishing Company Ltd., New Delhi.
6. Sachdeva R.C., “Fundamentals of Heat and Mass Transfer” Wiley Eastern Limited, Third Edition.
7. Sukhatme S.P, “A Text Book on Heat Transfer” (1989), IIIrd Edition, Orient Longmans Ltd., New Delhi.
8. Arora S.C. & Domkundwar S., “A Course in Heat and Mass Transfer” (1994), Dhanpat Rai & Sons, IVth Edition.
9. Chapman A.J., “Heat Transfer” (1989), IVth Edition.
10. Yunus A. Cengel, “Heat Transfer –A Practical Approach” (Tata McGraw Hill)
11. M. M. Rathore “Engineering Heat and Mass Transfer”, 2nd Edition, Laxmi Publications, New Delhi.
12. M. Thirumalseshwar,”Fundamentals of Heat and Mass Transfer” Pearson Education.
13. R. Rudramoorthy, K. Mayilsomy, “Heat Transfer”, Pearson Education.

Lab - Course Outline

Heat Transfer	**HT LAB**
Course Title:	Short Title Course Code

Branch - Mechanical / Automobile Engineering **Year – Third Year**

Course Description:

This lab includes different practical of Heat Transfer. The course aims at imparting knowledge of Heat Transfer and its modes.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	14	28	1

Evaluation scheme:

Internal Continuous Assessment (ICA)	25 Marks	50 Marks
End Semester exam (ESE) (Practical)	25 Marks	

Prerequisite Course(s): Mathematics (Calculus) at first year level and Engineering Thermodynamics, Applied Thermodynamics and Fluid Mechanics at Second Year Level.

Outline of Content: This course contains:

1. Determination of thermal conductivity of metal rod.
2. Determination of thermal conductivity of insulating powder.
3. Determination of thermal conductivity of composite wall.
4. Determination of heat transfer coefficient in natural convection.
5. Determination of heat transfer coefficient in forced convection.
6. Determination of temperature distribution, fin efficiency in natural and forced convection.
7. Determination of emissivity of a test surface.

8. Determination of Stefan Boltzmann constant.
9. Study of pool boiling phenomenon and determination of critical heat flux.
10. Determination of LMTD, overall heat transfer coefficient and effectiveness of heat exchanger in parallel and counter flow arrangement.
11. Determination of heat transfer from a heat pipe.
12. Calibration of thermocouple.

Note: Lab file should contain at list EIGHT experiments from above mentioned list.

ESE (Practical Examination)

The Practical Examination will comprise of performing the experiment and viva on the Practical's.

Instructions for practical Exam. :-

1. Five experiments should be selected for Practical Examination.

2. The Number of Students for each Practical set up should not be more than 5 Students.

3. Oral will be based on the Practical Performed in the examination and the experiments included in the Journal.

Internal Combustion Engine (Theory)

Internal Combustion Engine	**ICE**	
Course Title	Short Title	Course Code

Branch- Mechanical Engineering **Year- Third Year**

Course Description:
This course provides the knowledge of Internal Combustion Engine. Course includes different engine cycles its performance analysis, Various systems in IC Engine such as fuel feed, lubrication, cooling, ignition, supercharging and turbo charging. Fundamental of combustion in I C Engine, types and design of combustion chambers. Various emission control norms.

Teaching Scheme:

Lecture hours per Week	No. of Weeks	Total hours	Semester Credits
03	14	40	03

Examination Scheme:

End semester exam (ESE)	80 Marks	Duration: 03 Hours
Internal Sessional Exam (ISE)	20 Marks	

Prerequisite Course(s): Mathematics (calculus), Basic thermodynamics cycles, various ideal gas processes, Engineering Thermodynamics, Applied Thermodynamics.

Objectives:

1. Analysis of air standard cycles in the regard of I C Engine.
2. Understanding of induction system along with fuel feed system.
3. To impart insight in various operating systems like cooling, lubrication, Ignition system.
4. To be familiar with combustion chamber design and pollution control norms.
5. Performance analysis of I C Engine.

Unit. I

1	**BASIC CONCEPTS AND ENGINE CYCLES No. of Lect.-8, Marks-16**
	a)**Introduction**: Classification, engine components and their functions, Terminology, Work (indicated and brake), mean effective pressure, torque and power (brake and indicated), mechanical efficiency, thermal and volumetric efficiencies of engine, air fuel ratio, specific fuel consumption. **b) Air Standard Cycles**: Assumptions, Otto, Diesel, Dual Combustion cycle, derivation of their efficiency equation, work done and mean effective pressure. Comparison on the basis of heat input, compression ratio, Maximum pressure and temperature, Actual cycle, deviation from theoretical cycles. Pumping losses, time losses.

Unit. II

2	**FUEL FEEDING SYSTEMS No. of Lect.-8, Marks-16**
	a) Charge, intake valve and manifold, valve timing diagram, valve overlap, choked flow. **Carburetion**: Requirement, types of carburetors according to fluid flow, simple carburetor, Air fuel ratio calculation, effect of altitude, disadvantages of simple carburetor, compensating devices for starting, economy range, acceleration, compensating jet etc. additional systems in modern carburetors, Solex carburetor. Disadvantages of carburetion and gasoline injection, MPFI. **b) Fuel feeding systems in CI engines**: Requirement, classification, fuel feed pump, jerk type injection fuel pump, distributor type pump, injection pump governor, fuel injector and nozzles.

Unit. III

3	**OPERATING SYSTEM No. of Lect.-8, Marks-16**
	a) Cooling systems: requirement, types of cooling systems, thermostat and additives. **b) Lubrication**: Mechanism of lubrication, different methods, important properties of lubricating oils. **c) Ignition Systems**: requirement, battery ignition, magneto ignition, electronic ignition system, Ignition timing, spark timing advance. **d) Starting methods of engines**: Types of superchargers, Super charging, effect of

	super charging, limitations and advantages of supercharging, and turbo charging of engines.

Unit. IV

4	**COMBUSTION IN SI AND CI ENGINES No. of Lect.-8, Marks-16**
	a) Homogeneous and heterogeneous mixtures, **Combustion in SI engines**: Stages in combustion, Ignition lag, velocity of flame propagation, factors influencing flame speed, rate of pressure rise, Detonation, factors affecting the detonation, pre-ignition. Rating of SI engines fuels, Dopes, combustion chamber of SI engines. **b) Combustion in CI engine**; stages of combustion, factors affecting the delay period. Diesel knock, Effect of engine variables on Diesel knock , Rating of CI engine fuels: Cetane number, performance number, comparison of knock in SI and CI engines. Combustion chamber for CI engines.

Unit. V

5	**ENGINE TESTING AND PERFORMANCE No. of Lect.-8, Marks-16**
	a) Measurement of indicated power, brake power, Morse test, energy balance and efficiency calculations. **b)** BIS specification. Recent trends in internal combustion engines. Engine emission, air pollution due to engines, various Euro norms, Unburnt hydrocarbon emission in two stroke and CI engines, CO and Nox emission, particulate traps, EGR, emission control methods catalytic converters (Introductory), crank blow by losses

TERM WORK-

Practical: 2Hrs/week **ICA: 25 Marks**

Minimum **EIGHT** experiment should be performed form the following lists:

1) Study of cooling systems.
2) Study of lubrication systems.
3) Study of simple and Solex carburetors.
4) Study of fuel pump and fuel injector.
5) Trial on a petrol engine and calculation of air/fuel ratio, volumetric,

thermal and mechanical efficiencies.

6) Trial of a Diesel engine and calculation of air/fuel ratio, volumetric, thermal and mechanical efficiencies.

7) Morse test and determination of bsfc and isfc.

8) Study of combustion chambers of SI engines.

9) Study of combustion chambers of CI engines.

10) Study and demonstration of mechanical and Pneumatic governors.

11) Study and analysis of exhaust emission from the engine (PUC).

RECOMMENDED BOOKS:

1) V. Ganeshan, “Internal Combustion Engines”, 2/e, Tata McGraw Hill, New Delhi.

2) R. K. Rajput , “Internal Combustion Engines”’, Laxmi Publications, New Delhi.

3) W. W. Pulkrabek , “Fundamentals of Internal Combustion Engines”, Prentice Hall of India (P) Ltd., New Delhi.

4) E. F. Obert , “Internal Combustion Engines and Air Pollution”, Harper and Row, New York.

5) Ferguson C. R , “Internal Combustion Engines”, Wiley Inc. New York.

6) Sharma R.P. and Mathur M.L., “Internal Combustion Engines”, Standard Publications, New Delhi.

7) Domkundwar, ., “Internal Combustion Engines”, Dhanpat Rai & Co. New Delhi.

8) Willard W Pulkrabek. “Internal Combustion Engines”, Pearson Education

9) Shyam K. Agrawal, “Internal Combustion Engines”, New Edge International Publication.

10) K.K. Ramalingam, “Internal Combustion Engines”, Scitech Publication.

Course Outline

Machine Design - I **MD-I**

Course Title: Short Title Course Code

Branch - Mechanical Engineering **Year – Third Year**

Course Description: This course introduces undergraduate students to Machine Design. The background required includes a sound knowledge of Mathematics (Calculus), Engineering Mechanics, SOM and TOM.

Objective: - The course aims at to familiarize the various steps involved in the Design Process to understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements. To learn to use standard practices and standard data learn to use catalogues and standard machine components

Teaching Scheme

	Hours Per Week	No. of Week	Total Hours	Semester Credits
Lecture	03	14	40	3
Practical	02	14	28	1

Examination scheme:

End semester exam (ESE)	80 Marks	Duration: 04 hours
Internal Sesstional exam (ISE)	20 Marks	
Internal Continues Assessment (ICA)	25 Marks	
End Semester Exam (ESE) oral	25 Marks	

Purpose of Course: Degree Requirement

Course Description: A degree holder engineer is expected to design and draw simple machine components. Fundamental knowledge of Mathematics, Applied Mechanics, Strength of Materials,

Engineering Materials and Theory of Machines, Manufacturing Process are essential. Subject aims at developing analytical abilities to give solutions to engineering design problems.

Objectives:

Students should be able to:

1. Analyze the various modes of failure of machine components under different load patterns.
2. Design and prepare part and assembly drawings.
3. Use design data books and different codes of design.
4. Select standard components with their specifications from manufacturer's catalogue

UNIT:-I

1.	**Introduction and Design of Simple Machine Parts No. of Lectures – 08 Marks: 16**	
	a	Introduction of Machine Design, Basic procedure of Machine Design, Requisites of design engineer, Design of machine elements, Sources of design data, Use of standards in design, Selection of preferred sizes.
	b	Simple Stress, Thermal Stresses, Impact Stress, tortional stress, Poisson's Ratio, Volumetric Strain, Young's Modulus, Maximum principal Stress Theory, Maximum shear stress theory, Maximum principal strain Theory, Maximum strain energy Theory, Maximum Distortion energy Theory . Stress Concentration – Causes & Remedies.
	c	Design of Simple parts – Knuckle joint & Cotter joint

Numerical Should be asked on Preferred sizes and Theories of Failure (b,c)

UNIT:-II

2.	**Design of Shafts, Keys and Couplings No. of Lectures – 08 Marks: 16**	
	a	*Shafts :-*Material, Design on the basis of strength considering shaft subjected to, twisting moment only, bending moment only, Combine twisting and bending moment, axial load in addition to twisting and bending. Design on the basis of

		rigidity. A.S.M.E. code for shaft design,
	b	*Keys:-*Classification of keys, Design considerations in parallel and tapered sunk keys, Design of square, flat and Kennedy keys, Splines.
	c	*Couplings:-*Design considerations, Classification, Design of Rigid, Muff coupling, Flange coupling and Flexible bushed pin coupling.

*Numerical Should be asked on Shafts, coupling (*Flange coupling and Flexible bushed pin coupling) *(a,c)*

UNIT: - III

3.	**Design of Temporary and Permanent Joints No. of Lectures – 08 Marks: 16**	
	a	Threaded Joints:- Different Forms of Threads, Bolts of uniform strength, Locking devices, I.S.O. metric screw threads, Stresses in threaded joint, eccentrically loaded bolted joint, Torque requirement for bolt tightening.
	b	Welded Joints: - Types of welding and joints, strength of transverse and parallel fillet welded section, axially loaded unsymmetrical welded section, eccentrically loaded joint.

Numerical should be asked on eccentrically loaded bolt joint and axially loaded unsymmetrical welded section, eccentrically loaded joint. *(a,b)*

UNIT:-IV

4.	**Design of Energy Storing Elements No. of Lectures – 08 Marks: 16**	
	a	Flywheel: - Function and material, Torque Analysis, coefficients of fluctuation of energy, Solid disk Flywheel, Rimmed Disk flywheel, stresses in flywheel rim.
	b	Spring:- Types, Applications and materials of springs, Stress and deflection equations for helical springs, Style of ends, Wahl's Stress Factor, Design of helical compression and tension springs, Springs in series and parallel, Concentric helical springs, leaf spring, Shot peening

Numerical should be asked on Solid Disk and Rimmed Disk Flywheel and Design of Helical springs and Leaf spring. *(a,b)*

UNIT: - V

5.	***Design for Fluctuating Loads and Statistical consideration in Design*** **No. of Lectures – 08 Marks: 16**	
	a	*Design for Fluctuating Loads:* Stress concentration - causes and remedies, Fluctuating stresses, Fatigue failure, Endurance limit, Notch sensitivity, Reversed stresses, Solderberg and Goodman diagrams, Fatigue design of components under combined stresses such as shafts, bolts and springs.
	b	*Statistical consideration in design:* - Design and natural tolerances –Design for assembly- Statistical analysis of tolerances – Mechanical reliability and factor of safety.

Numerical should be asked on Fatigue design of components under combined stresses such as shafts, bolts and springs. *(a)*

Term Work:

1. Term work shall consist of "ONE" design project. The design project shall consist of assembly drawing with a part list and overall dimensions and the other sheet involving drawing of individual components using AUTO CAD on A3 size paper. Manufacturing tolerances, surface finish symbols and geometric tolerances should be specified so as to make it working drawing. A design report giving all necessary calculations of the design of the components and assembly should be submitted in a separate file.
2. Design projects should include selection of prime mover and design of mechanical systems comprising of machine elements: Design data book shall be used extensively for the selection of the components.
3. Total five assignments (One on each unit - only Numerical)

Recommended Books:

[1] Shigley J.E. and Mischke C.R., "Mechanical Engineering Design", Tata McGraw Hill Publication Co. Ltd.

[2] Spotts M.F. and Shoup T.E. , "Design of Machine Elements", Prentice Hall International.

[3] Bhandari V.B., "Design of Machine Elements", Tata McGraw Hill Publication Co. Ltd.

[4] FArzdak Haideri, “Machine Desig”, Nirali Prakashan, Pune.

[5] Willium C. Orthwein, “Machine Components Design”, West Publishing Co. and Jaico Publications House.

[6] Design Data”, P.S.G. College of Technology, Coimbatore.

[7] Juvinal R.C., “Fundamentals of Machine Components Design”, John Wiley and Sons.

[8] Hall A.S., Holowenko A.R. and Laughlin H.G., “Theory and Problems of Machine Design”, Schaum’s Outline Series.

[9] A. H. Burr and J. B. Cheatham, Mechanical Analysis and Design, 2 nd Ed., Prentice Hall.

Lab - Course Outline

Machine Design-I **MD-I LAB**

Course Title: Short Title Course Code

Branch - Mechanical / Automobile Engineering **Year – Third Year**

Course Description:

This lab includes different practical of Heat Transfer. The course aims at imparting knowledge of Machine Design procedure for different elements.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	02	14	28	1

Evaluation scheme:

Internal Continuous Assessment (ICA) 25 Marks
End Semester exam (ESE) (Oral) 25 Marks

Prerequisite Course(s): Fundamental knowledge of Mathematics, Applied Mechanics, Strength of Materials, Engineering Materials and Theory of Machines, Manufacturing Process are essential. Subject aims at developing analytical abilities to give solutions to engineering design problems.

Outline of Content: This course contains:

1. Total five assignments (One on each unit - only Numerical)
2. Design Report: - The design project shall consist of assembly drawing with a part list and overall dimensions and the other sheet involving drawing of individual components using AUTO CAD on A3 size paper. Manufacturing tolerances, surface finish symbols and geometric tolerances should be specified so as to make it working drawing.

ESE (Practical Examination)

The Oral Examination will be based on the all five units of Machine Design – I.

Course Outline

Theory of Machines – II TOM-II

Course Title: Short Title Course Code

Branch - Mechanical / Automobile Engineering **Third Year** **First**

Branch Year Semester

Course Description:

The course under Theory of Machine-II has been designed to cover the concepts of force analysis, construction, working and applications of important components of machines. The students will understand the overall working of machines and able to understand constructional and working features of important machine elements. The students should be able to understand the basic theoretical and numerical methods, which is the pre-requisites to design and selection of these components of machines for different applications.

Course Objectives:

1. To understand various types of machine components, its working & applications.
2. To understand the force analysis of power train components gears.
3. To study the need and different methods of balancing of rotating and reciprocating masses.
4. To aware about the speed regulating components such as governors, flywheel, etc.
5. To describe graphical and analytical methods.

Course Outcomes:

Development of concepts and logics about machine components.
Development of problem solving approach by graphical and analytical methods.
Understanding of functional requirements of machine components for designing purpose.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	3	14	40	3

Examination scheme:		
End semester exam (ESE)	80 Marks	Duration : 03 hours
Internal Sessional exam (ISE)	20 Marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Mathematics (Calculus), Engineering Drawing & Element of Mechanical Engineering, Engineering Mechanics at first year level and Theory of Machine-I at Second Year Level.

Course Contents:

UNIT-I

1.	**Flywheel and CAM**	**No. of Lectures - 8 Marks : 16**
	a	Turning moment diagram and fluctuation of the crankshaft speed, D' Alemberts principle Equivalent offset inertia force
	b	Determination of flywheel size for different types of engine and machine.
	c	Types of cams and followers, Analysis of motion of follower
	d	Determination of cam profile for given follower motion
	e	Analysis of cam with specified counters – Circular arc cam, Tangent cam

UNIT-II

2.	**Brakes & Dynamometer**	**No. of Lectures - 8 Marks : 16**
	a	**Brakes:** Types of brakes, Force analysis of brakes, external and internal expanding shoe brakes, block brakes.
	b	Band brakes, Band and block brakes, Breaking torque.
	c	**Dynamometer:** Absorption dynamometers: Prony brakes, Rope brake, Band brake
	d	Transmission dynamometer- belt transmission type, Fluid coupling

UNIT-III

3.	**Governor & Gyroscope**	**No. of Lectures - 8 Marks : 16**
	a	**Governor**: Types of governors – Watt, Porter, Proell, Hartnell, Sensitiveness of governors, Hunting, Isochronisms, Stability.
	b	Effect of governor, Power of governor, Controlling force.
	c	**Gyroscope**: Angular velocity and acceleration, Gyroscopic forces and couple, Gyroscopic effect on naval ships
	d	Gyroscopic stabilization, Stability of two wheel vehicle.

UNIT-IV

4.	**Balancing**	**No. of Lectures - 8 Marks : 16**
	a	Balancing of rotating masses in one and several planes.
	b	Balancing of reciprocating masses in single and multi-cylinder engine, radial and V-types.
	c	Primary and secondary balancing analysis, Concept of direct and reverse cranks.
	d	Balancing of locomotive engines and effect of partial balancing. , Static and dynamic balancing machine.

UNIT-V

5.	**Gears**	**No. of Lectures - 8 Marks : 16**
	a	**Spur Gears**:- Terminology used in gears, conjugate action,.
	b	Involute and cycloidal profile, Path of contact, Arc of contact, Contact ratio.
	c	Interference, Undercutting, Methods to avoid undercutting and interface, Gear standardization,
	d	Effect of center distance variation on the velocity ratio for involute profile tooth gears, Friction between gear teeths.

References:

1. Theory of Machines, S. S. Rattan, Tata McGraw Hill, New Delhi.
2. Theory of Mechanisms & Machines, Jagdish Lal, Metropolitan Book Co.
3. Theory of Machines, Longman's Green & Co., London.
4. Theory of Machines, W. G. Green, Blackie & Sons, London.
5. Theory of Machines, V.P. Singh, Dhanpat Rai & Co.
6. Theory of Machines – II, H. G. Phakatkar, Nirali Publication.
7. Theory of Machines and Mechanisms, Shigley, J.E and Uicker, J.J, McGraw45 Hill International Book Co.
8. Mechanisms and Machines theory, Rao J.S. and Dukkipati R.V, Wiley Eastern Ltd.
9. The Theory of Machines through solved problems , J.S.Rao. New age international publishers.
10. A text book of Theory of Machines, Dr.R.K.Bansal. Laxmi Publications
11. Theory of Machines, Sadhu Singh, Pearson Publication.
12. Theory of machine, P. L. Ballaney, Khanna publication.

Lab - Course Outline

Theory of Machines -II **TOM-II LAB**

Course Title: Short Title Course Code

Branch - **Mechanical / Automobile Engineering** Year – **Third Year**

Course Description:

This lab includes drawing sheets related to cam profile & balancing of rotating & reciprocating masses. Experiments on determination of characteristic curves of the centrifugal governor and verification of principle of working of gyroscope are also included. In addition study of gear boxes and Balancing machine.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation Scheme:

Internal Continuous Assessment (ICA)		: 25 Marks
End Semester exam (ESE) ORAL		: 25 Marks

Prerequisite Course(s): Engineering Mathematics, Theory of machine-I

Outline of Content:

This practical contains

1. To determine the characteristic curves of the centrifugal governor and find its coefficient of insensitivity and stability.
2. To study various types of gear boxes.
3. To verify the principle of working of gyroscope.
4. To study the static & dynamic balancing machine & balancing of masses in different planes.
5. To study graphical methods and prepare drawing sheets for – Drawing sheet 1:- Balancing of rotating masses and reciprocating masses. (2 Problems)
6. To study graphical methods and prepare drawing sheets for Drawing sheet 2: Draw cam profile for various types of follower motion.

Guide lines for ESE:-

ESE (Oral Examination)

The Oral Examination will comprise of viva on the above six experiments.

Course Outline

Industrial Engineering & Safety	**IES**	
Course Title	Short Title	Course Code
Mechanical Engineering	**Third Year**	**First**
Branch	Year	Semester

Course Description:
The course is intended to:

- build up necessary background for understanding the Industrial knowledge
- understand the applications of knowledge and correlation of various departments
- get acquainted with various acts, role of consultant and safety auditor
- acquire managerial skills of handling Industrial environment and human behavior
- develop awareness about industrial Engineering and safety Engineering

(Course outcomes)

Student will be able to:

- seek opportunity to work in the field of Industrial Engineering and safety
- contribute in a better way towards enhancing the productivity
- play the role of industrial and safety manager effectively

Teaching scheme:

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Lecture	3	14	40	3

Examination scheme:

End semester exam (ESE)	80 Marks	Duration: 03 hours
Internal Sessional exam (ISE)	20 Marks	20 Marks

Outline of Content: This course contains:

Unit - I

1	**No. of Lectures – 08,**	**Marks: 16**
	a	Introduction to Industrial Engineering, origin & growth, contribution of Taylor, Tools & Techniques of Industrial Engineering.
	b	Work study- Method Study- Aims, objectives, scope & applications.
	c	Select criteria for selecting assignments; record charting symbols. Flow process chart, multiple activity chart. Examine- questioning technique, Develop motion economy, work place layout, improvement and working condition, implement and maintain
	d	Work Measurement Aims objectives scope and application
	e	Stop watch study- equipment and procedure, rating allowance and standard time; activity sampling- principle, procedure and applications.

Unit-II.

2	**No. of Lectures – 08, Marks: 16**	
	a	Criteria for plant location, site selection, types of plant layout, planning for utilities
	b	Material Handling- necessity of material handling, procedure for analyzing material handling system, methods and equipment of material handling. Effect of layout and material handling system on productivity and profitability
	c	Safety in material handling & factory operation.

Unit-III

3	**No. of Lectures – 08, Marks: 16**	
	a	Definition, concept, Aims, objectives and Scope of Industrial Psychology.
	b	Individual and Group, Individual differences in behavior
	c	Group Dynamics, Theory X and Y
	d	Hawthorne Experiment, Morale
	e	Motivation, Working Environmental Conditions
	f	Industrial Fatigue

Unit-IV

4	**No. of Lectures – 08, Marks: 16**	
	a	Definition of safety, safety engineering, human factor engineering, anthropometry
	b	Principles of safety management ,industrial hygiene and occupational health
	c	Safety education and training: Importance of training – identification of training needs, training methods, motivation communication, safety campaign
	d	Safety performance monitoring, safety audit ,accident investigation and reporting

Unit-V

5	**No. of Lectures – 08, Marks : 16**	
	a	Safety in chemical industries, food processing ,textile, explosives
	b	Safety in mines, nuclear plants ,cement plants
	c	Safety in hydro and thermal power plants, ship building and repair
	d	Safety in mechanical ,electrical industries' equipments"
	e	Disaster management

References:-

1) Maynard, Industrial Engineering. Hand book, McGraw Hill book company
2) ILO, Introduction to Work Study
3) Krishnan N.V. "Safety Management in Industry" Jaico Publishing House,
4) Khanna O.P. , Industrial Engineering. and Management, Dhanpat Rai Publication, New Delhi.
5) Factory Act -1948
6) Indian Boiler Act- 1923 (Revised 1983)
7) L.C. Jhamb " A text book of Industrial Engineering", Everest Publishing House, India.
8) Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, (1999.
9) M.Mahajan "Industrial Engineering and Production Management". Dhanpat Rai & CO (P)LTD Publication, New Delhi

Lab - Course Outline Cover Page

Computer Graphics **CG**

Course Title Short Title Course Code

Branch - Mechanical / Automobile Engineering **Year – Third Year**

Course Description: This course includes design and drafting related to mechanical elements. Lab's related to elementary level knowledge of drafting and Auto-LISP program. Sketching and computer aided design tools are used to create the various types of views needed for design and documentation.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	01	14	14	01
Practical	02	14	28	01

Purpose of Course: Degree Requirement

Prerequisite Course(s): Engineering Graphics, Essential Computer Knowledge Required.

Outline of Content: This course contains:

AUTOCAD

1	**No. of Lectures – 07**	
	a	Introduction to CAD. Advantages and Applications of CAD. Difference between conventional drafting methods and CAD.
	b	Introduction to Auto-cad (Latest Version). Details of various menu bars and tool bars, Drawing Area etc.
	c	Draw Toolbar- Line, Arc, Rectangle, Circle, Polygon, Text, Boundary Hatching etc.
	d	Modify Toolbar – Copy, Move, Erase, Mirror, Chamfer, Fillet, Array, Trim etc.
	e	Dimension Toolbar – Linear, Angular, Radius, Diameter, etc
	f	Properties Toolbar – Line Types, Colors, Line Weight, Text, etc
	g	Settings - Snap settings, Grid settings, parameter settings, print settings, etc

AUTO-LISP

2	**No. of Lectures – 07**	
	a	Introduction to Auto-LISP. Advantages and Applications of Auto-LISP .
	b	Auto-LISP commands
	c	Auto-LISP Programs for simple geometric shapes-line, circle, rectangle, pentagon, etc
	d	Auto-LISP Programs for elements geometric shapes such as circle in rectangle, triangle in rectangle, etc.
	e	Auto-LISP Programs for simple machine elements. (Nut, Bolt, Stud, Flange, etc)
	f	Auto-LISP Programs for simple machine elements. (Nut, Bolt, Stud, Flange, etc)
	g	Auto-LISP Programs for simple machine elements (Nut, Bolt, Stud, Flange, etc)

Course Objectives:

This course includes design and drafting related to mechanical elements. This lab related to elementary level knowledge of drafting and Auto-LISP program. Sketching and computer aided design tools are used to create the various types of views needed for design and documentation.

Course Outcomes: Upon successful completion of these practical the student will be able to

1. Demonstrate and understand the basic concepts of geometric modeling and computer graphics.
2. Design and Drafting of mechanical elements.
3. Programs for mechanical elements in Auto-LISP.

Assignment:

1. Two assignments on AutoCAD (preferably latest version).
2. Two assignments on Auto LISP (such as Design and drafting of any mechanical component through Auto LISP)

REFERENCES:

1. AutoCAD reference manual
2. Auto-LISP Developer's Guide
3. George Omura, ABCs of Auto LISP, BPB. Publication
4. H.G. Phakatkar, Engineering Graphics, Nirali publication

COURSE CONTENT

Industrial Training / EDP / Special Study	**IT/EDP/SS**	
Course Title	Short Title	Course Code

Semester-V **Examination Scheme**

Total Semester Credits: 02 **Internal Continuous Assessment (ICA): 25 Marks**

Industrial Training

- Student shall undergo industrial training for a minimum period **of two weeks** during summer vacations between fourth semester and fifth semester.
- The industry in which industrial training is taken should be a medium or large scale industry
- The paper bound report on training must be submitted by the student in the beginning of Fifth semester along with a certificate from the company where the student took training.
- Every student should write the report separately.
- Institute / Department/T&P Cell have to assist the students for finding Industries for the training.
- Students must take prior permission from Department before joining for Industrial Training.

OR

EDP (Entrepreneurship Development Program)

- Student has to participate in Entrepreneurship Development Program for a minimum period of **One week** during summer vacations between fourth semester and fifth semester.
- Every student must submit the paper bound report based on the program in the beginning of Fifth semester along with a certificate (Course / Program completion) from the program organizers.
- Every student should write the report separately.
- Institute / Department may arrange Entrepreneurship Development Program at their campus.
- Students must take prior permission from Department before attending any Entrepreneurship Development Program.

OR

Special Study

- Student has to submit name of three topics of his interest to the department.
- Special study in a group shall not be allowed.
- The three-member committee appointed by Head of Department shall allot one topic out

of the three topics submitted by the student.

- Every student must submit the paper bound report based on special study at the end of Firth semester.
- Department should allot guide to all such students, for monitoring their progress and guide them for literature survey / report writing etc.
- Evaluation of special study shall be done based on presentation made by student, followed by brief question answer session.

Evaluation of Industrial Training / EDP / Special Study

ICA: The Internal Continuous Assessment shall be based on the active participation of the students in the training / EDP / Special study and based on knowledge / skill acquired by the student. The three-member committee appointed by Head of Department shall assess the reports and award marks based on following:

(a) Report		10 marks.
(b) Presentation		10 marks.
(c) Viva-voce at the time of presentation		05 marks.
	Total:	**25 marks.**

Course Outline

Machine Design II **MD-II**

Course Title Short Title Course Code

Branch- Mechanical Engineering **Year- Third Year**

Course Description:

This course provides the knowledge of machine design. Course includes Design of Clutches, Design of Gears, Design of bearing & pressure vessels etc.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	14	40	3
Practical	02	14	28	1

Examination Scheme:

End semester exam (ESE) 80 Marks Duration: 04 Hours

Internal Sessional Exam (ISE) 20 Marks

Prerequisite Course(s): This course is aimed at introducing the Design of various mechanical components e.g. - clutches, gears, pressure vessels, bearing etc to the undergraduate students. The background expected familiar with Strength of Material, Theory of machine & Machine Drawing etc.

Objectives:

1 Analyze the various modes of failure of machine components under different load patterns.

2 Design and prepare part and assembly drawings.

3 Use design data books and different codes of design.

4 Select standard components with their specifications from manufacturer's catalogue.

UNIT-I

Friction Clutches and Brakes	**No. of Lect.-8, Marks-16**
a)	**Friction Clutches:** Classification and selection friction clutches, Torque transmitting capacities and Design of single-plate, multi-plate, cone and centrifugal clutches, Type of friction materials-their advantages, limitation and selection criteria.
b)	**Aesthetic and Ergonomic considerations in Design** Aesthetic considerations- Basic type of product form, design features like shape, colour, materials and finishes, quality etc. Ergonomic considerations- Man-Machine closed loop system, design of display panels, design of controls etc.

UNIT-II

Pressure Vessels	**No. of Lect.-8, Marks-16**
a)	**Design of Cylinders and pressure vessels:** Thick and thin cylinders- Thin cylindrical and spherical vessels- Lame's equation- Clavarino's and Birnie's equation- Auto frottage and compound cylinders- Gasketed joints in cylindrical vessels. Unfired pressure vessels- Classification of pressure vessels as per I.S. 2825- categories and type of welded joints- weld joints efficiency- Corrosion, erosion and protection vessels, stresses induced in pressure vessels, material of construction. Thickness of cylindrical and spherical shells and design of end closures as per code- Nozzle and Opening in pressure vessels- Reinforcement of opening in shell and end closures. Area compensation method.

UNIT-II

Spur and Helical Gear Drives	**No. of Lect.-8, Marks-16**
a)	Classification of gears, Selection of type of gears, Standard system of gear tooth. **Spur Gears:** Number of teeth and face width, Type of gear tooth failure, Desirable properties and selection of gear material, Force analysis, Beam strength (Lewis) equation, Velocity factor, Service factor, Load concentration factor, Effective load on gear, Wear strength equation, Estimation of module based on beam and wear strengths, Estimation of dynamic tooth load by velocity factor and Buckingham's equation,
b)	**Helical Gears:** Transverse and normal module, Virtual number of teeth, Force analysis, Beam and Wear strengths, Effective load on gear tooth, Estimation of dynamic load by velocity factor and Buckingham's equation, Design of helical gears.

UNIT-IV

Bevel and Worm Gear Drives	**No. of Lect.-8, Marks-16**
a)	**Bevel Gears** Straight tooth bevel gear terminology and geometric relationship, Formative number of teeth, Force analysis, Design criteria of bevel gears, Beam and wear strengths, Dynamic tooth load by velocity factor and Buckingham's equation , Effective load, Design of straight tooth bevel gears, Selection of material for bevel gears,
b)	**Worm Gear** Worm and worm gear terminology and geometrical relationship, Standards dimension, Force analysis of worm gear drives, Friction in worm gears and its efficiency, Worm and worm-wheel material, Beam strength and wear strength of worm gears, Thermal consideration in worm gear drive, Methods of Gears lubrication.

UNIT-V

Rolling Contact Bearings	**No. of Lect.-8, Marks-16**
a)	**Rolling contact Bearings** Type of rolling contact bearing, Static and dynamic load carrying capacities, Striback's equation, Equivalent bearing load, Load-life relationship, Selection of bearing life, Selection of rolling contact bearings from manufacturer's catalogue. Design for cyclic loads and speed, Bearing with probability of survival other than 90%, Lubrication and mounting of bearing, Type of failure in rolling contact bearing- causes and remedies.
b)	**Statistical consideration in design** Frequency distribution-Histogram and Frequency polygon – Normal distribution. Standard variable – population combinations.

TERM WORK-

Practical: 2Hrs/week	**ICA: 25 Marks** **ESE: 25 marks**
1. Term work shall consist of "ONE" design project. The design project shall consist of two imperial size sheets- one involving assembly drawing with a part list and overall dimension and the other sheet involving drawing with of individual components. Manufacturing tolerances, surface finish symbols and geometric tolerances should be specified so as to make it working drawing. A design report giving all necessary calculation of the design of the components and assembly should be submitted in a separate file. Design projects should be in the form of 'Design of Mechanical System' comprising of machine elements studied and topics covered in the syllabus. Design data book shall be used extensively for the selection of the component. 2. Problem based assignment on each unit.	

RECOMMENDATION

As far as possible, preference should be given to prepare drawing sheets using computer.

RECOMMENDED BOOKS:

1) Shigley J.E. and Mischke C.R., “Mechanical Engineering Design” McGraw Hill Pub. Co. Ltd.
2) Spott’s M.F. and Shoup T.E. “Design of Machine Elements”, Printice Hall International.
3) Bhandari V.B., “Design of Machine elements”, Tata McGraw Hill Pub. Co. ltd.
4) Black P.H. and O. Eugene Adams, “Machine Design”, McGraw Hill Book Co. Ltd.
5) Willium C. Orthwine, “Machine Component Design”, West Pub. Co. an Jaico Pub. House.
6) “Design Data”, P.S.G. College of Technology, Coimbatore.
7) Juvinal R.C. “Fundamental of Machine Component Design ”, John Wiely and sons.
8) Hall A.S., Holowenko A.R. and Laughlin H.G., “Theory and Problems of Machine Design”, Schaum’s Outline Series.
9) P.Kannaiah, “Machine Design”, Scitech Publication

Lab - Course Outline

Machine Design-II	**MD-II LAB**
Course Title:	Short Title Course Code
Branch - Mechanical / Automobile Engineering	**Year – Third Year**

Course Description:

This lab includes different practical of Machine Design. The course aims at imparting knowledge of Machine Design procedure for different elements.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	02	14	28	1

Evaluation scheme:

Internal Continuous Assessment (ICA) 25 Marks

End Semester exam (ESE) (Oral) 25 Marks

Prerequisite Course(s): Fundamental knowledge of Mathematics, Applied Mechanics, Strength of Materials, Engineering Materials and Theory of Machines, Manufacturing Process are essential. Subject aims at developing analytical abilities to give solutions to engineering design problems.

Outline of Content: This course contains:

1. Total five assignments (One on each unit - only Numerical)
2. Design Report: - The design project shall consist of two imperial size sheets- one involving assembly drawing with a part list and overall dimension and the other sheet involving drawing with of individual components & also using AUTO CAD on A3 size paper. Manufacturing tolerances, surface finish symbols and geometric tolerances should be specified so as to make it working drawing.

ESE (Practical Examination)

The Oral Examination will be based on the all five units of Machine Design – II.

Course Outline

Numerical Analysis & Computational Methods **NACM**

Course Title **Short title** **Course ode**

Branch: Mechanical Engineering Third Year

Course Description:

Course Objectives:

1. To introduce numerical methods for solving linear and non-linear equations.
2. To apply the knowledge of these methods to solve practical problems with suitable software.
3. To introduce numerical methods for evaluating definite integrals.

Course Outcome

At the end of the course the students are able to-

1. Identified, classified and choose the most appropriate numerical method for solving the problem.
2. Developed Numerical skills to Mechanical Engineering Problems.

Teaching Scheme

	Hrs per week	No. of weeks	Total hour	Semester Credits
Lecture	03	14	40	03
Tutorial	--	--	--	--

Examination Scheme:

End semester scheme(ESE)	**80 marks**	**Duration : 03 Hrs.**
Internal Sessional Examination (ISE)	**20 marks**	

Purpose of Course: Degree Requirement

Prerequisite Courses: Fundamental knowledge about the mathematics.

Outline of the content: This course contains:

Unit- I

1.	Title: Software development & Solution of transcendental equation **No. of Lecture:08 ,Marks: 16**	
	a	Software development principles, mathematical modeling problem solving, Algorithm, Flowchart, Errors, Graphical method,
	b	Solution of transcendental equation - Bisection method, False position method, successive approximation method, Newton-Raphson method, Horner's method, rate of convergence

Unit- II

2.	Title: Numerical Integration & Solution of ordinary Differential Equation **No. of Lecture:08 ,Marks: 16**	
	a	Numerical Integration Trapezoidal rule, Simpson's 1\3 rd rule, Simpson's 3\8 th rule, Gauss Quadrature method: 2 point.
	B	Solution of ordinary Differential Equation Taylor's series method, Euler's method, Improved & modified Euler's method, Fourth order Range- Kutta method.

Unit- III

3	Title: Interpolation & Curve Fitting **No. of Lecture:08 ,Marks: 16**	
	a	Interpolation Linear and quadratic interpolation, Lagrange's interpolation, Newton's forward interpolation, Newton's backward interpolation, Newton's divided difference interpolation, Stirling interpolation,
	b	Curve fitting Linear & quadratic regression, Logarithmic curve fitting, Exponential curve fitting.

Unit- IV

4.	Title: Solution of Linear Algebraic Equation & Iterative method **No. of Lecture:08 ,Marks: 16**	
	a	Solution of Linear Algebraic Equation - Gauss elimination method, Gauss Jordan method LU- decomposition method.
	b	Iterative method - Jacobi iteration method, gauss seidel interactive method, Cholesky method.

Unit- V

5	Title: Finite Element Analysis & FDM **No. of Lecture:08 ,Marks: 16**	
	a	Finite Element Method: Introduction, Steps used in finite element Analysis , general approach, interpolation function, & Finite element application on one dimension, Solution of elliptical equations for various boundary conditions, Solution of parabolic equation by explicit, implicit
	b	Introduction to Finite Difference method, Comparison with Finite Element Analysis, crank-Nicholson method,

References:

1 Chapra, Canale," Numerical Method for Engineer",McGraw Hill Co.

2 Joh. H. Mathews," Numerical Methods", Pearson Education

3 P. Kandaswamy," Numerical Methods",S. Chand & Co. New Delhi

4 J. N. Reddy," Finite Element Method",McGraw Hill Co.

5 S. S. Shastri," Introductory Method of Numerical Analysis ", Prentice Hill India.

6 Belegundupatla," Introduction to Finite Element Method",Prentice Hill India.

Course Outline

Metrology and Quality Control **MQC**
Course Title: Short Title Course Code

Branch - Mechanical Engineering **Year** **Third Year**

Course Description: This course introduces undergraduate students to Metrology and Quality Control. The background required includes a sound knowledge to Measurements, (calculus), applied thermodynamics, Industrial management at second year level.

Course Objective: The course aims at imparting knowledge of metrology and quality control. The course aims at to familiarize to understand the principles metrology of screw threads, gear measurement, study of measuring machines, recent trends in engineering metrology. To learn to use standard practices and standard data, learn to use statistical concept, control chart for variables, control chart for attributes, acceptance sampling

Teaching Scheme

	Hours Per Week	**No. of Week**	**Total Hours**	**Semester Credits**
Lecture	03	14	42	3
Practical	02	14	28	

Examination scheme:
End semester exam (ESE) 80 Marks Duration: 03 hours
Internal Sectional exam (ISE) 20 Marks
Internal Continues Assessment (ICA) 25 Marks
End Semester Exam (ESE) 25 Marks
Practical Examination

Purpose of Course: Degree Requirement

1.	**Metrology**	**No. of Lectures – 08, Marks: 16**
	a	Definition: Measurement, precision, accuracy, sensitivity, Classification of method of measurement
	b	Linear Measurement:-Standards, line standards, end standards, classification of standards, precision measurement, precision measuring instruments and their characteristics, slip gauge
	c	Straightness, flatness and squareness:-Surface plates, measurement of straightness, flatness testing, squareness testing, roundness testing, machine tool metrology, Measurement by light wave interference:- Basic principle, sources of light, optical

		flats, fringe patterns and their interpretation, testing of flat, convex and concave and irregular surface, checking of slip gauges.

UNIT:-II

2.	**Design of gauges &Metrology**	**No. of Lectures – 08, Marks: 16**
	a	Design of gauges:- Types of gauges, limits, fits, tolerences, Taylor's principle
	b	Comparators:-Characteristics, application, types, construction and working of different mechanical, optical, electrical, pneumatic comparators
	c	Angle measurement:-Sine bars, Sine centers, Use of sine bar, angle gauges, autocollimator angle dekkor, constant deviation prism, Measurement of surface finish:-Types of Surface texure, elements of surface texture, measuring surface finish by stylus probe, Tomlinson & Taly-surf

UNIT: - III

3.	**Metrology of Screw thread, Gear & recent trend in metrology. No. of Lectures – 08, Marks: 16**	
	a	Metrology of screw threads:-Terminology, errors and their effects, thread gauges, measurement of elements of external and internal threads, Gear measurement:-calipers measurements, involute testing, roller measurements, tool makers microscope, profile projectors
	b	Study of measuring machines:-Universal measuring machine, coordinate measuring machine, Errors in CMM, electronic inspection and measuring machine, Recent trend in engineering metrology:-precision instrument based on laser, probes, telemetric systems, Isometric viewing of surface defects, Machine vision

UNIT:-IV

4.	**Quality control**	**No. of Lectures – 08, Marks: 16**
	a	Introduction to quality :- factors controlling quality of design and conformance, balance between cost of quality and value of quality, Introduction to quality tools: Demings PDCA,PDSA cycles & Juran triology approach, Seven quality tools, Pareto

		analysis, cause &effect diagram, brainstorming, concurrent engineering
	b	Total quality management:, zero defect concept 5S,Kaizen,Kanban,,Poka yoke, TPM ,ISO 9000&TQM, Quality assurance ;-QFD, difference between inspection, quality control and quality assurance, quality survey

UNIT: - V

5.	**Statistical Quality Control**	**No. of Lectures – 08, Marks: 16**
	a	Statistic concept:-Concept of variation, variable & attribute data, the frequency distribution, quantitative description of distribution, normal curve, concept of six sigma, Control chart for variables:-definition of control chart, objective of control chart chart, R chart, Problems on X & R chart
	b	Control chart for attributes:-practical limitations of the control charts for variables charting chart chart, Problems on P & C chart
	c	Acceptance sampling:-Sampling inspection Vs hundred percent inspection, basic concept of sampling inspection, OC Curve, conflicting interests of consumer and producer, producer's and consumer's risk, AQL LTPD, Sampling plans

Recommended Books :

[1] R.K.Jain: Engineering Metrology: Khanna Publishers.
[2] Handbook to industrial metrology: ASTME: Printice Hall Pub
[3] G.M.Juran: Handbook of quality control, McGraw Hill Pub.
[4] M.Mahajan: Statistical quality control
[5] K.C.Jain:TQM & ISO 9000;Khanna publishers
[6] I.C.Gupta: A textbook of Engg Metrology: Khanna Publishers.
[7] M.Mahajan : A textbook of metrology :Dhanpat rai & co.

Lab - Course Outline

Metrology and Quality Control	**MQC**	
Course Title	Short Title	Course Code
Branch- Mechanical/Automobile Engineering	**Year**	**Third Year**

Course Description:
This lab includes performance practical and study practical related to metrology and quality control

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation Scheme:

Internal Continuous Assessment (ICA) 25 Marks

End Semester Exam (ESE) (Oral) 25Marks

Prerequisite Course(s): General mathematics, 11t^{h} Physics & 12th physics

Outline of content:

This practical contains following experiments

1 Determination of linear/angular dimensions of part using precision & non precision instrument.

2 Machine tool alignment tests on any machine tool like Lathe,Drilling,Milling.

3 Interferometer-Study of surfaces using optical flat.

4 Surface finish measurement.

5 Measurement of roundness/circularity using mechanical comparator.

6 Measurement of screw parameters

7 Measurement of Gear parameters i) gear tooth thickness ii)constant chord iii)PCD

8Study and applications of tool makers microscope

9 Use of profile projector

10 Study and use of control charts

Note: Any EIGHT practical from Mechanical Measurement and Metrology Lab shall be conducted during 14 weeks available during semester.

ESE (Practical Examination)

- **The Practical Examination will comprise of performing the experiment and viva on the practical's.**

Course Outline

Turbo Machinery **Turbo M/C**

Course Title Short Title Course Code

Branch: - Mechanical Engineering **Year** **Third Year**

Course Description:-

This course introduces undergraduate students to Turbo Machinery. The background required includes a sound knowledge to Mathematics (Calculus), Engineering Thermodynamics, Applied Thermodynamics and Fluid Mechanics at Second Year Level. The Course aims at imparting knowledge of Turbo Machinery.

Teaching Scheme:-

	Hours per week	**No. of weeks**	**Total Hours**	**Semester Credits**
Laboratory	3	14	42	3
Practical	2	14	28	1

Evaluation Scheme:-

End Semester exam (ESE) 80 Marks Duration: 03 hours

Internal Sessional exam (ISE) 20 Marks

Prerequisite Course (S):- Mathematics (Calculus) at first year level and Engineering Thermodynamics, Applied Thermodynamics and Fluid Mechanics at Second Year Level.

Outline of Content:- The Course Contains :

UNIT-I

1.	**Steam Turbines**	**No. of Lectures-08 Marks-16**
	a	Types of turbines, Constructional details impulse turbine.
	b	Compounding of turbine, Velocity diagrams, Output efficiency.
	c	Reaction turbine, Velocity, Diagrams, Degree of reaction.
	d	Governing of turbines, Application of turbines, Losses in turbines.

UNIT-II

2.	**Gas Turbines**	**No. of Lectures-08 Marks-16**
	a	Theory and fundamentals of gas turbines, principles, classification.
	b	Joule's cycles, Assumptions for simple gas turbines, Cycle analysis, Work ratio, Concept of maximum and optimum pressure ratio, Actual cycle.
	c	Effect of operating variable on thermal efficiency, Regeneration, Intercooling, reheating, their effects on performance.
	d	Closed cycle and semiclosed cycles gas turbine plant, Applications of gas turbines.

UNIT-III

3.	**JET PROPULSION**	**No. of Lectures-08 Marks-16**
	a	Introduction, Theory of jet propulsion, Types of Jet Engines.
	b	Energy flow through Jet Engines, Thrust, Thrust power, and Propulsive efficiency.

	c	Turbo jet, Turbo Prop, Turbo fan engines, Pulse jet and ram jet engines.
	d	Performance characteristics of these engines, Thrust segmentation application of jet engines, Concept of rocket propulsion.

UNIT-IV

4.	**HYDRAULIC TURBINES**	**No. of Lectures-08**	**Marks-16**
	a	Impulse momentum principle, Fixed and moving flat plate and curve vanes, Series of plates & vanes, Velocity triangles and their analysis, Work done, Efficiency etc.	
	b	Classification of hydraulic turbines, Heads & various efficiencies.	
	c	Impulse turbine: Main components and constructional features of pelton wheel,	
	d	Velocity diagrams & work done, Condition for max. hyd. Efficiency, Number of buckets, Jets, Non dimensional parameters (speed ratio, jet ratio).	

UNIT-V

5.	**HYDRAULIC TURBINES (REACTION TYPE)**	**No. of Lectures-08**	**Marks-16**
	a	Reaction turbine, Main components & Constructional Features.	
	b	Types of reaction turbine (Francis, Kaplan), Velocity Digrams.	
	c	Unit quantities, Selection of turbine considering various factors, Specific speed, Types of characteristic curves.	

	d	Draft tube types, Efficiency, Cavitations, Governing mechanisms for pelton wheel, Francis, Kaplan turbines.

References:-

1. Domkundwar, “Thermal Engineering”, Dhanpat Rai and Co Ltd. Delhi
2. P L Ballaney , “Thermal Engineering”. Khanna Publications, Delhi.
3. R K Rajput , “Thermal Engineering”, Laxmi Publication ltd. New Delhi.
4. Dr. R. K. Bansal, “Fluid Mechanics and Hydraulic M/c”, Laxmi publication Ltd. New Delhi.
5. Dr. Jagdish Lal, “Hydraulic Machine”. Metro politan book co. pvt Ltd. Delhi
6. Dr Modi seth, “Hydraulics & Fluid Machine”. Standard book house Delhi.
7. R. Yadav “Steam & Gas turbine”, Central Publications, Allahbad.
8. J. K. Jain “Gas Turbine Theory & Jet Populsion”, Khanna Publications, New Delhi.
9. Cohen, Roger “Gas Turbine theory”, Longman Publications.
10. Gopalkrishnan “A Treatise on Turbomachines”, Scitech Pub. (India)pvt.Ltd,Chennai
11. Kadambi V. & Prasrd M, “Turbo Machinery”, New Age International Publication New Delhi.

Lab: - Course Outline

Turbo Machinery **Turbo M/C Lab**

Course Title Short title Course code

Branch: - Mechanical Engineering

Course Description:-

This lab includes different practical of Turbo Machinery. The Course aims at imparting knowledge of Turbo Machinery.

Teaching Scheme:-

	Hours per week	**No. of weeks**	**Total Hours**	**Semester Credits**
Laboratory	2	14	28	1

Evaluation Scheme:-

Internal Continuous Assessment (ICA) 25 Marks

End Semester exam (ESE) (ORAL) 25 Marks

Prerequisite Course (S) :- Mathematics (Calculus) at first year level and Engineering Thermodynamics, Applied Thermodynamics and Fluid Mechanics at Second Year Level.

Outline of Content:- This Course Contains:

1. Study of steam turbine power plant.
2. Study of steam turbine systems.
    a) Methods of compounding
    b) Methods of governing
    c) Losses in steam turbine
    d) Lubrication system.
3. Trial on steam turbine.
4. Study of gas turbines.
5. Study of hydraulic turbines.
6. Trial on pelton wheel.
7. Trial on Francis turbine.
8. Trial on Kaplan turbine.
9. Trial on gas turbine plant.
10. Study of various jet propulsion devices / engine.
11. Visit to hydraulic power plant.

Note: Lab file should contain at list EIGHT experiments from above mentioned list.

ESE (Oral Examination)

The Oral Examination will comprise of viva on the above Eight Experiments.

Course Outline

Project and Business Management	**PBM**	
Course Title	Short title	Course Code
Branch: Mechanical Engineering	**Year**	**Third Year**

Course Description: This course introduces undergraduate students to imparting knowledge of project & business management. The background required a sound knowledge of network technique, organization structure, Financial and material management.

Course Objectives

1. To provide about project and its management.
2. To develop knowledge about organization and impart knowledge about functioning of management.
3. To develop knowledge about financial management techniques.

Course Outcome

At the end of the course the students are able to-

1. Develop knowledge of project management and statistical tools used in its.
2. Helped to understand the various functions of management along with its types.
3. Develop knowledge about Capital cost and cost control.

Teaching Scheme

	Hrs per week	No. of weeks	Total hour	Semester Credits
Lecture	03	14	40	03

Examination Scheme:

End semester scheme(ESE)	**80 marks**	**Duration : 03 Hrs.**
Internal Sessional Examination (ISE)	**20 marks**	

Purpose of Course: Degree Requirement

Prerequisite Courses: Fundamental knowledge about the mathematics.

Outline of the content: This course contains:

Unit- I

1.	Title: **Project Management**	**No. of Lecture:08 ,Marks: 16**
	a	Introduction to project management, Concept of project management, Managerial function at different organizational levels, Types of projects,
	b	Project identification, scheduling, Monitoring, Control, Basic tool & techniques for projects scheduling Bar chart, Project life cycle curves, Line balancing, Problems on Line balancing.

Unit- II

2.	Title: **Project statistic technique**	**No. of Lecture:08 ,Marks: 16**
	a	Introduction of Network technique, Fundamental concept and network models, construction of network diagrams,
	b	Application of network analysis, definition of PERT and CPM, comparison between CPM and PERT, Critical path method with problem, programme evaluation and review techniques with problem, time cost problem (crash) with PERT.

Unit- III

3	**Business management**	**No. of Lecture:08 ,Marks: 16**
	a	Introduction to management, Concept of management, The function of management, importance of management Forms of business organsation, Concept of Ownership Organization, Types of ownership, Individual Ownership, Partnership organization, joint stock companies, types of stock companies,
	b	Co-operative Organisations, various types of co-operative societies, Public sector organization,State ownership, public cooperation, choice of form of organisation, comparative evaluation of different forms of business ownership.

Unit- IV

4.	Title: **Financial Management**	**No. of Lecture:08 ,Marks: 16**
	a	Introduction, Definition of financial management, functions of financial management, Sources of Funds, Capital, classification of capital, working capital, need for working capital, assessment of working capital, Factors affecting working capital, Sources of finance (Shares, debentures, loans from banks, trade credit public deposits financial institutions).
	b	Cost and cost control: Elements of cost, direct cost, indirect cost, variable and fixed cost, cost control technique, marginal costing, break even analysis.

Unit- V

5	Title: **Material & Purchase Management**	**No. of Lecture:08 ,Marks: 16**
	a	Scope of material management, function of material management, objectives of scientific purchasing, functions of purchase department, , 5R's Of Buying, Methods of buying, source selection (vendor),vendor rating, just in time purchasing
	b	Inventory management, Objective of inventory management, types of inventory, selective inventory technique (ABC,VED), Inventory model (Economic lot size with fixed price, EOQ with quantity discount).

References:

1) L.C.Jhamb ,"Production(Operation)Management", Everest publishing house
2) Chary," Theory And Problems in Production and Operations Management",2nd Reprint, Tata McGraw Hill Publishing Co. New Delhi., 1996.
3) Nair,N.G.,"Production & Operations Management",Tata McGraw Hill Publishing Co. New Delhi.,1997.
4) Chadra Presanna,"Fundamentals of Financial Management" Tata McGraw Hill New Delhi.,1994.
5) Kolter Philip,"Marketing Management",Prentice-hall of India,1988.
6) Vyuptakesh Sharan.,"Fundamental of Financial Management", Pearson Education
7) Martand telsang,"industiral engineering and production management",1st Edition reprint 2013- S.chand & company ltd. New Delhi.2013
8) S.M.Inamdar, "Cost and Management Acounting"
9) M.K.Khan &P.K.Jain,"Financial Management", Tata McGraw Hill Publishing Co. New Delhi.
10) J.P.Bose, S.Talukdar, "Business Management", New Central Agencies (P) Ltd.

Lab - Course Outline

COMPUTER PROGRAMMING IN C / C++ **C/C++**

Course Title Short title Course code

Branch - Mechanical / Automobile Engineering **Year – Third Year**

Course Description:

This course provides students with a comprehensive study of the C /C++ programming language. Introduction to program design and problem solving using the C /C++ programming language. Programming topics include control structures, functions, arrays, pointers, and file I/O.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Prerequisite Course(s): Algebra and Trigonometry

Outline of Content: This course contains

a) One assignment on introduction to computer

b) To develop and Run "C/C++" programs for machine elements like

(Any two on C and two on C++)

a) Design of knuckle joint or turnbuckle joint

b) Design of power screw

c) Design of helical spring

d) Design of splines

e) Design of muff coupling

f) Theories of failure etc.

Recommended Books:

1) Balgurusamy, "Programming in C" Tata McGraw Hill Publication Co. Ltd.

2) Y. Kanitkar, “Let us C” BPB Publications.

3) M. P. Grover and Zimmer, “CAD/CAM” PHI Pvt. Ltd.

4) Shigley J.E. and Mischke C.R. “Mechanical Engineering Design” McGraw Hill Publication Co. Ltd.

5) Spotts M.F. and Shoup T.E. “Design of Machine Elements” Prentice Hall International.

6) Bhandari V.B. “Design of Machine Elements” Tata McGraw Hill Publication Co. Ltd.

7) Balgurusamy, “Object Oriented Programming with C++” Tata McGraw Hill, New Delhi

8) Ravi Chandran, “Programming in C++” Tata McGraw Hill Publication Co. Ltd.

COURSE CONTENT

Minor Project **MIP**

Course Title Short Title Course Code

Semester-VI

Laboratory	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	2	**10**	**20**	**2**

Examination Scheme **Internal Continuous Assessment (ICA): 50 Marks**

- Every student shall undertake the Minor Project in semester VI.
- Each student shall work on an approved project, a group of **05 students (maximum)** shall be allotted for the each minor project.
- Minor project may involve fabrication, design or investigation of a technical problem that may take design, experimental or analytical character or combine element of these areas. The project work shall involve sufficient work so that students get acquainted with different aspects of fabrication, design or analysis.
- Each student is required to maintain separate log book for documenting various activities of minor project.
- The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of minor project. Maximum four minor project groups shall be assigned to one teaching staff.
- Assessment of the project for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-A.**
- Before the end of semester, student shall deliver a seminar and submit the seminar report (paper bound copy)in following format:
    - Size of report shall be of minimum 25 pages.
    - Student should preferably refer minimum five reference books / magazines/standard research papers.

- Format of report
  - Introduction.
  - Literature survey.
  - Theory (Implementation, Methodology, Applications, Advantages, Disadvantages. etc)
  - Future scope.
  - Conclusion.

Assessment of Minor Project

Name of the Project: _____

Name of the Guide: _____

Table-A

SN	Exam Seat No	Name of Student	Project Selection	Documentation	Design /Simulation/Logic	PCB/hardware/programming	Result Verification	Presentation	Total
			5	10	10	10	10	5	50

COURSE CONTENT

Seminar-I **S-I**

Course Title Short Title Course Code

Semester-VI

Laboratory	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	2	**10**	**20**	**2**

Examination Scheme **Internal Continuous Assessment (ICA): 25 Marks**

1. For Seminar-I every student will individually study a topic assigned to him / her and submit a report and shall deliver a short lecture / Seminar on the topic during the term.
2. The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Seminar-I. Seminar shall be related state of the art topic of his choice approved by the committee.
3. Seminar topic should not be repeated and registration of the same shall be done on first come first serve basis.
4. Topic of Seminar shall be registered within a two week from commencement of VI Semester and shall be approved by the committee.
5. Maximum six seminar supervision shall be allotted to each teacher.
6. Before the end of semester, student shall deliver a seminar and submit the seminar report (paper bound copy).

ASSESSMENT OF SEMINAR-I

Assessment of the Seminar-I for award of ICA marks shall be done by the guide and a departmental committee jointly, as per the guidelines given in **Table- B**

Title of Seminar: _____

Name of Guide: _____

Table-B

SN	Exam Seat No	Name of Student	Topic Selection	Literature survey	Report writing	Depth of understanding	Presentation	Total
			5	5	5	5	5	25

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

FINAL YEAR ENGINEERING (B.E.)

(MECHANICAL ENGINEERING)

TERM-I & II

W.E.F.: 2008-09

NORTH MAHARASHTRA UNIVERSITY, JALGAON
STRUCTURE OF TEACHING AND EVALUATION
B.E. (MECHANICAL ENGINEERING)

FIRST TERM **W.E.F. 2008-09**

Sr. No.	Subject	Teaching Scheme Hours/week			Examination Scheme				
		Lectures	Tutorial	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Refrigeration And Air Conditioning	4	--	2	3	100	25	--	25
2	CAD/CAM	4	--	2	4	100	25	--	25
3	***Mechatronics Systems	4	--	2	3	100	25	--	25
4	Operational Research	4	--	--	3	100	--	--	--
5	Elective – I	4	--	--	3	100	25	--	--
6	***Seminar	--	--	2	--	--	25	--	--
7	***Project	--	--	2	--	--	25	--	25
	Total	**20**	**--**	**10**	**--**	**500**	**150**	**--**	**100**
	Grand Total	**30**			**750**				

*** Common with Production Engineering and Automobile Engineering

SECOND TERM

Sr. No.	Subject	Teaching Scheme Hours/week			Examination Scheme				
		Lectures	Tutorial	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Finite Element Analysis and Simulation	4	--	4	4	100	25	--	25
2	Mechanical Vibration	4	--	2	3	100	25	--	25
3	Tribology	4	--	2	3	100	25	--	25
4	Elective – II	4	--	--	3	100	25	--	--
5	***Project	--	--	4	--	--	100	--	50
6	***Industrial Visit / Case Study	--	--	--	--	--	25	--	--
	Total	**16**	**--**	**12**		**400**	**225**	**--**	**125**
	Grand Total	**28**			**750**				

*** Common with Production Engineering and Automobile Engineering

Elective-I
1. Energy Conservation and Management
2. Advanced Machine Design
3. Machine Tool Design
4. Product Development And Rapid Prototyping
5. Automobile Engineering
6. Fluid Machinery

Elective-II
1. Power Plant Engineering
2. Process Equipment Design
3. Introduction To Robotics
4. Advanced Welding Technology
5. Energy Engineering
6. Industrial Fluid Power

B.E. (MECHANICAL ENGINEERING): FIRST TERM
REFRIGERATION AND AIR CONDITIONING

Teaching Scheme
Lectures : 4 Hours/week
Practical : 2 Hours/week

Examination Scheme
Theory Paper : 100 Marks
Term Work : 25 Marks
Oral : 25 Marks
Paper Duration : 3 Hours

UNIT - I **10 Hours (20 Marks)**

Introduction, standard rating of refrigerating machine, coefficient of performance of refrigerator and heat pump.
Reversed Carnot cycle and its limitations, reversed Brayton cycle, application to air craft refrigeration, Bootstrap refrigeration cycle, reduced ambient air cooling system, regenerative air cycle system. (Numerical treatment)
Designation of refrigerant, selection of refrigerant, chemical, physical and thermodynamic requirements of refrigerants, lubricant in refrigerating system, secondary refrigerant, azeotropes and its uses.

UNIT - II **10 Hours (20 Marks)**

Vapour compression refrigeration system study of theoretical and actual vapour compression cycle, use of p-h & T-s charts, effect of evaporator and condenser pressure and temperature on the performance of the refrigeration cycle, effect of sub cooling and super heating. (Numerical treatment)
Compound vapour compression system with inter cooling, flash chamber, multi compressor and multi evaporators systems. (Numerical treatment)
Cascade refrigeration system, production of dry ice, Joule Thomson coefficient, and inverse curve, liquefaction of air and gases. (no numerical treatment)

UNIT - III **10 Hours (20 Marks)**

Vapour absorption refrigeration simple & modified vapour absorption refrigeration systems, Electrolux refrigerator.
Desirable properties of solvent, absorbent & refrigerant combinations, aqua ammonia & lithium bromide refrigeration system use of enthalpy concentration charts. (Numerical treatment)

UNIT - IV **10 Hours (20 Marks)**

Psychometric- properties of moist air, psychrometric chart and process, mixing of air stream, bypass factor, sensible heat factor, room sensible heat factor, Gross sensible heat factor, humidifying efficiency, air washer. Study of various types of psychrometers, sling, aspirating, and industrial type. (Numerical treatment)

UNIT - V **10 Hours (20 Marks)**

Introduction to industrial and comfort air conditioning, human requirements of comfort, effective temperature and comfort chart.Air conditioning load calculations, inside and outside design conditions, Building cooling & heating load calculation, Effective sensible heat factor advanced psychrometry. (Numerical treatment)
Window and central air conditioning systems year round air conditioning, Direct and chilled water air conditioning.

TERM WORK

LIST OF PRACTICAL**:** Any eight out of the following to be performed with minimum three trials.
1) Trial on vapour compression refrigeration system.
2) Trial on ice plant/domestic refrigeration system.
3) Study and trial on vapour absorption refrigeration system.
4) Study and trial on window/central air conditioner.
5) Study and trial on heat pump test rig.
6) Study of construction of hermetically sealed compressor and actual viewing of a cut model of the same (reciprocating, rotary and car A/C compressor).
7) Study of evacuation and charging of refrigeration system.
8) Study and trial on cooling towers.
9) Study of expansion devices, solenoid valve and safety devices used in vapor compression system.
10) Study of thermostat and humidistat, dryer, oil separator.
11) Study of measuring instruments and various tools used in refrigeration and air-conditioning systems.

12) Visit to cold storage/ice plant/ central air conditioning system.
13) Cooling load calculation of any laboratory / class room in the institute & suggest the requirement of Air conditioner unit in terms of capacity.

Note: Oral will be based on the prescribed term work presented in the form of certified journal.

REFERENCE BOOKS

1) Arora C. P.," Refrigeration and air conditioning", TMH, New Delhi.
2) Monohar Prasad," Refrigeration and air conditioning", New Age Publishers New Delhi.
3) Ananthnarayanan," Basics of Refrigeration", TMH, and New Delhi.
4) Stocker W. F. and Jones," Refrigeration and air conditioning", McGraw Hill.
5) Dossat," Principles of Refrigeration", John Wiley Inc.
6) Arora and Domkundawar," Refrigeration and air conditioning", Dhanpatrai and sons, New Delhi.
t) Faye C McQuistom,"Heating Ventilatging nad Air conditioning",Wiley India Pvt.Ltd. New Delhi

B.E. (MECHANICAL ENGINEERING): FIRST TERM
CAD/CAM

Teaching Scheme
Lectures : 4 Hours/week
Practical : 2 Hours/week

Examination Scheme
Theory Paper : 100 Marks
Term Work : 25 Marks
Oral : 25 Marks
Paper Duration : 4 Hours

UNIT – I **10 Hours (20 Marks)**

INTRODUCTION TO CAD/CAM AND NETWORKING
Define CAD/CAM, Product Life Cycle & CAD/CAM, Application of Computers for Design Process, Selection of a CAD system, Desirable relationship of CAD/CAM database, Benefits & Application of CAD
Hardware in CAD, Introduction, The Design Work Station, The graphics terminal, Operator input/output devices,
Computer communication,Principle of networking, Classification of network, Transmission media & interface, LAN system.

UNIT – II **10 Hours (20 Marks)**

COMPUTER GRAPHICS
Introduction, Graphic Primitives, Point plotting, Drawing of lines, Co ordinate system used in graphic element, Transformation in graphics, D transformation, Homogeneous transformation, Concatenate co ordinate transformation, Translation, Rotation, Scaling, Mirror, Reflection, Inverse co ordinate transformation, clipping, 3D transformation, Projections, Scan conversion, Rendering, Shaving, View Port, Windowing, Standardization in graphics IGES files

UNIT – III **10 Hours (20 Marks)**

GEOMETRIC MODELING
Requirement of Geometric Modeling, Geometric Model, Geometric Model Construction Method,, Wire Frame Modeling, Surface Modeling, Solid Modeling, Representation of Curve & Surfaces, Design of curve shape, Cubic Spline, Bezier curve, B-spline curve, Nurbs B-spline, Representation of surfaces
AUTOMATION
Concept of Automation, Types of Automation, Advantages & limitations of Automation, Levels of Automation, Advanced Automation Function

UNIT – IV **10 Hours (20 Marks)**

INDUSTRIAL CONTROL SYSTEM
Continuous control system, Discrete control system, Computer process control, Forms of CPC, Computer process Monitoring, Direct Digital Control, Numerical Control & Robotics, Programmable logic controller, Supervisory control, Distributed Control & Personnel Computers
CNC PROGRAMMING
Axis of CNC Machines, Manual Part Programming using G codes, Use of Sub routines, Computer Aided Part Programming using APT or any other language/G- coding /M- coding.

UNIT – V **10 Hours (20 Marks)**

FMS, GT AND ROBOTICS
FMS – Introduction, Components of FMS, Types of FMS, Application & Benefits, Planning & implementation issue, Typical FMS layout.
GT – Part families, Part classification & coding, optic coding system, Multiclass coding system, Application of GT.
Robotics – Robot Anatomy, Robot Control System, End effectors, Sensors, Industrial Robot, Application and its selection.

TERM WORK

List of Practical-
1. Modeling of any three Machine Component *
2. Any Two Assembly of Mechanical Components*
3. Three assignments based on above syllabus

* Modeling & Assembly can be done by using any modeling software

Note: Oral will be based on the prescribed term-work presented in the form of certified journal.

REFERENCES

1) P. Radhkrishnan, S. Subramanyam, V. Raju ,"CAD/CAM/CIM" , New Age Publication
2) Grover, Automation, "Production System and Computer Integrated Manufacturing", Pearson Education.
3) Mikell P. Grover, Emory W. Zimmers ,"Computer Aided Design and Manufacturing", P.H.I
4) Rao, Tiwari, Kundra ,"Computer Aided Manufacturing" ,T.M.H
5) Zeid ,"CAD/CAM" ,T.M.H
6) James G. Keramas ,"Robot Technology Fundamentala", Vikas Publication House
7) B.S.Pabla, M.Adithan ,"CNC Machine ", New Age International(P) Ltd.
8) Rudra Pratap, "Getting Started with Matlab 7", OUP, New Delhi.

B.E. (MECHANICAL ENGINEERING): FIRST TERM
MECHATRONICS SYSTEMS
(Common with Production Engineering and Automobile Engineering)

Teaching Scheme
Lectures : 4 Hours/week
Practical : 2 Hours/week

Examination Scheme
Theory Paper : 100 Marks
Term Work : 25 Marks
Oral : 25 Marks
Paper Duration : 3 Hours

UNIT – I **10 Hours (20 Marks)**

INTRODUCTION TO MECHATRONICS
Scope and importance of mechatronics, Key issue, Systems, Measurement systems.
TRANSDUCERS AND SENSORS
Introduction, Difference between transducer and sensor, Transducer types, Transduction principle, Photoelectric transducers – photoemissive transducers, photoconductive transducers, photovoltaic transducers, Thermistors, Thermodevices, Thermocouple, Inductive transducers, Capacitive transducers, Pyroelectric transducers, Piezoelectric transducer, Half-effect transducer, Ionization transducers, Light Emitting diode, Optical encoder – incremental encoder, absolute optical encoder, Bimetallic strip, Bourdon tube, Strain gauge, Load cell, Diaphragms, Mechanical switches, Flow transducers, Fibre optic transducers.

UNIT – II **10 Hours (20 Marks)**

SIGNAL CONDITIONING
Introduction, Voltage divider, Rectification, Diode voltage stabilizer, Clipping and Clamping circuit, Amplifier – OPANP circuits, more about filter circuits, Isolator, Instrumentation amplifier, Bridge circuit, Comparator, Oscillator, 555 Timer, Sample and Hold, Clock, Analog to Digital conversion – digital to analog converter, counter based analog to digital converter, successive approximation, Galvanometer, Ammeter and Voltmeter, Cathode ray oscilloscope.
DATA PRESENTATION AND DATA LOGGING SYSTEMS
Introduction, Recorders – Graphic recorders, Strip chart recorders, X-Y recorders, Magnetic tape recorder.
Data loggers – block diagram description , Data acquisition system – generalized data acquisition system, computer based data acquisition system.

UNIT – III **10 Hours (20 Marks)**

ACTUATORS AND MECHANISMS
Introduction, Actuator types and application areas, Electromechanical actuators, DC Motors – brushed DC motor, brushless, coreless, AC Motors – induction motors, synchronous motors, stepper motor, Fluid power actuators – pneumatic actuators, valves actuators, hydraulic actuators, comparison, Piezoelectric actuators – an illustration, piezoelectric motor, Magnetostrictive actuators, Memory metal actuators, Ion-exchange polymer metal composites, Chemical actuator.
Mechanisms, Bearings – slide bearing, journal bearing, rolling element bearing, magnetic bearing, molecular bearing, Belt, Chain, Pulleys, Gears – gear ratio, Rack and pinion, Ratchet, Pawl and Crank, Slider and crank, Cam and Follower – shape of the cam, shape of the follower, Chain and Sprocket, Geneva wheel, Four bar linkages.

UNIT – IV **10 Hours (20 Marks)**

INTRODUCTION TO MICROPROCESSORS AND MICROCONTROLLERS
Microprocessor – Introduction, Basic element of control systems
Microcontrollers – Introduction, Difference between Microprocessors and Microcontrollers
Programmable logic controllers – Introduction.
CONTROL SYSTEMS AND CONTROLLERS
Introduction, Control system, Open-loop control systems, Closed-loop control systems – notations, reachability, transfer function.
The Controllers – on-off controller, proportional controller, integral controller, derivative controller, proportional plus integral controller, proportional plus derivative controller, proportional plus integral plus derivative controller, comparison, More about automatic control, Difing automatic control methods.

UNIT – V **10 Hours (20 Marks)**

INTEGRATION

Introduction, Background, Advanced actuators – advanced motorized actuators, pneumatic actuators, servo actuator systems, Consumer mechatronic products, Hydraulic fingers, Surgical equipment, Industrial robot – different parts of a robot, controller, drive, arm, end effector, sensor, functional requirements, robot based automation, Autonomous guided vehicle – AGV architecture, components based DCS view, man machine interface, design with fieldbus technology, Drilling machine, Conveyor based material handling systems – validation, design.

INDUSTRIAL DESIGN, AESTHETICS AND ERGONOMICS

Introduction, Element of product design – product physiogonomy aesthetics, product physiogonomy ergonomics, ergonomics in machine tool design, ergonomics in machine tool safety, product safety audit, Ergonomic factors for advanced manufacturing systems – machine oriented industrial design, factory without people, ergonomic problems in new technology.

TERM WORK

Term work shall consist of any five experiments and three assignments.

1) Study of Basic block diagram of mechatronics system components.
2) Study and demonstration of motion / force transducers.
3) Study and demonstration of temperature / pressure transducers.
4) Study and demonstration of AD / DA converter
5) Study and demonstration of hydraulic actuator / pneumatic actuator.
6) Study and demonstration of graphic / magnetic tape recorders.
7) Study of Microprocessors and Microcontrollers
8) Study of Robot / Autonomous guided vehicle

Note: Oral will be based on the prescribed term-work presented in the form of certified journal.

REFERENCE BOOKS

1)D.R. Appukuttan,"Introduction to Mechatronics", Oxford University Press, New Delhi
2)N.P.Mahalik,"Mehatronics", Tata McGraw-Hill Publishing Company Limited, New Delhi
3) W. Bolton," Mechatronics", Pearson Education, New Delhi
4) Dan Necsulescu , "Mehatronics", Pearson Education, New Delhi
5) R.P. Borole," Mehatronics", Nirali Prakashan, Jalgaon.
6) D. V. Alciatore, "Introduction to Mechatronic and Measurement Systems", Tata McGraw- Hill Publishing Company Limited, New Delhi
7) HMT Limited, "Mechatronics", Tata McGraw-Hill Publishing Company Limited, New Delhi
8) J.G. Joshi, "Mechatronics", Prentice Hall of India, New Delhi
9) A.Smaili, "Applied Mechatronics", Oxford University Press, New Delhi.

B.E. (MECHANICAL ENGINEERING): FIRST TERM
OPERATIONAL RESEARCH

Teaching Scheme
Lectures : 4 Hours/week

Examination Scheme
Theory Paper : 100 Marks
Paper Duration : 3 Hours

UNIT – I **10 Hours (20 Marks)**

Introduction to O.R., Models in O.R., Scope, Phases, O.R. in Decision Making, Linear Programming,-model formulation, Graphical Method, Simplex Method(ONLY THEORY) , Concept of Quality and its application, Sensitive Analysis.

UNIT – II **10 Hours (20 Marks)**

Linear Programming – Simplex Method, Standard Form of an L.P. Problem , Simplex algorithm (Maximization Case), Simplex Algorithm(Minimization Case) Two Phase Method, The Big- M Method.

UNIT – III **10 Hours (20 Marks)**

Dynamic Programming- Introduction, Basic Concepts and Application, Characteristic of D.P., Dynamic Programming Approach.
Special Techniques of L.P. such as Transportation Model, Assignments Model, Traveling Salesman, Transshipments Problem.

UNIT – IV **10 Hours (20 Marks)**

Decision Theory- Decision Trees, Classes of Decision Model, Utility, Decision under Certainty, Uncertainty and Risk.
Games Theory – Theory Concept, Characteristics, Maximum And Minimum Principles, Saddle Point, Dominance Basic Concept and Terminology of Two Person Zero Sum Games, MXZ and ZXN Games, Sub Games Method, Graphical Method.

UNIT – V **10 Hours (20 Marks)**

Job Sequencing – Introduction, Sequencing Algorithm, Processing N Jobs Through Two Machines, Three Machines and M – Machines, two Jobs and M-Machine Graphical Method.
Replacement Models – Introduction, Types of Failure, Replacement of Items whose efficiency deteriorates with time(Model I & II), Replacement of Item that fail suddenly.

RECOMMENDED BOOKS

1) L.C. Jhamb ,"Quantities Techniques" Vol I and II, Everest Publication
2) Hira , Gupta ,"Operation Research "
3) Taha ,"Operation Research"
4) S.D. Sharma, "Operation Research", Khanna Publication
5) Manohar Mahajan, "Operation Research"
6) J.K.Sharma ,"Operation Research, Problem and Solution" , Macmillan
7) N.D.Vohra ,"Quantitative Techniques in Management" ,TATA Mc Graw Hill
8) Ravindran," Operation Research Principles and Practice ",Wiley India Pvt.Ltd. New Delhi

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B.E. (MECHANICAL ENGINEERING): FIRST TERM
ENERGY CONVERSION AND MANAGEMENT
ELECTIVE - I

Teaching Scheme
Lectures : 4 Hours/week

Examination Scheme
Theory Paper : 100 Marks
Term Work : 25 Marks
Paper Duration : 3 Hours

UNIT - I **10 Hours (20 Marks)**

Global and linear market - Energy scenario in various sector and Indian economy. Need and importance of energy conservation and management pay back period. Return on investment (R.O.I.), life cycle cost, sanyes diagrams, specific energy consumption. Load management.

UNIT - II **10 Hours (20 Marks)**

Energy auditing - Methodology, analysis and reporting, portable and on-line instruments. Costing of utilities like steam, compressed air, electricity and water. Energy system modeling analysis general concepts, classification of models and use of digital computers in modeling and analysis.

UNIT - III **10 Hours (20 Marks)**

Steam and condensate systems boilers (including package boilers), efficiency testing, Demand control, power factor improvement its benefit and ways of improvement, load scheduling.
Electric motors, lowers, efficiency, energy efficient types of electrical motors for energy conservation, motor speed control variable speed drive.
Lighting: Illumination level, fixtures, timers, energy efficient illumination.

UNIT - IV **10 Hours (20 Marks)**

Energy conservation compressed air systems, refrigeration and air conditioning systems, and water systems. Elementary converge of energy conversation in pumps and fans co-generation concepts, options (steam/gas turbine/D C T based) selection criterion.

UNIT - V **10 Hours (20 Marks)**

Energy action planning : Key elements, force field analysis, energy policy purpose, perspective contents, formulation, ratification, organizing, location of energy management, top management support, managerial function, roles and responsibilities of energy manager, accountability, motivating – motivation of employees, information system designing barriers, strategies, marketing and communicating, training & planning.

TERM WORK

Term work shall consist minimum eight assignments based on above syllabus.

RECOMEMNDED BOOKS:

1) Prof. Henderson," India the energy sector", oxford university press.
2) L.J. Nagrath ," System modeling and analysis", Tata McGraw Hill Press.
3) D.A.Ray," Industial energy conservation pergamon press".
4) IGC Drydin editor," The efficient use of energy" (butter worths)
5) W.C.Turner editor,"Energy management handbook (Wiley)
6) Patrick Steven R, Patric Dake R, Fordo Stephen,"Energy conservation guidebook". Fairmont press Inc.
7) F. William Payne & Richard E. Thompsion ," Efficient Boiler" Operation Source Book.
8) W.C.Turner editor: energy management handbook (Wiley)

B.E. (MECHANICAL ENGINEERING): FIRST TERM
ADVANCED MACHINE DESIGN
ELECTIVE- I

Teaching Scheme
Lectures : 4 Hours/week

Examination Scheme
Theory Paper : 100 Marks
Term Work : 25 Marks
Paper Duration : 3 Hours

UNIT - I **10 Hours (20 Marks)**

OPTIMUM DESIGN
Introduction to optimum design, Adequate design, Johnson's method of optimum design, Case of normal specifications, Case of redundant specifications, Case of incompatible specifications.

UNIT - II **10 Hours (20 Marks)**

SYSTEM APPROACH
Introduction, System approach to design mathematical model, Dynamic response to a distributed system, Dynamic response to a lumped system, Modelling the elasticities, Modelling the masses, Modelling the inertia, Modelling friction and damping, Mathematical model for shock analysis, Cam system, Value engineering approach to design problem.

UNIT - III **10 Hours (20 Marks)**

CAM:
Introduction, Advance cam curves, Polynomical cam, 3-4-5 polynomoal cam, 4-5-6-7 polynomial cam, Jerk cycloidal cam, Sine acceleration cam, Forces on cam, Mathematical model with elasticity, Jump phenomenon, Ramp of the cam – Precam, Polydyne cam.

UNIT - IV **10 Hours (20 Marks)**

DESIGN OF I.C. ENGINE COMPONENTS
Introduction, Principal part of IC engine, Design of piston, piston rings and piston pin, Design of cylinder and cylinder head, Design of connecting rod, Design of crank shaft, Design of valve gear mechanism.

UNIT - V **10 Hours (20 Marks)**

DESIGN OF HOISTING MECHANISMS
Introduction, Design of hoisting chains and drums, Design of ropes, Design of wire ropes, Stress in curved beams, Design of crank hook.

TERM WORK

Term work shall consist minimum eight assignments based on above syllabus.

REFERENCE BOOKS

1) Dr. Rajendra Karwa ," A text book of Machine Design", Laxmi Publications (P) Ltd, New Delhi
2) J. Uicker,"Theory of Machines and Mechanism", 3ed., Oxford University Press, New Delhi.
3) Farazdak Haideri ," Machine Design", Nirali Prakashan, Jalgaon
4) M.F. Spotts," Design of Machine Elements", Pearson Education
5) N.C.Pandya ," Element of Machine Design", Charotar book stall, Anand
6) Norton ," Dynamics of Machinery", Tata Mc-Graw Hill, New Delhi
7) P.C.Sharma ,"Machine Design", S K Katuria & Sons
8) R. S. Khurmi ," A text book of Machine Design", Eurasis Publishing House Pvt. Ltd, Delhi
9) R.B.Patil ,"Design of Machine Elements", Tech- Max Publications, Pune

B.E. (MECHANICAL ENGINEERING): FIRST TERM
MACHINE TOOL DESIGN
ELECTIVE- I

Teaching Scheme
Lectures : 4 Hours/week

Examination Scheme
Theory Paper : 100 Marks
Term Work : 25 Marks
Paper Duration : 3 Hours

UNIT - I **10 Hours (20 Marks)**

DESIGN OF SPEED AND FEED RATES
Aim of speed and feed rate regulation, Stepped regulation of speed : Design of speed box, Design of feed box, Machine tool drives using multiple speed motors, Special cases of gear box design, General recommendations for developing the gearing diagram, Determining the number of teeth of gears, Classification of speed and feed boxes, Stepless regulation of speed and feed rates.

UNIT- II **10 Hours (20 Marks)**

DESIGN OF MACHINE TOOL STRUCTURES
Functions of Machine tool structures and their requirements, Design criteria for tool structures, Static and dynamic stiffness, Profiles of machine tool structures, Basic design procedure of machine tool structures, Design of beds, Design of columns, Design of housings, Design of bases and tables, Design of cross rails, arms, saddles and carriages, Design of rams.

UNIT - III **10 Hours (20 Marks)**

DESIGN OF GUIDEWAYS AND POWER SCREWS
Functions and types of guideways, Design of slideways, Design criteria and calculations for slideways, Guideways operating under liquid friction conditions, Design of aerostatic slideways, Design of anti-friction guideways, Combination guideways, Protecting devices for slideways, Design of Power screws.

UNIT - IV **10 Hours (20 Marks)**

DESIGN OF SPINDLES AND SPINDLE SUPPORTS
Functions of spindle unit and requirements, Material of spindles, Effect of machine tool compliance on machining accuracy, Design calculations of spindles, Antifriction bearings, Sliding bearings.
DYNAMICS OF MACHINE TOOLS : Machine tool elastic system cutting process closed loop system, General procedure for assessing dynamic stability of EES cutting process closed loop system, Dynamic characteristics of elements and systems, Dynamic characteristic of the equivalent elastic system, Dynamic characteristic of the cutting process, Stability analysis, Forced vibrations of machine tools.

UNIT - V **10 Hours (20 Marks)**

CONTROL SYSTEMS IN MACHINE TOOLS
Functions, Requirements and classification, Control systems for changing speeds and feeds, Control systems for executing forming and auxiliary motions, Manual control systems, Automatic control systems Adaptive control systems.
NUMERICAL CONTROL OF MACHINE TOOLS : Fundamental Concepts, Classification and structure of numerical control systems, Manual part programming, Computer aided part programming

TERM WORK

Term work shall consist minimum eight assignments based on above syllabus.

REFERENCE BOOKS

1) S.K. Basu," Design of Machine Tools"
2) Koenigs, "Berger Principles of Machine Tools "
3) Sen and Bhattacharya," Principles of Machine Tool"
4) N Acherkan, "Machine Tool Design", MIR Publication, Moscow 1973
5) Mehta Machine Tool Design

B.E. (MECHANICAL ENGINEERING): FIRST TERM
PRODUCT DEVELOPMENT AND RAPID PROTOTYPING
ELECTIVE- I

Teaching Scheme
Lectures : 4 Hours/week

Examination Scheme
heory Paper : 100 Marks
Term Work : 25 Marks
Paper Duration : 3 Hours

UNIT – I **10 Hours (20 Marks)**

Product Development history and product development process tool, product development verses design, modern product development theories and methodologist in design. Product development teams, product development planning, technical and business concerns. Understanding customer needs, Establishing product functions. Functionality, augmentation. Aggregation, common basis, functional functional modeling methods.

UNIT – II **10 Hours (20 Marks)**

Product tear down and experimentation, benchmarkting and establishing engineering specification. Product portfolios and portfolio architecture. Tear down process, tear down methods, post teardown reporting, benchmarking approach, support tools, setting specifications, portfolio architecture, types, platform, functional architecting, optimization selection, Product modularity, modular design.

UNIT – III **10 Hours (20 Marks)**

Concepts and Modeling - Generation of concepts, information gathering and brain storming, directed search, morphological analysis, combining solutions. Decision making, estimation of technical feasibility, concept selection process, selection charts, measurement theory, numerical concept scoring, design evaluation scheme, concept embodiment, geometry and layout, system modeling, modeling of product metrics, selection of model by performance specifications, physical prototyping, informal and formal models.

UNIT – IV **10 Hours (20 Marks)**

Rapid Product Development - Product Development: Classical steps of product development, Requirement of New Product development strategies, Critical factors affecting success, The Principle of simultaneous Engineering.
Model: Model classes, Influence of models to speed up product development.
Model making by Rapid prototyping: Definitions of rapid prototyping (RP), Rapid Tooling (RT), Rapid Manufacturing (RM). Relating Rapid prototyping models to product development phases.

UNIT – V **10 Hours (20 Marks)**

Generation of Layer information – description of the geometry by a 3D data record, Data flow, CAD model types.
Rapid prototyping Technologies –
Photo polymerization Stereo lithography (SL), Laser Sintering, Layer Laminate Manufacturing (LLM), Extrusion Processes.
Rapid Prototyping Materials-Photopolymers, SL Resins, Sintering Materials, FDM Materials, LOM Materials.
Rapid Prototyping Industrial Applications.

TERM WORK

Term work shall consist minimum eight assignments based on above syllabus.

REFERENCE

1) Roozenburg, J. Eekels, “Product Design : Fundamentals and Methods NFM”, John Wiley and Sons Ltd.,
2) D.Whitney, “Mechanical Assemblies”, Oxford University Press, New Delhi.
3)Geoftry Boothroyd, “Peter dew Product Design for manufacturing and Assembly”
4) Mike Baxter, “Product Design: A Practical guide to systematic methods of new product development”, Champman and Hall.
5) A. K. Chitale, R. C. Gupta,” Product Design and Manufacturing”, Prentice Hall India
6) John R. Lindbeck,”Product Design and Manufacturing”, Prentice Hall International Editime

7) Kevin Otto, Kristin wood, “Product Design : Techniques in Revenue Engineering and New Product Development”, Pearson Education Inc.
8) Andreas Gebharat, Hanser,” Rapid Prototyping” ,Gardner Publication Inc. Cincinnati.
9) Naber H., Macht M., “Fast Prototype Tools in : Rapid Protyping & Manufacturing”
10) Geuer A. Society of Manufacturing Engineers, Dearborn
11) D. Kochan, “Solid Free from Manufacturing ? Advanced Rapid Prototyipng “, Elsevier Science Publisher, B.V. New York.
12) Roozenburg, J. Eekels, Product Design : Fundamentals and Methods NFM, John Wiley and Sons Ltd.,

B.E. (MECHANICAL ENGINEERING): FIRST TERM
AUTOMOBILE ENGINEERING
ELECTIVE – I

Teaching Scheme
Lectures : 4 Hours/week

Examination Scheme
Theory Paper : 100 Marks
Term Work : 25 Marks
Paper Duration : 3 Hours

UNIT - I **10 Hours (20 Marks)**

Chassis & Breaking System
Classification of Automobile, Layout of Automobile Vehicle , Chassis and Frame , Sub- frame, Articulated Vehicle and Trailers, Breaking Systems- Necessity, requirement of good breaking system, classification, types of breaks- mechanical, hydraulic, pneumatic power break. Brake shoe & lining, brake testers. Brake effectiveness, factors controlling stop of an automobile

UNIT - II **10 Hours (20 Marks)**

Transmission Devices
Clutches:- Requirement of Clutches , Single Plate Clutch, Multiplate, Cone, Centrifugal ,Semi centrifugal ,and Fluid Coupling ,Troubleshooting of Clutches,Gear Box:- Sliding Mesh , Constant Mesh, Synchromesh, Epicyclic Gear Train, Torque Converter , Troubleshooting of Gear Box, Propeller Shaft , Differential Axle.

UNIT - III **10 Hours (20 Marks)**

Suspension and Steering System
Suspension System :- Spring, Types of Spring , Coil and helper spring ,Leaf, Transverse Leaf Spring , Independent suspension, Rubber suspension, Self Leveling suspension ,Pneumatic suspension, Troubleshooting of suspension System.
Steering System :- Function and Geometry, Types of Steering System ,Caster and Camber, Toe-in and Toe-out, Steering Linkage and Gear , Reversible Steering and Power Steering .

UNIT - IV **10 Hours (20 Marks)**

Wheel , Tyres and Tubes
Construction and Types of Wheel , Wheel Dimensions , Types of Tyres , Tyre Properties , Tyre Material , Specification of Tyre Size , Ply Rating , Class Ply, Radial Ply, Consideration in Tread Design , Wheel and Tyre Troubleshooting ,Retreading of Tyre Process, Precautions , Controls, Conventional and Procured retreading processes,Tubes ,Natural Rubber and Butyl Flops, Rims , types and Maintenance.

UNIT - V **10 Hours (20 Marks)**

Automobile Electrical System
Starting system - Introduction, battery, starting motors(self starters)
Charging system - Introduction, generator(dynamo),alternator-(A.C. generator)
Ignition system -Introduction, purpose, requirement, basic, ignition system-battery, magneto, and electronics ignition system, firing order, ignition timing, vacuum controlled distributor, spark plug

TERM WORK

Term work shall consist minimum eight assignments based on above syllabus.

RECOMMENDED BOOKS

1) W.L.Crouse, “Automotive Mechanics”, MaGraw Hill International.
2) G.B.S.Narang ,”Automotive Engineering” , Khanna Publishers.
3) Kripal Singh ,”Automobile Engineering” I & II , Standard Publisher distributors.
4) Heitner ,”Automotive Mechanics” , CBS Publisher distributors.
5) Dr. K.M.Gupta,”Automobile Engineering”, Umesh Publication.
6) R.K.Rajput,” Automobile Engineering”, Laxmi Publication, New Delhi

B.E. (MECHANICAL ENGINEERING): FIRST TERM
FLUID MACHINERY
ELECTIVE- I

Teaching Scheme
Lectures : 4 Hours/week

Examination Scheme
Theory Paper : 100 Marks
Term Work : 25 Marks
Paper Duration : 3 Hours

UNIT - I **10 Hours (20 Marks)**

MOMENTUM EQUATION AND ITS APPLICATION
Impulse momentum principle, fixed and moving flat plates and curved vanes ,series of plates and vanes, Velocity triangles and their analysis, work done, efficiency etc.
HYDRODYNAMIC MACHINES
Classification, General theory, Centrifugal head and fundamental equations, (Eulerean, Degree of reaction etc.) head on machines, various efficiencies, condition for max hyd. Efficiency.

UNIT - II **10 Hours (20 Marks)**

IMPULSE TURBINES
Main components and constructional features of a pelton wheel, velocity diagrams and analysis, Number of buckets, jets, non-dimensional parameters (speed ratio, jet ratio)
REACTION TURBINE
Main components and constructional features draft tube –types, efficiency, limitation to the use of draft tube, cavitations, types of reaction turbines (Francis, Kaplan,Deriaz, reversible.)
Governing mechanisms for Francis, Kaplan turbines, pelton wheels, safety devices of turbines (pressure regulator surge tanks, farebay.)
Types of characteristics curves and related terms (unit quantities.) specific speed and shape of runner. Selection of turbine considering various factors.

UNIT - III **10 Hours (20 Marks)**

HYDRODYNAMIC PUMPS
Components of centrifugal pumps. Its installations. Classifications, various terms associated with centrifugal pump (various head, velocity triangles and there analysis, effect of outlet blade angle.) cavitation, NPSH (Thomas cavitation factor), priming of pumps, installation, and specific speed and pump classification. Performance and characteristic of centrifugal pump. Axial thrust case and maintenance, troubles and remedies.

UNIT - IV **10 Hours (20 Marks)**

APPLICATION OF SIMILARITY AS APPLIED TO TURBINES AND PUMPS
Principals, scale effects.
SPECIAL PUMPS
Jet pump, lift pump, hyram pump, deep well pump, regenerative pump, accumulator, intensifier, screw pump.
FLUID COUPLING AND TORQUE CONVERTERS
Construction, working characteristic curves, applications.

UNIT - V **10 Hours (20 Marks)**

HYDRAULIC SYSTEMS
Study of elements such as pump valves packing, motors, Introduction to elements, hydraulic circuits, pertaining of machine tools, selection of fluids.
PNEUMATIC POWER
Basic principles study of elements used in circuits and control of pneumatic power. Applications in mechanical engineering practice. Comparison of pneumatic and hydraulic systems.

TERM WORK

Term work shall consist minimum eight assignments based on above syllabus.

REFERENCE BOOKS

1) S.Ananthswamy, “Fundamentals on hydraulic machinery” ,United book corporation , Pune.
2) V.P. Vasandani, “Theory of hydraulic machinery”Khanna publishers, Delhi.
3) Dr. J. Lal,” Hydraulic machines “ , Metropolitan Books co. pvt. Ltd. Delhi.
4) S.R.Majumda,r “Oil Hydraulic System”, Tata McGraw Hill.
5) S.R.Majumdar, “Pneumatic System”, Tata McGraw Hill.
6) Agrawal,” Fluid Mechanics and Machinery” , Tata McGraw Hill
7) Hicks,” Pump Operation and maintenance”, Tata McGraw Hill
8) E.D. Shaughnessy, “Introduction to Fluid Mechanics”, Oxford University Press, New Delhi.

B.E. (MECHANICAL ENGINEERING): FIRST TERM
PROJECT I
(Common with Production Engineering and Automobile Engineering)

Teaching scheme
Practical: 2 hrs / week

Examination scheme
Oral: 25 Marks
Term Work: 25 Marks

1. Every student individually or in a group (group size is of 4 students. However, if project complexity demands a maximum group size of 5 students, the committee should be convinced about such complexity and scope of the work.) Shall take a project in the beginning of the (B.E. first Term) seventh term in consultation with the guide and the project must be completed in the (B.E. Second Term) eighth term.

2. The project proposal must be submitted in the institute in the beginning of the (B.E. first Term) seventh term. While submitting project proposal care is to be taken that project will be completed within the available time of two term i.e. 2 Hrs per week for (B.E. first Term) seventh term and 4 Hrs per week for (B.E. Second Term) eighth semester (total time become 12*2 + 12*4 = 72 Hrs per project partner). The final title of the project work should be submitted at the beginning of the (B.E. Second Term) eighth semester.

3. Project title should be precise and clear. Selection and approval of topic:

Topic should be related to real life application in the field of MECHANICAL, AUTOMOBILE AND PRODUCTION ENGINEERING

OR

Investigation of the latest development in a specific field of MECHANICAL, AUTOMOBILE AND PRODUCTION ENGINEERING

OR

The investigation of practical problem in manufacture and / or testing of MECHANICAL, AUTOMOBILE AND PRODUCTION ENGINEERING equipments

OR

The MECHANICAL, AUTOMOBILE AND PRODUCTION ENGINEERING based applications project is preferable.

OR

Software development project related to MECHANICAL, AUTOMOBILE AND PRODUCTION ENGINEERING and Agriculture Engineering with the justification for techniques used / implemented is accepted.

OR

Interdisciplinary projects should be encouraged. The examination will be conducted independently in respective departments.

4. The group should maintain a logbook of activities. It should have entries related to the work done, problems faced, solution evolved etc., duly signed by guide.

5. The group is expected to complete details system design, layout etc. in (B.E. first Term) seventh term, as a part of term work in the form of a joint report. Project report must be submitted in the prescribed format only. No variation in the format will be accepted.

6. One guide will be assigned at the most three project groups.

7. The guides should regularly monitor the progress of the project work.

8. Assessment of the project for award of TW marks shall be done by the guide and a departmental committee (consisting of minimum two teachers with experience more than three years) as per the guidelines given in the following table.

A) ASSESSMENT OF PROJECT I TERMWORK B.E. FIRST TERM

NAME OF THE PROJECT _____

NAME OF THE GUIDE: _____

Sr No	Exam Seat No	Name Of Student Marks	Assessment by guide (70%)					Assessment by Departmental committee (30%)			Grand Total	Out of 25 Marks
			Literature survey	Topic Selection	Documentation	Attendance	Total	Evaluation (10%)	Presntaion (20%)	Total		
			10	05	15	05	35	05	10	15	50	25

Sign of Guide Sign. of Committee Members Sign. Of H. O. D.

9. The guide should be internal examiner for oral examination (If experience is greater than three years).

10. The external examiner should be from the related area of the concerned project. He should have minimum of five Years of experience at degree level / industry.

11 .The evaluations at final oral examination should be done jointly by the internal and external examiners.

B.E. (MECHANICAL ENGINEERING): FIRST TERM
SEMINAR
(Common with Production Engineering and Automobile Engineering)

Teaching scheme:
Practical: 2 hrs / week

Examination scheme:
Term Work : 25 Marks

1. **For seminar every student will individually study a topic assigned to him / her and submit a report and shall deliver a short lecture / Seminar on the topic at the end of term.**
2. **Selection of topic should be done by students in consultation with concerned guide**
    a. Topic should be related to branch but it should be extended part of the branch (latest and advance topic).
    b. The topic should be such that the student can gain latest knowledge. Student should preferably refer at least one research paper

3. **Seminar topic should not be repeated in the department and registration of the same should be done on first come first served basis**
4. **Seminar report should be submitted in paper bound copy prepared with computer typing**
    a. Size of report depends on advancement of topic.
    b. Student should preferably refer minimum 5 reference books / magazines.
    c. Format of content
        i. Introduction.
        ii. Literature survey.
        iii. Theory 1) Implementation 2) Methodology
        3) Application 4) Advantages, Disadvantages.
        iv. Future scope.
        v. Conclusion.

5 ASSESSMENT OF SEMINAR for TERM WORK
Title of seminar: _____
Name of guide: _____

Sr. No.	Exam Seat No.	Name of Student	Assessment by examiners					Grand Total
			Topic Selection	Literature Survey	Report Writing	Depth of understanding	Presentation	
			5	5	5	5	5	25

6. Assessment of Literature survey will be based on
    a. Collection of material regarding history of the topic.
    b. Implementation.
    c. Recent applications.

7. Assessment of Depth of understanding will be based on
    a. Questioning by examiners.
    b. Questioning by students.
    c. What the student understands i.e. conclusion regarding seminar.

8. Assessment of presentation will be based on;
    a. Presentation time (10 minutes)
    b. Presentation covered (full or partial)
    c. Way of presentation
    d. Questioning and answering (5 minutes)

9. Examiners should be a panel of two one of them must be guide. Examiner must have experience at least 3 years. Examiners will be appointed by HOD in consultation with Principal.

B.E. (MECHANICAL ENGINEERING): SECOND TERM
FINITE ELEMENT ANALYSIS AND SIMULATION

Teaching Scheme
Lectures : 4 Hours/week
Practical : 4 Hours/week

Examination Scheme
Theory Paper : 100 Marks
Term Work : 25 Marks
Oral : 25 Marks
Paper Duration : 4 Hours

UNIT - I **10 Hours (20 Marks)**

CONVENTIONAL NUMERICAL METHODS
Finite difference method ,method of least square, ritz method, boundary value problems, displacement methods, equilibrium method, mix method of solid mechanics, fe formulation, variational element,Introduction to FEM ,Discritization going from part to whole approach, Physical problem, mathematical models and finite element solution, FEA as a integral part of CAD.
FINITE ELEMENTS TYPES:One dimensional element such as two nodded & three nodded Spar or truss element. Two and three dimensional elements, triangular, rectangular quadrilateral, sector curved, iso parametric, sub parametric elements, etc.

UNIT - II **10 Hours (20 Marks)**

GENERAL PROCEDURE OF FEM
Discritation, element shape, interpolation function, shape function, element stiffness matrix, global stiffness matrix, application of boundary,FEM Softwares - Preprocessing, processing and post processing
Finite element analysis of 1D problem, bending of beams.Introduction, FEM direct approach elements stiffness, potential energy approach, treatment of boundary conditions, temperature effects.
Torsion of circular shaft, thin valve tubes steady state heat conduction, laminar pipe flow.
TRUSSES:Introduction plane trusses, space trusses.

UNIT - III **10 Hours (20 Marks)**

Finite element analysis for two dimensional problem, single variable problems, mesh generation and imposition, egine value and time dependent problems.
Application of heat transfer, fluid mechanics, solid mechanics, plane elasticity and analysis of structural vibration.
Finite element formation of beams.

UNIT - IV **10 Hours (20 Marks)**

Application of FEA to free vibration of thin plate cylindrical shell, transient heat conduction, shaft , motion of fluid in flexible container, flow of idle fluids, viscous fluids, shape structure.

UNIT - V **10 Hours (20 Marks)**

SIMULATION THEORY AND APPLICATION
System models and studies:- concepts of a system, system environment, stochastic activities, continuous and discrete systems, system modeling, types of models, principles used in modeling, types of system studies.
System simulation:-The techniques of simulation, Monte Carlo method, comparison of simulation and analytical methods, analog computers and methods, hybrid computer, simulators, continuous system simulation languages, system dynamics, growth models, logistic curves, multi segments models, probability concepts in simulation, system simulation, events, representation of time, arrival pattern.

TERM WORK

Any Five practical and three assignments based on above syllabus using analysis software.

Note: Oral will be based on the prescribed term-work presented in the form of certified journal.

RECOMMENDED BOOKS

1) J.N. Reddy, An Introduction to Nonlinear Finite Element Analysis, OUP.
2)C.S.Krishnamoorthy.,Finite element analysis TMH
3) J.N.Reddy, Finite element methods,Mc graw hill publition ltd.
4) Robert Cook ,Concept an application of Finite element analysis
5) Klaus-Jurgen Bhate, finite element analysis , PHI
6) C.S. Desai and J.F.Abel.,Introduction to finite element methods ,CBS
7) Tirapati R. Chandrupatla ,Finite element analysis by, PHI.
8) Geoffery Gordon ,System simulation
9) Narsingh Deo ,System simulation with digital computers
10) Kenneth Lt. Huebner, " The FEM for Engineers ",Wiley India Pvt.Ltd. New Delhi

B.E. (MECHANICAL ENGINEERING): SECOND TERM
MECHANICAL VIBRATION

Teaching Scheme
Lectures : 4 Hours/week
Practical : 2 Hours/week

Examination Scheme
Theory Paper : 100 Marks
Term Work : 25 Marks
Oral : 25 Marks
Paper Duration : 3 Hours

UNIT - I **10 Hours (20 Marks)**

FUNDAMENTAL OF VIBRATIONS
Introduction, Definitions, Vector method of representing harmonic motions, Addition of two simple harmonic motions of the same frequency, Beat phenomenon, Complex method of representing harmonic vibrations, Work done by a harmonic force on a harmonic motion, Fourier series and harmonic analysis.
UNDAMPED FREE VIBRATIONS OF SINGLE DEGREE OF FREEDOM SYSTEMS
Introduction, Derivation of differential equation, Solution of differential equation, Torsional vibrations, Equivalent stiffness of spring combinations, Energy method.

UNIT – II **10 Hours (20 Marks)**

DAMPED FREE VIBRATIONS OF SINGLE DEGREE OF FREEDOM SYSTEMS
Introduction, Different types of dampings, Free vibrations with viscous damping, Logarithmic decrement, Viscous dampers, Dry friction or coulomb damping, Solid or structural damping, Slip or interfacial damping.
FORCED VIBRATIONS OF SINGLE DEGREE OF FREEDOM SYSTEMS
Introduction, Forced vibrations with constant harmonic excitation, Forced vibrations with rotating and reciprocating unbalance, Forced vibrations due to excitation of support, Energy dissipated by damping, Forced vibrations with coulomb damping, Forced vibrations with structural damping, Determination of equivalent viscous damping from frequency response curve, Forced vibrations of a system having non-harmonic excitation, Vibration isolation and transmissibility, Vibration measuring instruments.

UNIT - III **10 Hours (20 Marks)**

TWO DEGREE OF FREEDOM SYSTEMS
Introduction, Principal modes of vibration, Other cases of simple two degree of freedom systems, Combined rectilinear and angular modes, System with damping, Undamped forced vibrations with harmonic excitation, Vibration absorbers.
CRITICAL SPEED OF SHAFT:
Introduction, Critical speed of a light shaft having a single disc without damping, Critical speed of a light shaft having a single disc with damping, Critical speed of a shaft having multiple discs, Secondary critical speed, Critical speed of a light cantilever shaft with a large heavy disc at its end.

UNIT - IV **10 Hours (20 Marks)**

MULTI DEGREE OF FREEDOM SYSTEMS EXACT ANALYSIS
Introduction, Free vibrations equations of motion, Influence coefficients, Generalized coordinates and coordinate coupling, Natural frequencies and mode shapes, Orthogonal properties of normal modes, Model analysis, Forced vibrations by matrix inversion, Torsion vibrations of multi-rotor systems.
MULTI DEGREE OF FREEDOM SYSTEMS NUMERICAL METHODS
Introduction, Rayleigh's method, Dunkerley's method, Stodola's method, Rayleigh-Ritz method, Method of matrix itrrations, Holzer's method.

UNIT - V **10 Hours (20 Marks)**

CONTINUOUS SYSTEMS
Vibrations of strings, Longitudinal vibrations of bars, Torsional vibrations of circular shafts, Lateral vibrations of beams.
TRANSIENT VIBRATIONS
Introduction, Laplace transformation, Response to an impulsive input, Response to a step input, Response to a pulse input, phase plane method, shock spectrum.
NON-LINEAR VIBRATIONS: Introduction, Examples of non-linear systems, Phase plane, Undamped free vibration with non-linear spring forces, Pertubation method, Forced vibration with non-linear spring forces, Self excited vibrations.

TERM WORK

Term work shall consist of any five experiments out of the following and three assignments based above syllabus.

1) To study the torsional vibrations of single rotor system.
2) To study the torsional vibrations of two rotor system.
3) To study damped torsional vibrations of single rotor system.
4) To study undamped free vibrations of a spring.
5) To study the natural vibrations of a spring mass system.
6) To study forced damped vibrations of a spring mass system.
7) To study the forced damped vibrations of simply supported beam.
8) To determine critical speed of a single rotor system.

Note: Oral will be based on the prescribed term-work presented in the form of certified journal.

REFERENCE BOOKS

1) Dilip Kumar Adhwarjee "Theory and Applications of Mechanical Vibrations"Laxmi Puyblications (p) Ltd., New Delhi
2) G.K.Grover "Mechanical Vibrations"New Chand & Bros Roorkee (U.P.)
3) Leonard Meirovitch " Element of Vibration Analysis" Tata McGraw-Hill Publishing Company Limited, New Delhi
4) Singiresu S. Rao " Mechanical Vibrations " Pearson Education Ptd. Ltd., Delhi
5) S. Graham Kelly " Schaum's Out lines Mechanical Vibrations " Tata McGraw-Hill Publishing Company Limited, New Delhi
6) Thompson," Theory of Vibration with Application", Pearson Education
7) V.P.Singh " Mechanical Vibrations " Dhanpat Rai & Co. (P) Ltd., Delhi
8)B.H.Tongue," Principles of Vibration", 2/ed. Oxford University Press, New Delhi.

B.E. (MECHANICAL ENGINEERING): SECOND TERM
TRIBOLOGY

Teaching Scheme
Lectures : 4 Hours/week
Practical : 2 Hours/week

Examination Scheme
Theory Paper : 100 Marks
Term Work : 25 Marks
Oral : 25 Marks
Paper Duration : 3 Hours

UNIT - I **10 Hours (20 Marks)**

Tribology: Introduction, Tribology in design, Tribology in Industry, Economic considerations.
Friction: Introduction, Laws of friction, Kinds of friction, Causes of friction, Friction measurement, stick slip oscillations & its elimination,Wear: Theory of wear, Types of wear, Various factors affecting wear, measurement of wear, wear between solids and flowing liquids, theory of wear.

UNIT - II **10 Hours (20 Marks)**

Lubricants and Lubrication: Lubricant properties – physical and chemical. Lubrication – introduction, basic modes of lubrication. Flow of viscous fluid through rectangular slot.
Hydrostatic bearings: Basic concept, operations, advantages and limitations. Hydrostatic conical and spherical bearings, load carrying capacity and flow of lubricants. Bearing power and film thickness, bearing temperature and power. Compensators and their action. Optimum design step bearing.

UNIT - III **10 Hours (20 Marks)**

Hydrodynamic bearing: Theory of hydrodynamic lubrication, Mechanism of pressure development in oil film. Two Dimensional Reynolds equation, Infinite tapered shoe slider bearings and infinite long journal bearing. Short bearing theory applied to journal bearing.

UNIT - IV **10 Hours (20 Marks)**

Hydrodynamic thrust bearing: Introduction, flat plate thrust bearing, step thrust bearing, tapered land thrust bearing, tilting pad thrust bearing, spring mounted thrust bearing, hydrodynamic pocket thrust bearing.
Friction and power losses in journal bearings: Evaluation of friction loss in concentric & eccentric journal bearing & quantity of oil flow with circumferential groove and hole.

UNIT - V **10 Hours (20 Marks)**

Hydrostatic squeeze film, circular & rectangular plates, impact conditions between lubricated solids, applications to journal bearing,Air lubricated bearings: Tilting pad bearings, magnetic recording disk with flying heads, hydrostatic & hydrodynamic thrust bearing with air lubrications. Lubrication practice, quality control & management – characteristics of lubricating methods, lubricating devices & systems, organizing application charts.

TERMWORK

Assignments Problems on -
Problem in hydrostatic bearing
Problem in hydrodynamic bearing
Reynolds equation
Derivation of squeeze film lubrication on rectangular plate and
Practical On (Any FOUR)
Journal Bearing apparatus.
Tilting pad thrust bearing apparatus
Friction in journal bearing
Break line friction test rig.
Coefficient of friction using pin on disc test rig.

Note: Oral will be based on the prescribed term-work presented in the form of certified journal.

REFERENCE BOOKS

1) B. C. Majumdar “Introduction Tribology and Bearings”, H. Wheeler and Company Pvt. Ltd.
2) Cameron A. “Basic Lubrication Theory , Wiley Eastern Ltd.
3) Fuller D. D., “Theory and Practice of Lubrication for Engineers”. John Wiley and Sons.
4) Halling J. “Principles of Tribology”, McMillan Press Ltd.
5) Hrassan & Powel , “Gas Bearing”.
6) Neale M. J. “Tribology Hand Book”, Butterworths.

B.E. (MECHANICAL ENGINEERING): SECOND TERM
POWER PLANT ENGINEERING
ELECTIVE - II

Teaching Scheme
Lectures : 4 Hours/week

Examination Scheme
Theory Paper : 100 Marks
Term Work : 25 Marks
Paper Duration : 3 Hours

UNIT - I **10 Hours (20 Marks)**

THERMAL POWER PLANT
Introduction, general layout of modern thermal power plant, working of thermal power plant, coal classification, coal handling, coal blending, coal desulphanization, Indian coals, selection of coal for TPP., coal handling, storage, preparation and feeding, ash handling and dust collection, fluidized bed combustion systems, steam turbines, condensers, cooling pond and cooling tower, necessity of feed water treatment, high pressure boilers and importance of water purity, thermodynamic cycles.

UNIT - II **10 Hours (20 Marks)**

HYDROELECTRIC POWER PLANT
Hydrograph, flow duration curve, site selection, classification of HPP, and their field of use, capacity calculation for hydro power, dam, head water control, penstock, water turbines, specific speeds, governors, hydro electric plant auxiliaries, plant layout, automatic and pumped storage , project coasty of hydroelectric plant. advantages of HPP

UNIT - III **10 Hours (20 Marks)**

NUCLEAR AND DIESEL POWER PLANT
Elements of nuclear power plant, nuclear reactor and its types, fuels moderators , coolants, control rod, classification of nuclear power plants, waste disposal, diesel power plant diesel engine performance and operation , plant layout, log sheet, application, selection of engine size

UNIT - IV **10 Hours (20 Marks)**

GAS TURBINE PLANT
Plant layout, method of improving output and performance, fuel and fuel systems, method of testing open and closed cycle plants, operating characteristics, applications, free piston engine plant, limitation and application , combined cycle plants, advantages , need of generation power plant in power systems based load station and peak load station.

UNIT - V **10 Hours (20 Marks)**

MAJOR ELECTRICAL EQUIPMENT IN POWER STATION
Generator and exciters, earthling of power system, power and unit transformer, circuit breakers, protective equipments, control board equipment, elements of instrumentation, plant layout, switch gear for power station auxiliaries, recent developments in methods of power generation, introduction to magneto hydrodynamic, fuel cells , geothermal, solar power, tidal power.

TERM WORK

Term work shall consist minimum eight assignments based on above syllabus.

REFERENCE BOOKS

1) Domkundwar and Arora " Power Plant Engineering", Dhanpat Rai & Sons, New Delhi
2) E.I. Wakil, "Power Plant Engineering", Publications, New Delhi
3) P.K.Nag,"Power Plant Engineering", Tata McGraw Hill, New Delhi
4) R.K.Rajput," Power Plant Engineering", Laxmi Publications, New Delhi

B.E. (MECHANICAL ENGINEERING): SECOND TERM
PROCESS EQUIPMENT DESIGN
ELECTIVE - II

Teaching Scheme
Lectures : 4 Hours/week

Examination Scheme
Theory Paper : 100 Marks
Term Work : 25 Marks
Paper Duration : 3 Hours

UNIT - I **10 Hours (20 Marks)**

PRESSURE VESSELS : Introduction, Operating conditions, Pressure vessel code, Selection of material, Vessel opening at low temperatures, Vessel opening at elevated temperatures, Design conditions and stresses, Design of shell and its components, Supports for vessels, Bracket supports, Leg supports, Skirt supports, Saddle supports, Stress from local loads and thermal gradient, Thermal stresses in cylindrical shell, Fabrication, Inspection and tests.

UNIT - II **10 Hours (20 Marks)**

HIGH PRESSURE VESSELS : Introduction, Constructional features, Material for high pressure vessels, Solid walled vessel, Multi-shell construction, vessel closures, jacket for vessels, STORAGE VESSELS: Introduction, Storage of Fluids, Storage of non-volatile liquids, Storage of volatile liquids, Storage of gases, Design of rectangular tanks, Design of tanks, Nozzles and mountings, Large capacity storage tanks.

UNIT - III **10 Hours (20 Marks)**

REACTION VESSELS : Introduction, Material of construction, Agitators, Types of agitators, Baffling, Power requirements for agitation, Design of agitators system components, Drive for agitators, Classification of reaction vessels, Heating systems, Design considerations,Heat Exchangers: Introduction, Types of heat exchangers, Design of shell and tube heat exchangers.

UNIT - IV **10 Hours (20 Marks)**

EVAPORATORS AND CRYSTALLISERS : Evaporators, Types of evaporators, Entrainment separators, Material of construction, Design considerations, Crystallisers,Distillation And Absorption Towers / Columns:Introduction, Basic features of Towers / Columns, Process engineering data, Towers / columns internals, stresses in columns shell, Determination of shell thickness, Elastic stability under compressive stresses, Allowable deflection, Design and construction features of column internals, Supports for column.

UNIT - V **10 Hours (20 Marks)**

AUXILIARY PROCESS VESSELS
Introduction, Reflux drum, Compressors knock-out drum, Liquid-liquid separators, Vapour/gas liquid separators, Wire mesh mist eliminators, Process Hazard And Safety Measures in Equipment Design:Introduction, Hazards in process industries, Analysis of hazards, Safety measures, Safety measures in equipment design, Pressure relief devices.

TERM WORK

Term work shall consist minimum eight assignments based on above syllabus.

REFERENCE BOOKS

1) B.C. Bhattacharyya ," Chemical Equipment Design", CBS Publishers and Distributors, Delhi
2) E.E. Ludwig"Applied Process Design for Chemical and petrochemical Plants", Gulf Publishing Co.
3) E.E. Ludwig "Applied Process Design for Chemical Plants", Gulf Publishing Co.
4) J.H. Perry ,"Chemical Engineering Handbook"
5) L.E. Brownell ," Process Equipment Design", John Wiley and Sons
6) M.V. Joshi ," Process Equipment Design", Macmillan India Ltd, New Delhi
7) S. D. Dawande ,"Process Equipment Design", Central Techno Publication
8) Babu," Process Plant Simulation", Oxford University Press, New Delhi.

B.E. (MECHANICAL ENGINEERING): SECOND TERM
INTRODUCTION TO ROBOTICS
ELECTIVE - II

Teaching Scheme
Lectures : 4 Hours/week

Examination Scheme
Theory Paper : 100 Marks
Term Work : 25 Marks
Paper Duration : 3 Hours

UNIT - I **10 Hours (20 Marks)**

PLANNER MECHANICS: Advanced synthesis of planner mechanics for ISP and FSP burmester theories and analytical techniques, applications.
MECHANICS DYNAMICS: Newtonian lagrangian techniques, energy methods, spatial mechanisms, axodes, and kinematics of open and closed loop mechanism.

UNIT - II **10 Hours (20 Marks)**

BASIC CONCEPT IN ROBOTICS: automation and robotics, robot anatomy, basic structure of robotics, resolution, accuracy and repeatability, classification and structure of robotics system, point to point and continuous past system, control loop of robotics system.

UNIT - III **10 Hours (20 Marks)**

DRIVES AND CONTROL SYSTEM: Hydraulic, DC servomotors, basic control system, concept and models, control system analysis, robot activation and feedback component, positional and velocity sensors, actuators, power transmission system, robot joint control design. Application of robot in manufacturing.

UNIT - IV **10 Hours (20 Marks)**

END EFFECTORS, SENSORS AND VISION SYSTEMS:
End Effectors Types of end effectors, mechanical grippers, vacuum / magnetic / adhesive grippers, tools as end effectors, Gripper selection and design.
Introduction to Sensors: Need of sensors in a robotic system, selection of sensors, photo sensors, limit switches. Range sensors, proximity sensors, touch / sensors.
VISION SYSTEMS: concept of low level and high-level vision in a robotic system.

UNIT - V **10 Hours (20 Marks)**

ROBOT PROGRAMMING: Methods of robot programming, lead through programming methods, a robot program as a path in space, motion interpolation WAIT, SIGNAL, AND DELAY commands.
ROBOT LANGUAGES: The textural robot languages, generation of robot programming languages, robot language structure, constant, variables and other data objects, motion commands, end effector and sensor commands.

TERM WORK

Term work shall consist minimum eight assignments based on above syllabus.

RECOMMENDED BOOKS

1) Groover," Industrial Robotics", McGraw Hill Publication Co.Ltd..
2) John J. Craig, "Introduction to Robotics Mechanics and Control", Pearson Education Inc.,
3) M.P.Groover,"Industrial Robotics - Technology, Programming and Applications"
4) Niku,"Introduction to Robotics : Analysis System and Application", Pearson Education
5) POVOV , Robotics", Mir Publication Co.Ltd.
6) Robot J.Schilling, " Fundamental of Robotics", Pearson Education
7)Mark W Sping," Robot Modelling And Control ",Wiley India Pvt.Ltd. New Delhi

B.E. (MECHANICAL ENGINEERING): SECOND TERM
ADVANCED WELDING TECHNOLOGY
ELECTIVE-II

Teaching Scheme
Lectures : 4 Hours/week

Examination Scheme
Theory Paper : 100 Marks
Term Work : 25 Marks
Paper Duration : 3 Hours

UNIT - I **10 Hours (20 Marks)**

SOLDERING AND BRAZING
Welding characteristics capillary attraction bond formation, metallurgy of solders, foreign materials in the solders alloy. Designing solder joint. Soldering iron, special soldering technique, thermal free solder, low temperature soldering, high temperature soldering, expanding type solders.
Metallurgical aspects of brazing, Design of joint, brazing fluxes, Method of heating – touch brazing, furnace brazing, induction brazing, Resistance brazing, disphasing, Salt bath brazing, brazing solders, silver solders.

UNIT - II **10 Hours (20 Marks)**

SPECIAL WELDING PROCESSES:
Electron beam welding, plasma arc welding, laser welding, bronze welding, under water welding. Ultrasonic, Diffusion welding, Friction and inertia welding, Forge welding, Expolsive welding, Thermit welding, Atomic hydrogen welding

UNIT - III **10 Hours (20 Marks)**

WELDABILITY OF STEELS:
Plain carbon steels-mild steel, medium carbon steel, high carbon steel, tool steels, low alloy and high alloy steels, stainless steels, Austenitic manganese steels.
WELDABILITY OF ALUMINIUM AND ITS ALLOY:
metallurgical behavior during welding, choice of methods, welding rods, fixtures, methods of welding.
WELDABILITY OF CAST IRON AND CASTING:
Gray cast iron, malleable cast iron spheriodal graphite cast iron, selection of cast iron, electrodes and welding rods-methods of welding.
WELDABILITY OF COPPER AND COPPER ALLOY:
Copper brasses, bronzes, Phospher bronze, aluminium bronze, welding of dissimilar metal joints on copper and copper alloys, methods of welding.

UNIT - IV **10 Hours (20 Marks)**

METULLURGICAL CONCEPT OF WELDABILITY:
Temperature changes in welding concepts of weldability carbon equivalent, cracking of welds, weldability testing, welding metallurgical of dissimilar metals, heat treatments of welds.
HARD FACING:
Types of wear, hard facing metallurgy, preparing hard facing, basic hard facing procedure, spray hard facing, basic treatment weld.

UNIT - V **10 Hours (20 Marks)**

DESIGN AND FABRICATION:
Designing for welding types of joints welds and stress distribution, layer sequences, deposition rates, expansion, contraction and residual stresses in weld structure.
Indian standards for welding electrodes, fluxes and properties, electrode selection.

TERM WORK

Term work shall consist minimum eight assignments based on above syllabus.

REFERENCE BOOKS

1) M. Lal , “Fabrication Technology”
2) O. P. Khanna , “Welding Technology”, Dhanpat Rai Publications
3) P.C. Sharma ,” Production Engineering”
4) P. N. Rao , “Manufacturing Tech”. Vol I & II
5) R. K. Jain , “Production Technology”

B.E. (MECHANICAL ENGINEERING): SECOND TERM
ENERGY ENGINEERING
ELECTIVE- II

Teaching Scheme
Lectures : 4 Hours/week

Examination Scheme
Theory Paper : 100 Marks
Term Work : 25 Marks
Paper Duration : 3 Hours

UNIT – I **10 Hours (20 Marks)**

INTRODUCTION:Global primary energy reserves, energy needs of growing economy, Indian energy scenario, energy pricing in India, energy conservation and its importance, energy conservation act-2001 and its features, energy management strategy, energy audit: types and methodology, energy audit reporting format

UNIT - II **10 Hours (20 Marks)**

SOLAR ENERGYsolar radiation, measurement of solar radiation, energy potential of sun, simple flat plate collector, design of liquid flat plate collector, application of liquid flat plate collector, performance analysis, testing procedure of liquid, air, water, FPC.Concentrating Collectors: types, material of construction parameters characterizing, the concentrators, thermodynamic limits on concentration, tracking, performance analysis of cylindrical parabolic & dish collector. Comparison with FPC.

UNIT - III **10 Hours (20 Marks)**

APPLICATION OF SOLAR SYSTEMS AND ECONOMICS ANALYSIS:
Solar ponds, solar distillatory, solar satellite power system, solar cooker, solar air & water heaters, solar dryers, photovoltaic direct energy conversion, solar cells, solar thermal power system, Solar passive heating, solar air-conditioning, solar energy storage's. Economics analysis of solar systems, net present value concept, calculation of pay back periods for solar system.

UNIT - IV **10 Hours (20 Marks)**

WIND ENERGY:Nature of wind, wind machines, classification & description, wind data and its representation, energy in wind, wind mill site characteristic , performance calculations, recent development.
BIOMASS ENERGY:Various forms of biomass energy as a potential energy source, various species of plants suitable for India, bio-fuel production processes, bio-gas plants gasifiers principle, bio-gas & plants, types of gober gas plants.

UNIT - V **10 Hours (20 Marks)**

OCEAN ENERGY:Types of ocean energy sources, ocean temperature difference, OTEC cycle (open and closed) comparison with normal vapor cycle.Ocean Waves: Wave motion energy, power from wave, wave energy conversion devices.Geothermal Energy:History, Future origin, types of geothermal energy, dry rock & hot aquifer analysis, vapour dominated geothermal systems, operational & environmental problems.

TERM WORK
Term work shall consist minimum eight assignments based on above syllabus.

RECOMMENDED BOOKS

1) B.S.Magal, "Solar Power Engineering"
2) G.D. Rai.,Non Conventional Energy Sources
3) Garg H.P.,Treatise on solar Energy Vol. I, II, III
4) John W. Twidell and Anthony D. Weir ,Renewable Energy Resources, ELBS Publication
5) J.A. Duffy, W.A. Beckman- John Willy, Solar Energy of Thermal Processes-
6) Krieth, Krieder ,Principles of solar Engineering ,Mc Graw Hill Pub. Co.
7) S.Rao & B.B.Parulekar, Energy Technology, TMT, New Delhi
8) S.P. Sukhatme ,Solar Energy, Principles of collection and storages , Tata McHill Publication, New Delhi
9) W.C. Turner.,Energy Management Hand Book
10) S.N. Bhadra, Wind Electrical Systems, Oxford University Press, New Delhi.

B.E. (MECHANICAL ENGINEERING): SECOND TERM
INDUSTRIAL FLUID POWER
ELECTIVE- II

Teaching Scheme
Lectures : 4 Hours/week

Examination Scheme
Theory Paper : 100 Marks
Term Work : 25 Marks
Paper Duration : 3 Hours

UNIT - I **10 Hours (20 Marks)**

Fluid power system: Component advantages, application in the field of machine tool, material handling. Hydraulic pressing, mobile and stationary machine clamping, devices etc. Transmission of power at static and dynamic states.
Laws of fluid flow, type of flow,Types of hydraulic fluids, petroleum base, synthetic, and water based. Properties of fluid, selection of fluids, additives, effect of temperature and pressure on hydraulic fluid.

UNIT - II **10 Hours (20 Marks)**

Seals, seating material, compatibility of seal with fluid, Types of pipes, hoses, material, quick acting couplings, presser drop in hosses/pipes, Fluid conditioning through filters, strainers, source of contamination, and contamination control, heat exchangers,Pumps - Types, classification, principal of working, power calculations, efficiency calculation, characteristic curves, selection of pump for hydraulic power transmission form vane pump, gear pump, redial and axial plunger pumps, screw pumps.

UNIT - III **10 Hours (20 Marks)**

Manually operated, solenoid operated, pilot operated. Directional control valve , check valve, Modular construction of valve.
Control of fluid power,Necessity of fluid control through pressure control, direction, control, flow control valves,Principle of pressure control valves, direct operated, pitol operated, relief valves, pressure reducing valve, sequence valve, quick exhaust valve,Principle of flow control valve- Pressure compensated, temperature compensated flow control valve, meter in circuit, meter out circuit, flow through restrictor, Types of direction control valves: Two way two position, four way three position, four way two piston valves, Open center, close center, Tandem center, position of valve

UNIT - IV **10 Hours (20 Marks)**

Actuators - linear and rotary, Symbols of hydraulic circuits, Hydraulic motors gear type vane type piston type radial piston type methods of control of acceleration and deceleration, Types of cylinder mountings, Calculation of piston velocity and thrust under static and dynamic application considering friction inertia loads, Design consideration for cylinders, Selection of components and design of hydraulic circuits for linear circuits regeneration circuits sequencing circuits with the use of electrical control, Laden diagram, Maintenance trouble shooting safety precaution of hydraulic circuits

UNIT – V **10 Hours (20 Marks)**

JIC symbols/ISO pneumatic symbol, Principle of pneumatic, Laws of compression , types of compression, selection of compression, Comparison of pneumatic with hydraulic power transmission, Types of filters regulators , lubrication, mufflers, driers, Pressure regulating valve, Direction control valve two-way three way four way valve solenoid operated valve push button level control valve,Speed regulating methods in pneumatic, Pneumatic actuators, rotary and reciprocating,Air motors radial piston vane type axial piston type,Basic pneumatic circuits, Selection of components for linear circuits sequencing circuits

TERM WORK

Term work shall consist minimum eight assignments based on above syllabus.

RECOMMENDED BOOKS

1) A.Esposito"Fluid Power with Application" Prencice Hall.
2) B. Lall ,"Oil Hydraulics"International Literature Association
3) D.A. Pease ," Basic fluid power " Prentice Hall
4) Godwin ," Power Hydraulics " Cleaver Hume.

5) H.L. Stewart ," Hydraulics and Pneumatics" Industrial Press
6) J.J. Pippenger ,"Industrial Hydraulics "McGraw Hill Co.
7) Vickers' manual on Industrial Hydraulics.
8) Yeaple ,"Fluid Power Design Handbook."
9)E.J.Shaughnessy, "Introduction to Fluid Mechanics" (SI Adoption),OUP, New Delhi.

B.E. (MECHANICAL ENGINEERING): FIRST TERM
PROJECT II
(Common with Production Engineering and Automobile Engineering)

Teaching scheme:
Practical : 4 hrs / week

Examination scheme:
Oral : 50 Marks
Term Work : 100 Marks

1. The Project group in (B.E. first Term) seventh term will continue the project work in (B.E. Second Term) eighth term and complete project in all respect (assembly, testing, fabrication, tabulation, test result etc.)
2. The group should maintain a logbook of activities. It should have entries related to the work done, problems faced, solution evolved etc., duly signed by guide.
3. The guides should regularly monitor the progress of the project work.
4. The project work along with project report should be submitted as part of term work in (B.E. Second Term) eighth term on or before the last day of the (B.E. Second Term) eighth term
5. Project report must be submitted in the prescribed format only. No variation in the format will be accepted.
6. Assessment of the project for award of TW marks shall be done by the guide and a departmental committee (consisting of minimum two teachers with experience more than three years) as per the guidelines given in the following table.

B) ASSESSMENT OF PROJECT II TERMWORK (B.E. SECOND TERM)

NAME OF THE PROJECT: _____

NAME OF THE GUIDE: _____

Sr. No	Exam. Seat No	Name Of Students	Assessment by guide (70%)						Assessment by department (30%)			Grand Total
			Fabrication /software / actual work	Execution of project	Project report	Scope/ Cost / Utility	Attende-nece	Total	Evaluation (10%)	Prese-ntaion (20%)	Total	
		Marks	20	10	20	10	10	70	10	20	30	100

Sign of Guide Sign. of Committee Members Sign. of H. O. D.

7. The guide should be internal examiner for oral examination (If experience is greater than three years).
8. The external examiner should be from the related area of the concerned project. He should have minimum of five years of experience at degree level / industry.
9. The evaluation at final oral examination should be done jointly by the internal and external examiners.

NORTH MAHARASHTRA UNIVERSITY JALGAON

B.E. (Common Automobile Engineering and Production Engineering)

W.E.F : 2008- 09

TERM - II

INDUSTRIAL VISIT / CASE STUDY

Teaching scheme: **Examination scheme:**

NIL **Term Work : 25 Marks**

EDUCATION TOUR / TECHNICAL VISITS / CASE STUDY AND ITS EVALUATION

1. During (B.E. First Term / Second Term) seventh and / or eighth terms or during vacation between (B.E. First Term / Second Term) seventh and eighth terms, every student; shall visit minimum two industries, factories arranged by colleges and accompanied by teachers. There shall be at least one teacher for a group of 20 students and at least one non-teaching staff accompanied with the students.

2. The colleges should obtain appropriate certificates of visit from the concerned organizations just after the visits.

3. Students should submit written report about the visits individually at the end of (B.E. Second Term) eighth term.

4. The report should contain information about the following points:

   (a) The organization - activities of organization and administrative setup technical personnel and their main duties.
   (b) The project / industry brief description with sketches and salient technical information.
   (c) The work / processes observed with specification of materials, products, equipments etc. and role of engineers in that organization.
   (d) Suggestions (if any) for improvement in the working of those organizations.

5. The evaluation of the report of technical visits will be made by panel of two teachers appointed by principal based on following points:

   (a) Coverage aspect: All above points should be covered.
   (b) Detailed observations: System / Process / Product explained with data, diagram specifications.
   (c) Quality of presentation: Report should be very objective and should consist of clear and systematic organization of topics and information.
   (d) Viva - voce: A viva -voce shall be conducted on the technical visit report by the teachers to assess the specific knowledge gained by the students for technical applications.

6. The case study should include the study problem in Mechanical Engineering, Automobile Engineering and Production branch.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
ENGINEERING AND TECHNOLOGY FACULTY
Equivalent Subjects of B.E. Mechanical Engineering

FIRST TERM

S.N.	Old Subjects	S.N.	Equivalent Subjects	Year
1	Machine Design –III	1	--	--
2	Refrigeration And Air Conditioning	2	Refrigeration And Air Conditioning	B.E.Mech (New)
3	Project and Financial Management	3	--	--
4	Elective – I	4	Elective – I	
	1. Non-conventional Energy Sources		1. --	--
	2. Machine Tool Design		2. Machine Tool Design	B.E.Mech – Elective-I (New)
	3. Operation Research		3. --	--
	4. Robotics		4. --	--
	5. Automobile Engineering-I		5. --	--
	6. Mechanical Estimation and Costing		6. --	--
	7. Reliability Engineering		7. --	--

SECOND TERM

S.N.	Old Subjects	S.N.	Equivalent Subjects	Year
1	CAD/CAM	1	--	--
2	Tribology	2	Tribology	B.E.Mech (New)
3	Mechanical Vibration	3	Mechanical Vibration	B.E.Mech (New)
4	Elective - II	4	Elective - II	
	1. Power Plant Engineering		1. Power Plant Engineering	B.E.Mech – Elective-II (New)
	2. Management Information system		2. --	--
	3. Materials Management		3. --	--
	4. Energy Conservation and Management		4. --	--
	5. Automobile Engineering-II		5. --	--
	6. Production Planning and Control		6. --	--
	7. Analysis and Synthesis of Mechanism		7. --	--

Rules and Regulations Relating to Degree of Bachelor of Engineering / Bachelor of Technology (B.E. /B. Tech.)

(To Be Introduced from Academic Year, 2012-13)

Degree Course (Modified) with Effect from Academic Year 2012-13

(These rules and regulations will supersede earlier rules and regulations)

Preamble

The present education needs to improve its international competitiveness and the employability of its student community. In this age of information technology the education paradigm is shifting from teaching to learning and the role of teacher is a facilitator. The focus of education should be student centered and thrust should be on learning by the students than teaching by the faculty. The contact hours should be optimized so that student can approach to library, use Internet and take up self-study to improve his / her skills.

This curriculum structure has been framed by considering guidelines of National Knowledge Commission (NKC), which suggests appropriate importance of basic courses, core courses and interdisciplinary / elective courses to fulfill the varied needs of the industry.

Features of the CGPA system:

1) The degree course B.E. / B. Tech. being run under the faculty of Engineering and Technology shall be of **46** credits per year. There shall be total **184** credits allotted for **4** year degree course.

   Note: For lateral entry admitted students (Diploma and B.Sc. students), total no. of credits allotted shall be **138**. But B.Sc. student has to complete credits of courses of 'Elements of Civil Engineering & Engineering Mechanics' and 'Elements of Mechanical Engineering & Engineering Graphics' of F.E. in addition to **138** credits of SE to BE.

2) The credits shall be awarded as follows except for some special subjects:

   - **1** credit for **1** hour theory lecture.
   - **½** credit for **1** hour practical / tutorial.

3) The batch size for practical shall be as follows:

   - FE & SE: **18** to **22** students
   - TE & BE: **13** to **17** students

4) The batch size for Mini Project, Project, and Seminar shall be of **8** to **10** students. Each teacher can guide maximum **2-3** projects.

5) There shall be some credit courses having grade points and some audit courses having audit points. However audit points shall not be counted in calculation of final SGPA and CGPA.

6) The structure of syllabus from FE to BE shall be same for all branches of Engineering and Technology.

Course Title: Bachelor of Engineering / Bachelor of Technology

Abbreviation: B. E. / B. Tech.

Type of Course: A **4** year degree course divided into **8** Semesters.

Pattern: Semester

Number of Years and Semesters: 4 Years divided into **8** semesters with **2** semesters per year.

Nomenclature of Semesters:

The revised Rules, Regulations and Syllabus for four year courses in Engineering and Technology shall be introduced gradually as follows:

No	Year	Abbreviation	Semester	With effect from
1	First Year B.E. / B. Tech.	FE	I & II	A.Y. 2012-13
2	Second Year B.E. / B. Tech.	SE	III & IV	A.Y. 2013-14
3	Third Year B.E. / B. Tech.	TE	V & VI	A.Y. 2014-15
4	Final Year B.E. / B. Tech.	BE	VII & VIII	A.Y. 2015-16

Award of the Degree: Degree shall be awarded to students earning credits of all eight semesters (Minimum **184** Credits) and completing of minimum number of Audit Points as given in **Rule 11**.

Note: For lateral entry admission (Diploma and B.Sc. students), minimum number of credits shall be **138** and minimum number of Audit Points as given in **Rule 11**.

Duration of Semester: Each Semester shall be normally of **15** To **16 weeks** duration for class room teaching / laboratory work.

Definitions:

- **University:** North Maharashtra University, Jalgaon.
- **College / Institute:** Any college / Institute conducting B.E / B. Tech. course and affiliated to North Maharashtra University, Jalgaon.

- **State Government:** Government of Maharashtra.
- **Admission Authority:** Any authority to conduct admission process as prescribed by Government of Maharashtra.
- **DTE:** Directorate of Technical Education, Maharashtra State.

Rule 1: B.E. / B. Tech. Entry levels into the course, eligibility criteria, admission authority and procedures

Entry levels into the course shall be at the beginning of the Semester - I or at the beginning of the Semester - III.

Eligibility criteria, admission authority and procedures shall be Government of Maharashtra / Directorate of Technical Education and procedure shall be as per directions of admission authority prevailing at the time of admission.

Rule 2: B.E. / B. Tech. Examinations

Rule 2.1: The Examination conducting authority shall be North Maharashtra University, Jalgaon.

Rule 2.2: The examination at the end of each semester shall be normally held in November / December and April / May in each academic year.

Rule 3: Attendance Rule and Detention Rule

Rule 3.1: The student will not be allowed to appear for the examinations i.e. he / she shall be detained if he / she do not attend minimum **75** % classes of theory, practical etc.

The attendance rules will be governed by DTE rules and relevant ordinance of university as applicable at that time.

Rule 3.2: If a candidate is detained in first term of any year, he / she will not be allowed to register for second term. He / she will have to register for the same in succeeding year(s).

If a candidate is detained in second term of any year, he / she will have to register for the second term of succeeding year(s).

Rule 4: Passing Criteria for Theory Course

Rule 4.1: For the ESE in Theory courses, minimum passing marks are **32** out of **80**. No separate passing is required for ISE but the student has to score minimum **40** marks out of **100** to pass in theory course.

Rule 4.2: In ESE and ICA of all courses other than theory, minimum **40** % of total marks shall be required for passing.

Rule 5: Internal Sessional Examination (ISE)

To ensure uniform attention of the students of their work throughout each semester of their study, Internal Sessional Examinations (ISE) shall be conducted

in each semester. Conducting authority shall be Institute where candidate is admitted. The institutional examination committee shall consist of Principal as a Chairman and four teachers nominated by the Principal. Internal Sessional Examinations (ISE) shall not have any passing criteria. Internal Sessional examinations shall normally be conducted in the middle of regular semester only.

Re-examination for ISE shall be allowed during current semester only. The institute must submit the ISE marks at the end of semester and there shall be no improvement test after the marks are sent to the university. Scaling down shall be done for ISE as per **Rule 5.1**.

No separate passing is required for Internal Sessional Examinations and if the candidate remains absent for the ISE, the candidate shall be just treated as not appeared for the test securing **zero** marks. The ISE marks obtained by the candidate shall be added to the marks obtained by the candidate in End Semester Examination (ESE) conducted by the University as given in Annexure - I.

Rule 5.1: Scaling Down Formula

Scaling down of Internal Sessional Examination (ISE) marks shall be done as per following formula

A - Marks obtained by a student in ESE.

B - Marks obtained by a student in ISE.

Scaled down marks= (A * (20 / 80)) + (20 % * 20)

For example:

Sr. No.	A (ESE)	B (ISE)	Scale Down B (ISE)
1	36	15	13
2	45	10	10

Note: There shall not be any scaling up scheme for ISE. If a student fails in any theory course (i.e. scores less than **32** marks) in ESE, scaling down, if required, will be done whenever the student passes in that course (i.e. scores **32** or more marks) in the ESE.

Rule 6: Internal Continuous Assessment (ICA)

ICA shall be based on continuous evaluation of student's performance throughout semester.

Rule 7: Eligibility Criteria for Admission in Next Year

Rule 7.1: Student has to complete minimum **32** Credits in an academic year to be eligible for admission to next year.

Rule 7.2: Student shall be admitted in **TE** provided he / she have earned all credits of **FE** and minimum **32** credits of **SE**. Similarly the student shall be admitted in **BE** provided he / she have earned all credits of **SE** and minimum **32** credits of **TE**.

Note: For latterly admitted B.Sc. students, credits against courses 'Elements of Civil Engineering & Engineering Mechanics' and 'Elements of Mechanical Engineering & Engineering Graphics' of FE shall not be considered while deciding eligibility for **TE** admission. These students shall be allowed for admission in **BE** only after earning credits of these courses.

Rules 7.3: If student does not complete ICA of any course, he / she shall be awarded '**I**' (**Incomplete**) grade. In case of **'I'** or '**F'** grade in ICA, student shall not be allowed to appear for ESE (Practical / Oral) of the same course, if there is an ESE for that course. In all cases, if the student secures **'I'** or **'F'** grade, he / she have to register for the same course in succeeding semester when the same course is offered. However if the institute offers the same course in next semester, the student can register for the same in the very next semester also.

Rule 7.4: If a student secures '**F**' or '**I'** grade in any course, his / her SGPA and CGPA shall not be declared till he / she earns the credit of that course.

Rule 8: Calculation of SGPA and CGPA

Semester Grade Point Average (SGPA):

The performance of a student in a semester is indicated by a number called SGPA. SGPA is the weighted average of the grade points obtained in all courses registered by the student during the semester. It shall be calculated as follows:

$$SGPA = \frac{\sum_{i=1}^{n} C_i \; p_i}{\sum_{i=1}^{n} C_i}$$

Where,

C_i = the number of credits earned in the i^{th} course of a semester for which SGPA is to be calculated

p_i = grade point earned in the i^{th} course.

i = 1, 2, 3.....n, where 'n' represents the number of courses in which a student is registered in that semester.

The SGPA is rounded up to two decimal places.

Cumulative Grade Point Average (CGPA):

Up-to-date assessment of the overall performance of a student from the time of his / her first registration is obtained by calculating a number called Cumulative Grade Point Average (CGPA), which is weighted average of the grade points obtained in all courses registered by the student since he/she entered the institute. It shall be calculated as follows:

$$CGPA = \frac{\sum_{j=1}^{m} C_j \, p_j}{\sum_{j=1}^{m} C_j}$$

Where,

C_j = The number of credits offered in the j^{th} course up to the semester for which CGPA is to be calculated.

p_j = Grade point earned in the j^{th} course. A letter grade lower than E in a course shall not be taken into consideration for calculation of CGPA.

j = 1, 2, 3.....m, where 'm' represent the number of courses in which a student is registered up to the semester for which the CGPA is to be calculated.

The CGPA is rounded up to two decimal places.

Rule 8.1: Conversion of CGPA to Percentage Marks and Vice-versa

CGPA = (% Marks + 7.5) / 10

Percentage Marks = (CGPA - 0.75) * 10 %

Rule 9: CGPA Improvement

A student shall be allowed to improve his / her CGPA by reappearing for the courses from VII and / or VIII Semesters of BE as per prevalent policy of the university.

Rule 10: Methodology for award of Grades

Details of Rule10 will be declared in due course of time.

Rule 11: Audit Courses

In addition to academic credits, student has to complete audit courses for obtaining audit points. The following audit courses shall be completed.

- Environmental Science
- Co-curricular activities

- Extra Curricular activities

Rule 11.1: Environmental Science Audit Course

It is compulsory to complete Environment Science audit course for all admitted students. ESE for Environmental Science shall be conducted as per the prevalent rules of the university. There shall be **6** audit points for the Environment Science audit course.

Rule 11.2: Co-curricular Activity

A minimum **16** Audit points for co-curricular activities shall be obtained by the student during his course of study distributed over at least **4** semesters. There is no limit on maximum audit points obtained by the student. The final grade sheet will include the actual number of audit points obtained by the student during his entire course of study.

Note: For lateral entry admission (Diploma and B.Sc. students), student shall obtain a minimum **12** Audit points for co-curricular activities distributed over at least **3** semesters.

No	Name of Activity	Audit Points
01	Technical Conference Attendance (Minimum State Level)	01
02	Technical Paper Presentation (Minimum State Level)	02
03	Award Winning Technical Paper Presentation	04
04	Technical Workshop for Minimum 2 Days	01
05	Technical Courses other than Curriculum for Each Course	02
06	Professional Society Membership (1 point for each membership)	01
07	Any Foreign Language Course (2 points for each course)	02
08	Any other Relevant Activity*	-

***Note:** If the institute wants to include any other activity, the details shall be sent to the university. The dean faculty of Engineering & Technology shall take the decision of approving the activity and allocating number of audit points for the activity.

Rule 11.3: Extra-curricular Activity:

A minimum **8** Audit points for Extra - curricular activities shall be obtained by the student during his course of study distributed over at least **4** semesters. There is no limit on maximum audit points obtained by the student. The final grade sheet will include the actual number of audit points obtained by the student during his entire course of study.

Note: For lateral entry admission (Diploma and B.Sc. students), student shall obtain a minimum **6** Audit points for Extra - curricular activities distributed over at least **3** semesters.

Sr. No.	Name of Activity	Audit Points
01	***Sports***	
	• Member of Inter College Team	01
	• Member of Inter University Team	02
	• Member of National Level Team	03
02	***Cultural Events***	
	• Inter College Level	01
	• Inter University Level	02
	• Inter State Level	03
03	Membership of NSS, NCC	01
04	Social Service Activities (Blood Donation, Tree Plantation, Adult Education etc.)	01
05	Any other Relevant Activity*	-

***Note:** If the institute wants to include any other activity, the details shall be sent to the university. The dean faculty of Engineering & Technology shall take the decision of approving the activity and allocating number of audit points for the activity.

Rule 11.4: The grade card in each semester shall contain the information about audit points obtained by the student as shown in the following table:

No	Description	Audit Points Balance	Audit Points Obtained	Total Audit Points
01	Environmental Science			
02	Co-curricular Activities			
03	Extra-curricular Activities			

The final grade card of a student shall contain the information about audit points obtained by the student as shown in the following table:

No	Audit Course	Grade	Audit Points	
			Minimum Required	Total Obtained
01	Environmental Science	CES / NCES	06	
02	Co-Curricular Activities	CCC / NCCC	16	
03	Extra-Curricular Activities	CEC / NCEC	08	
		Total	30	

Rule 11.5: Audit Point Report

The college shall send the audit point report of all admitted students in following format:

Sr. No.	Name of The Student	PRN	Exam Seat No	No of Audit Points Obtained	
				Co-Curricular Activity	Extra-Curricular Activity
01					
02					

The college shall keep the detailed record of audit points obtained by each student with documentary proof for verification till he / she shall completes the requirement of the degree.

Rule 12: Credit Groups

The syllabus of all branches shall be divided into 5 groups with credit distribution as given in the following table:

Sr. No.	Group Name	Group Code	Number of Credits
01	Basic Sciences	A	26
02	Basic Engineering & Skills	B	29
03	Humanities, Social Science & Management	C	13
04	Programme Core	D	101
05	Electives	E	15
		Total	184

Annexure - I

FE Semester – I

Name of the Course	Group	Teaching Scheme				Theory		Practical		Total	Credits
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Engineering Physics - I	A	3	---	---	3	20	80	---	---	100	3
Engineering Chemistry – I	A	3	---	---	3	20	80	---	---	100	3
Engineering Mathematics - I	A	3	1	---	4	20	80	---	---	100	4
Elements of Civil Engineering & Engineering Mechanics	B	3	1	---	4	20	80	---	---	100	4
Computer Programming	B	3	---	---	3	20	80	---	---	100	3
Engineering Science Lab - I	A	---	---	2*	2*	---	---	25	---	25	1
Computer Programming Lab	B	---	---	2	2	---	---	25	25 **(PR)**	50	1
Elements of Civil Engineering & Engineering Mechanics Lab	B	---	---	2	2	---	---	25	25 **(OR)**	50	1
Workshop Practice – I	B	---	---	2	2	---	---	25	---	25	1
Soft Skills – I	C	1	---	2	3	---	---	50	---	50	2
Total		**16**	**2**	**10**	**28**	**100**	**400**	**150**	**50**	**700**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA : Internal Continuous Assessment**

Note: For Engineering Science Lab, practical of Engineering Physics and Engineering Chemistry shall be conducted in alternate week.

FE Semester - II

Name of the Course	Group	Teaching Scheme				Theory		Practical		Total	Credits
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Engineering Physics – II	A	3	---	---	3	20	80	---	---	100	3
Engineering Chemistry - II	A	3	---	---	3	20	80	---	---	100	3
Engineering Mathematics - II	A	3	1	---	4	20	80	---	---	100	4
Elements of Electrical & Electronics Engineering	B	3	---	---	3	20	80	---	---	100	3
Elements of Mechanical Engineering & Engineering Graphics**	B	3	---	---	3	20	80	---	---	100	3
Engineering Science - II Lab	A	---	---	2*	2*	---	---	25	---	25	1
Elements of Mechanical Engineering & Engineering Graphics Lab**	B	---	---	4	4	---	---	25	25 **(OR)**	50	2
Elements of Electrical & Electronics Engineering Lab	B	---	---	2	2	---	---	25	25 **(PR)**	50	1
Workshop Practice - II	B	---	---	2	2	---	---	50	---	50	1
Soft Skills-II	C	1	---	2	3	---	---	25	---	25	2
Total		**16**	**1**	**12**	**29**	**100**	**400**	**150**	**50**	**700**	**23**

ISE: Internal Sessional Examination ESE: End Semester Examination ICA: Internal Continuous Assessment
Note: For Engineering Science Lab, practical of Engineering Physics and Engineering Chemistry shall be conducted in alternate week.
**** Subject to Revision/change by the committee appointed by academic council**

SE Semester - III

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory			Practical	Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
TH	* A/D	3	1	---	4	20	80	---	---	100	4
TH	B	3	---	---	3	20	80	---	---	100	3
TH	D	3	1	---	4	20	80	---	---	100	4
TH	D	3	---	---	3	20	80	---	---	100	3
TH	D	3	---	---	3	20	80	---	---	100	3
Soft Skills – III	C	1	---	2	3	---	---	50	---	50	2
LAB	B	---	---	2	2	---	---	50	---	50	1
LAB	D	---	---	2	2	---	---	25	25	50	1
LAB	D	---	---	2	2	---	---	25	25	50	1
LAB	D	---	---	2	2	---	---	25	25	50	1
Total		**16**	**2**	**10**	**28**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

Note 1: For branches like Chemical Engineering and Biotech Engineering, two laboratory hours can be merged to form a four hour slot.

Note 2: Out of 3 practical ESE heads, at least 1 head should be practical.

*** E & TC, Mechanical, Automobile & Production Engineering branches shall have group D course and rest of the branches shall have group A course (e.g. Engineering Mathematics-III).**

SE Semester - IV

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
TH	* A/D	3	---	---	3	20	80	---	---	100	3
TH	D	3	1	---	4	20	80	---	---	100	4
TH	D	3	1	---	4	20	80	---	---	100	4
TH	D	3	---	---	3	20	80	---	---	100	3
TH	D	3	---	---	3	20	80	---	---	100	3
LAB	B	1	---	2	3	---	---	50	---	50	2
LAB	D	---	---	2	2	---	---	50	---	50	1
LAB	D	---	---	2	2	---	---	25	25	50	1
LAB	D	---	---	2	2	---	---	25	25	50	1
LAB	D	---	---	2	2	---	---	25	25	50	1
Total		**16**	**2**	**10**	**28**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

Note 1: For branches like Chemical Engineering and Biotech Engineering, two laboratory hours can be merged to form a four hour slot.

Note 2: Out of 3 practical ESE heads, at least 1 head should be practical.

*** E & TC, Mechanical, Automobile & Production Engineering branches shall have group A course (e.g. Engineering Mathematics-III) and rest of the branches shall have group D course.**

TE Semester – V

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
TH	D	3	---	---	3	20	80	---	---	100	3
TH	D	3	---	---	3	20	80	---	---	100	3
TH	D	3	---	---	3	20	80	---	---	100	3
TH	D	3	---	---	3	20	80	---	---	100	3
TH	C	3	---	---	3	20	80	---	---	100	3
LAB	D	---	---	2	2	---	---	25	25	50	1
LAB	D	---	---	2	2	---	---	25	---	25	1
LAB	D	---	---	2	2	---	---	25	25	50	1
LAB	D	---	---	2	2	---	---	25	25	50	1
LAB	B	1	---	2	3	---	---	50	---	50	2
Industrial Training / EDP / Special Study	D	---	---	---	---	---	---	25	---	25	2
Total		**16**	**---**	**10**	**26**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination ESE: End Semester Examination ICA : Internal Continuous Assessment

Note 1: For branches like Chemical Engineering and Biotech Engineering, two laboratory hours can be merged to form a four hour slot.

Note 2: Out of 3 practical ESE heads, at least 1 head should be practical.

TE Semester – VI

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
TH	D	3	--	---	3	20	80	---	---	100	3
TH	D	3	---	---	3	20	80	---	---	100	3
TH	D	3	---	---	3	20	80	---	---	100	3
TH	D	3	---	---	3	20	80	---	---	100	3
TH	C	3	---	---	3	20	80	---	---	100	3
LAB	D	---	---	2	2	---	---	25	25	50	1
LAB	D	---	---	2	2	---	---	25	25	50	1
LAB	D	---	---	2	2	---	---	25	25	50	1
LAB	B	---	---	2	2	---	---	25	---	25	1
Minor Project	D	---	---	2	2	---	---	50	---	50	2
Seminar - I	D	---	---	2	2	---	---	25	---	25	2
Total		**15**	**---**	**12**	**27**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

Note 1: For branches like Chemical Engineering and Biotech Engineering, two laboratory hours can be merged to form a four hour slot.

Note 2: Out of 3 practical ESE heads, at least 1 head should be practical.

BE Semester - VII

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
TH	D	3	---	---	3	20	80	---	---	100	3
TH	D	3	---	---	3	20	80	---	---	100	3
Interdisciplinary Elective	E	3	---	---	3	20	80	---	---	100	3
Elective - I	E	3	---	---	3	20	80	---	---	100	3
TH	D	3	--	---	3	20	80	---	---	100	3
LAB	D	---	---	2	2	---	---	25	25	50	1
LAB	D	---	---	2	2	---	---	25	25	50	1
LAB#	E	---	---	2	2	---	---	25	25	50	1
Project – I	D	---	---	2	2	---	---	25	25	50	2
Seminar - II	D	---	---	2	2	---	---	25	---	25	2
Industrial Visit	D	---	---	---	---	---	---	25	---	25	1
Total		**15**	**---**	**10**	**25**	**100**	**400**	**150**	**100**	**750**	**23**

ISE: Internal Sessional Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

#Lab for Elective-I

Inter Disciplinary Elective	Elective I
1	1
2	2
	3
	4

Note 1: For branches like Chemical Engineering and Biotech Engineering, two laboratory hours can be merged to form a four hour slot.

Note 2: Out of 3 practical ESE heads, at least 1 head should be practical.

Note 3: Interdisciplinary Elective shall be offered by the department to the students of other department. Students from one department can not register for Interdisciplinary Elective of the same department.

Note 4: At least 15 students should register for offering any elective.

BE Semester – VIII

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
TH	D	3	---	---	3	20	80	---	---	100	3
TH	D	3	---	---	3	20	80	---	---	100	3
Elective - II	E	3	---	---	3	20	80	---	---	100	3
Elective - III	E	3	---	---	3	20	80	---	---	100	3
LAB	D	---	---	2	2	---	---	25	25	50	1
LAB	D	---	---	2	2	---	---	25	25	50	1
LAB#	E	---	---	2	2	---	---	25	25	50	1
Industrial Lecture*	C	---	---	1*	1	---	---	50	---	50	2
Project - II	D	---	---	4	4	---	---	75	75	150	6
Total		**12**	**---**	**11**	**23**	**80**	**320**	**200**	**150**	**750**	**23**

ISE: Internal Sessional Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

#Lab for Elective-II

*** Minimum 6 lectures to be delivered by experts from the industry in alternate weeks. Next week group discussion on the lecture delivered.**

Elective II	Elective III
1	1
2	2
3	3
4	4

Note 1: For branches like Chemical Engineering and Biotech Engineering, two laboratory hours can be merged to form a four hour slot.

Note 2: Out of 3 practical ESE heads, at least 1 head should be practical.

Note 3: Interdisciplinary Elective shall be offered by the department to the students of other department. Students from one department can not register for Interdisciplinary Elective of the same department.

Note 4: At least 15 students should register for offering any elective.

North Maharashtra University, Jalgaon

First year term I
ME Civil Engineering (Environmental Engineering)
Examination scheme and structure with effect from year 2010 – 11
First Year Term – I

Sr. No.	Subject	Teaching Scheme per week		Examination Scheme				
		L	P	Paper Hr.	Paper	TW	PR	OR
1	Environmental Engineering Microbiology	3	--	3	100	--	--	--
2	Design operation and maintenance of water supply and sewerage system	3	--	3	100	--	--	--
3	Air pollution	3	--	3	100	--	--	--
4	Environmental Engineering Chemistry	3	--	3	100	--	--	--
5	Elective-I	3	--	3	100	--	--	--
6	Laboratory Practice-I	--	6	--	--	100	--	50
7	Seminar-I	--	4	--	--	100	--	--
Total		15	10		500	200		50
Grand Total		**25**		**750**				

Elective-I

1) Environmental Sanitation
2) Remote Sensing GIS and its environmental application
3) Rural water supply and sanitation

ME Civil Engineering (Environmental Engineering)
First Year Term – II

Sr. No.	Subject	Teaching Scheme per week		Examination Scheme				
		L	P	Paper Hr.	Paper	TW	PR	OR
1	Advanced Water Treatment Technology	3	--	3	100	--	--	--
2	Advanced Waste Water treatment Technology	3	--	3	100	--	--	--
3	Industrial water and waste water Management	3	--	3	100	--	--	--
4	Water shed management	3	--	3	100	--	--	--
5	Elective-II	3	--	3	100	--	--	--
	Laboratory Practice-II	--	6	--	--	100	--	50
	Seminar-II	--	4	--	--	100	--	--
Total		15	10	--	500	200		50
Grand Total		**25**		**750**				

Elective II

1) Design of Water Supply and Waste Water structure
2) Environmental impact Assessment
3) Solid Waste and Management

ME Civil Engineering (Environmental Engineering)
Second Year Term I

Sr. No.	Subject	Teaching Scheme per week		Examination Scheme				
		L	P	Paper Hr.	Paper	TW	PR	OR
1	Seminar – III	--	4	--	--	50	--	50
2	Project Stage – I	--	18	--	--	100	--	--
Total		--	22	--	--	150	--	50
Grand Total		**22**		**200**				

ME Civil Engineering (Environmental Engineering)
Second Year Term II

Sr. No.	Subject	Teaching Scheme per week		Examination Scheme				
		L	P	Paper Hr.	Paper	TW	PR	OR
1	Progress Seminar	--	--	--	--	50	--	---
2	Project Stage - II	--	18	--	--	150	---	100
Total		--	18	--	--	200	--	100
Grand Total		**18**		**300**				

North Maharashtra University, Jalgaon

ME Civil Engineering (Environmental Engineering)

Examination scheme and structure with effect from year 2010 – 11

First year term I

1) ENVIRONMENTAL ENGINEERING MICROBIOLOGY

Lectures – 03 Hours / Week	Theory 100 marks
Tutorial - 01Hours/week	Min passing 40 marks
Term work 50 marks	Duration - 03Hours

Role of microorganisms in environmental engineering. Microorganism classification, bacteria, Algae, Fungi, Protozoa, Crustacea, Rolifers, Oligochaeta, Parasites. Observation of microbes. Biochemical reactions. Metabolic activities. Role of enzymes. Pure and mix culture. Biodegradibilty. Factors affecting biodegradability, ph, temperature, nutrition, salt concentration, toxicity, osmotic pressure etc. Optimum conditions for growth, oxygen requirement.

Bacterial metabolism- oxidation of carbohydrates Protein and fats under aerobic and anaerobic conditions, Carbon, Nitrogen and Sulfur cycles in nature.

Role and micro-organisms in the treatment of sewage and industrial wastes by different methods.

Synthesis, growth and death of microorganisms, population dynamics.

Role and significance of bacteria and viruses in potable water, occurrence of water borne diseases and their prevention, Bacterial indicators of pollution.

M. P. N. techniques and bacterial colony counting, M. F. technique – principle, procedure, limitation of test, Interpretation of analytical results. Bacteriological standards for raw and treated waters.

Applied microbiology of domestic sewage and industrial wastewater. Anaerobic and aerobic metabolic pathways.

Microbial inner look into various wastewater treatment systems including trickling filter, activated sludge process, oxidation ponds, anaerobic digesters.

Role of microorganisms in solid waste disposal, pathogenic aspects of landfilling and composting, microbiological factors affecting performance of landfills and composting plants.

Effect of radioactivity on microorganisms. Milk and food sanitation. Air born disease, spread and control of air born diseases. Biological indicators of pollution. Control of Algae and other Biological growth in water supplies.

Term work:

1. Determination of MPN index of a given sample of water.
2. Study of optical microscope and its setting.
3. Preparation of culture media.
4. Acclimatization of bio mass and its concentration under aerobic conditions.
5. Determination of B Coli count of water by membrane filtration method.
6. Study of microbes under microscope and staining of microorganisms.
7. Study of heavy metals on microorganisms.
8. Five Assignments based upon above syllabus.

Books:

1. Microbiology for sanitary engineer by McKinney.
2. Sanitary microbiology by Gauddy and Gauddy.
3. Microbiology by Pelzar.

2. ENVIRONMENTAL ENGINEERING CHEMISTRY

Lectures – 03 Hours / Week
Tutorial - 01Hours/week
term work 50 marks

Theory 100 marks
min passing 40 marks
Duration - 03Hours

Basic concepts from general chemistry- elements, atomic weights, gram atomic weights, compounds, mole, avagadro's number, valancy, oxidation state, nomenclature, chemical equations and weight relationship, oxidation-reduction, gas laws, solutions, Le Chatelier's principal, , ionization, common ion effect,
shifting chemical equillibria, amphotermic substances.

Basic concepts from physical chemistry- thermodynamic aspects, energy, enthalpy, entropy, Gibb's free energy, vapor pressure, surface tension, solution of solids in liquids, osmosis, dialysis, solvent extraction, electrochemistry, chemical kinetics, catalysis, adsorption,.

Basic concepts from organic chemistry- carbon atom, isomerism, hydrocarbons, alcohols, aldehydes, ketones, acids, esters, ethers, alkyl halides, amines, amides, cyclic aliphatic compounds, aromatic compounds, phenols, heterocyclic compounds, dyes, common foods, trace organics, detergents, pesticides.

Basic concepts from equilibrium chemistry- limitations of equlibrium calculations, ion activity coefficients, acids and bases, buffers, solubility, complex formation, oxidation-reduction, preliminary numerical treatment with these topics.

Basic concepts from colloid chemistry- colloid, methods of formation, dispersion of colloids in liquids, dispersion in air.

Basic concepts from biochemistry chemistry- enzymes, cofactors, temperature dependence, pH, trace elements, biochemistry of protines, biochemistry of fats, biochemistry of carbohydrates, energetics and bacterial growth.

Standard methods of examination of waters and wastewaters, standard solutions, primary and secondary standards, colorimetry.

LIST OF PRACTICALS:

1. Preparation of standard solutions.
2. Determination of conductivity
3. Kijedahl Nitrogen determination.
4. Calcium, magnesium and total hardness.
5. Determination of Iron using spectro photometry
6. Determination of chromium using spectro photometry
7. Determination of fluoride using spectro photometry
8. Residual chlorine determination..
9. Determination of Dissolved oxygen of a given sample of water.
10. Determination of Biochemical oxygen demand of a given sample of wastewater using acclimatized bio mass..
11. Determination of TOC of a given sample of wastewater.
12. Determination of IOD of a given sample of wastewater.

Any ten experiments out of the twelve experiments given above must be performed.

Books:

1. Chemistry for environmental engineering: Sawyer and McCarty, TMC Publication N Delhi.
2. Physical chemical and organic chemistry by Bahal and Tuli, Khanna publication New Delhi.

3. DESIGN OPERATION AND MAINTENANCE OF WATER SUPPLY AND SEWERAGE SYSTEM.

Lectures – 03 Hours / Week
Tutorial - 01Hours/week
term work 50 marks

Theory 100 marks
min passing 40 marks
Duration - 03Hours

Importance of sewerage system. General History of water supply and sewerage system in India. Development in different five year plans, Future scope.
Estimation of water requirements and flow into sewers.

Sources of water, Surface and underground sources. Intake structures, construction and maintenances of wells and infiltration galleries. design of intake structures.

Transmission of water, Types and materials of conduits, Hydraulic characteristics, Water hammer appurtenances, Pumping of water, types, design and selection.
Types of pumps, Economics of pumps and rising main.
Distribution of water, Pressure and capacity requirement of systems. Field and office analysis of distribution network, Service reservoir. Maintenance of distribution system. Emergency disinfections of mains.

Sewerage System : Patterns of sewerage systems, kinds of sewer.

Design of sewerage systems : Hydraulics of sewers. Flow at sewer transitions. Length of side weirs and capacity of street inlets, Estimates of sewage flow. Storm water runoff. Design and layouts of sanitary and combined sewerage systems. Maintenances of sewers.

Sewer Appurtenance : Manholes, flushing tanks. Inverted siphons, Regulators., design and working principal

Pumping of sewage: Necessity, Types and characteristics of pumps. Typical problems in sewage pumping.

Plumbing requirements of tall buildings: design of water supply and sewerage for houses, numerical treatment.

Term work: term work shall be based upon ten assignments based upon the above mentioned syllabus. The assignments should base upon following topics:

a. Significance of sewerage and eater supply systems and their history. (one assignment)

b. Design of intake structure. (one assignment)

c. Design of pressure mains (one assignment)

d. Materials, layout and maintenance of pipes network. (two assignments)

e. Design of pipe network. (two assignments)

f. Estimation of run off and sewerage (one assignment)

g. Design of sewer (two assignments)

h Lay out and maintenance of sewers (one assignments).

Books:-

1. Water & Wastewater Technology:- Mark J. Hammer
2. Pumping and collection of wastewater, Meclaf and eddy Inc.
3. Water supply & Wastewater engineering :-B.S.N. Raju
4. Water supply engineering :-Dr. P. N. Modi.

4. AIR POLLUTION

Lectures – 03 Hours / Week
Tutorial - 01Hours/week
term work 50 marks

Theory 100 marks
min passing 40 marks
Duration - 03Hours

Definitions, energy environment relationship.

Importance of air pollution studies in modern world, elements of air pollution, sources of air pollution, effects of air pollution on human beings, plant, animals, property. Economic effects of air pollution. Global and local effects of air pollution. Case studies of India and world. Permissible air pollution. Ambient and effluent standards.

Nature's cleaning mechanism. Point source. Atmospheric conditions and dispersion of air pollution, various types of plume behaviors, Guassian dispersion equations, their limitations, numerical treatment. Estimation of dispersion of air pollution from a given height of stack under given atmospheric conditions, plume rise estimation, estimation of maximum concentration under given conditions, calculation of required height for permissible concentration. Concept of line source.

Air pollution from thermal power plant, their characteristics and control.

Air sampling methods and equipments. Analytical methods for air pollution studies, smoke survey, planning an air pollution survey.

Particulate matter and its control by equipments. Working principal, advantages,

Disadvantages, design and applications of various types of particulate control devices. Concept of bio filters.

Automobile air pollution, types, control methods, effect of A/F ratio.

Photochemical smog formation, bad effects, control.

Control of air pollution : strategy, effect of town planning, road conditions, vehicle condition etc. history of air pollution legislation in India. Life style and air pollution.

Glance over present day global and Indian scenario of air pollution.

Term work:

1. Ten assignments based upon above syllabus.

The assignments shall be based upon following topics:

a. Automobile air pollution and its control (one assignment)
b. Meteorological factors and their influence on air pollution dispersion, plume behavior (two assignments)
c. Life style and air pollution control (one assignment)
d. Energy utilization and environmental degradation (one assignment)
e. Estimation of effective height of stack (one assignment)
f. Estimation of required height of stack for pollution control under given environmental conditions (two assignments)
g. Global environmental phenomenon (two assignments).

2. Visit to a site where air pollution control device is working.
3. Practical:
    a. Air pollution sampling using high volume sampler.
    b. Automobile air pollution sampling using auto exhaust analyzer.
    c. Study of functioning of air pollution control devices installed at sites.

Books:-

1. Air pollution:- A C Stern.
2. Air pollution :-M N Rao & H V N Rao
3. Air pollution engineering by Perkins.
4. Air pollution control technology: Wark and Warner.

5. *ELLECTIVE-I*

1. ENVIRONMENTAL SANITATION

Lectures – 03 Hours / Week
Tutorial - 01Hours/week
term work 50 marks

Theory 100 marks
min passing 40 marks
Duration - 03Hours

Definitions, environment and its effect on public health, global environmental sanitation history, problem of environmental sanitation in India.

Refuse Collection And Disposal: generation, storage and Composition of refuse, quantity, house treatment, Administration of collection and disposal. Socio economic and cultural aspect associated with refuse management problem.

House sanitation: importance of house sanitation, indoor pollution, importance of sun light, Heating, cooling, ventilation, air conditioning, lighting. Noise-hazards of noise, protection against noise, fly and mosquito control. Architectural aspects for house sanitation.

Communicable Disease: Disease and immunity, communicable, diseases source, Mode of transfer, Control of communicable diseases

Sanitation of public places: Problems of sanitation of the following public places and their solutions : Swimming pools and bathing places, Bus and railway station, Hospitals, Cinema houses, Campus, fairs and festival.
Milk Food Sanitation: Essentials of dairy farm and cattle shed sanitation. Tests for milk and dairy products. Food epidemics, food poisoning, Botulism.

Parasitology: Tropical health, Health problems of under develop countries. Disease due to parasite infestation. Physiological effects, specific examples of region. Engineering control.

Term work: Ten assignments based upon above syllabus as on following topics:

a. Importance of environmental sanitation and historical back ground (one assignment)
b. Traditional Indian practices for environmental sanitation and health protection. (one assignment)
c. Refuse problem and its cultural aspects (two assignment)
d. Refuse collection and socio economic aspects.(two assignment)
e. Disease transmission and its prevention, role of individual and community (two assignments)
f. Sanitation of public places (two assignment)

In addition to above, students must do a minor project based upon above syllabus the project must be a case study of field.

Books:-

1. Municipal & Rural Sanitation:- Ehlens &Steel
2. Environmental Management:- G.N. Pandey
3. Environmental Sanitation:- B.S. Kapoor

2. REMOTE SENSING, GIS AND ITS ENVIRONMENTAL APPLICATIONS

Lectures – 03 Hours / Week	Theory 100 marks
Tutorial - 01Hours/week	min passing 40 marks
term work 50 marks	Duration - 03Hours

Fundamental principals of remote sensing, electromagnetic energy and its atmospheric interactions, remote sensing systems.

Elements of remote sensing systems, Indian remote sensing program.

Principles of Ariel survey, ariel photography, scale, types of photographs, over lapping, drift and drag, air photo interpretation, equation of parallex, stereoscopic vision, air base distance, areil points.

Satellite imageries, stationary and geo-stationary satellites, global positioning system and its application in environmental engineering. Indian satellite program.

Geographical information system, fundamentals, applications, characteristics. Different types of sensors, data interpretation.

Integrated application of remote sensing and GIS in environmental engineering, resource management, monitoring and evaluation, modeling.

Term work:

1. Practice with GIS software.
2. Minor project using GIS
3. Study of areil photographs and satellite imageries.
4. Five assignments based upon above syllabus. The assignments should include following topics:
    a. Principles of remote sensing (one assignments)
    b. GIS, its scope and applications (Two assignments).
    c. History and development of GIS (one assignment)
    d. Digital data interpretation (one assignment).

Books:

1. Remote sensing, principles and interpretation by W H & Freeman & Co. NY.
2. Remote sensing by Gupta R P.
3. Introductory digital image processories by Jensen J R, Pentice Hall, NZ.

3. Rural Water Supply and Sanitation

Lectures – 03 Hours / Week
Tutorial - 01Hours/week
term work 50 marks

Theory 100 marks
min passing 40 marks
Duration - 03Hours

Importance of village community in India , conditions of Indian villages with special regard to economic ,social and health aspect. Quality of water needed for village community. Sources of water for village water supplies. Types of wells of sanitary aspects in well construction. Disinfections of wells. Different types of pumps used for village wells. Treatment of water. Hydrological aspects of source and its impact on water quality. Strengthening of source.

Engineering project and role of engineer. Steps in project development report. Feasibility of the project both technical and financial. Alternative project construction. Cost comparison, scientific management and relationship , Rationalization, Qualities of good manager , office organization. Organization and management of stores. Present worth annuities, sinking funds, capitalized cost, annual expense, depreciation salvage value Rate structure, sources of money. General principles of financing, capital improvements and operating water works. Benefit cost ratio analysis, life of scheme, history, development and management of water supply and sanitary engineering projects in India.

Design of rural water supply scheme. Cost estimation of rural water supply scheme.

Term work: Five assignments based upon above-mentioned syllabus. The above assignments shall include following topics:

a. Importance, history and economic aspect of rural water supply in India. Five year development plans (one assignment).
b. Project management techniques applied to rural water supply engineering (two assignments)
c. Automation of small water supply schemes and limitation (two assignments)

In addition to above, the candidate must do a minor project based upon rural water supply schemes. It may be a case study or a design.

Books:-

1. Water supply Engineering:- S.K. Garg
2. Management of water projects:- Oxford &IBH publishing Co.
3. Pumping and Collection of water by MetCalf and Eddy TMC publications.

Laboratory Practice I

All assignments are compulsory

1. Assignment No I – Environmental Engineering Microbiology
2. Assignment No 2 – Design operation and maintenance of water supply and sewerage system
3. Assignment No 3 – Air pollution
4. Assignment No 4 – Elective I

Experiment (Minimum Four)

1. Determination of Microbial quality of water by standard Plate count
2. Determination of coli form density by MPN method
3. Membrane Filter Test
4. Determination of NO_x/SO_x
5. Determination of chloride content
6. Determination of C O D
7. Determination of Oil and Grease

ME Civil Engineering (Environmental Engineering)

TERM II

1. ADVANCED WATER TREATMENT TECHNOLOGY

Lectures – 03 Hours / Week
Tutorial - 01Hours/week
term work 50 marks

Theory 100 marks
min passing 40 marks
Duration - 03Hours

Quality of water: Standards of raw and treated waters. Sources of water and their natural quality. Protection of sources. Effects of water quality. Water ecology, water demand, fluctuation, water supplies.

Water treatment: Requirements of water treatment facilities. Process design and hydraulic design.
Unit operations and process, kinetic theory of reactors, plug flow and completely mixed reactor, dye tracing, efficiency of reactors, reactors in series, partially mixed reactors.
Sedimentation and flotation: General equation for settling or rising of discrete particles. Hindered settling. Effect of temperature, viscosity. Efficiency of an ideal settling basin, Reduction in efficiency due to various causes. Sludge, Storage and removal. Design criteria of settling tanks.

Coagulation: theories of chemical coagulation, coagulation aids. Mixing arrangement design of mechanical flocculator. Mean velocity gradient, effect of temperature.

Filtration: Theory of filtration. Size & shape characteristics of filter media. Preparation of filter sand. Hydraulics of filtration through homogenous and stratified media. Hydraulics of filter washing. Design of filter elements. Filter appurtenances, multimedia filters.

Disinfection: importance of disinfections, Methods of disinfections. Factors affecting disinfections. Destruction of bacteria, virus. Methods of dosing. Safety measures. Bad effect of chlorination.

Aeration: Principles of aeration methods.

Softening of water: types of hardness, effects, permissible limits, Langelier index, Methods of softening.

Miscellaneous water purification processes: Removal of Iron and manganese, Removal of taste and odor. Removal of Fluorides. Treatment of saline water.

Corrosion: Theory and principles of corrosion, Factors influencing corrosion. Methods of protection.

Latest methods of water treatment.

Complete design of water treatment plant as per prevailing Indian standard codes of practice with cost estimation.

Term work:

1. Five assignments based upon above-mentioned syllabus. The assignments should include following topics:
    a. Design of primary settling tank with all components
    b. Design of secondary settling tank with all components
    c. Design of coagulation units with all components
    d. Design of Filtration unit with all components
    e. Design of disinfection unit with all components.

2. Visit to a water treatment plant and its report.
3. Complete design of water treatment plant with all details, drawings and cost estimation.

Books:-

1. Water supply and sanitary engineering: E W Steel.
2. Water treatment technology: Walter J Weber
3. Water treatment manual by CPHEEO

2. ADVANCED WASTEWATER TREATMENT TECHNOLOGY

Lectures – 03 Hours / Week
Tutorial - 01Hours/week
term work 50 marks

Theory 100 marks
min passing 40 marks
Duration - 03Hours

Sewage characteristics: Characteristics of domestic sewage, storm and combined sewage. Constituents of Sewage. Sampling and storage of sewage. Decomposition of organic materials. Biodegradability. Biochemical oxygen demand. BOD satisfaction rate constant. Population equivalent. Chemical oxygen demand.
Monod's equation for substrate utilization. Kinetic coefficients of microbial decomposition of wastewater under aerobic and anaerobic conditions. Determination of kinetic coefficients. Mathematic relationship between coefficients. Kinetic theory applied to aerobic and anaerobic suspended growth mixed biological reactor, Kinetic theory applied to aerobic and anaerobic attached growth biological reactor.

Sewage disposal: Disposal methods. Self Purification of natural bodies of water. Oxygen balance and oxygen sag. Critical time and critical distance, mathematical treatment. Sewage farming.

Sewage treatment: Object of sewage treatment. Process design and hydraulic design. Screening and Grit Removal: Design and operation of screens. Disposal of screening. Principles of sedimentation applied to grit chamber. Velocity control. Disposal of grit.

Oil and grease separation: Sedimentation Primary , intermediate and final clarification. Design of tanks. Removal of sludge and scum . Sedimentation aided by chemical. Principle and theory of biological methods of treatment. Design of facilities for biological treatment of wastewater, activated sludge process, trickling filters, anaerobic and aerobic lagoons, oxidation ditch, oxidation ponds, septic tanks.
Sludge production, removal, handling, disposal methods, bio gas generation, design of bio gas reactor, sludge drying beds and their design. Aerobic digesters.

Miscellaneous Treatment: Disinfections of sewage. Coagulation of sewage.
Non biodegradable organics, their occurrence, bad effects, conventional removal methods introduction to photocatalysis theory for non biodegradable organics.

Complete design of wastewater treatment plant with all components, details, drawings and cost estimation.

Term work:

1. Five assignments based upon above-mentioned syllabus. The assignmenst should include following topics:
    a. Design of preliminary treatment system.
    b. Design of primary treatment system.
    c. Design of Biological treatment system
    d. Design of tertiary treatment system
    e. Design of advance wastewater treatment methodology.
2. Visit to a wastewater treatment plant and visit report.
3. Complete design of wastewater treatment plant with all components, details, drawings and cost estimation.

Books:-

1. Wastewater treatment, disposal and reuse: Metcalf & Eddy Inc.
2. Wastewater treatment technology by S J Arceiwala.
3. Wastewater treatment system by Hammer.
4. Wastewater treatment manual by CPHEEO

3. INDUSTRIAL WATER AND WASTEWATER MANAGEMENT

Lectures – 03 Hours / Week
Tutorial - 01Hours/week
term work 50 marks

Theory 100 marks
min passing 40 marks
Duration - 03Hours

Special problems of Industrial wastewater, water quality index and its application for industrial wastewater recalculation and reuse, industrial ecology, integrated approach for industrial water and wastewater management.
Water requirements of various industries. General idea of manufacturing process in various industries. Sources of wastewaters.

Legal aspects of industrial wastewater management, Regulatory agencies, Standards for treatment.

Reuse and recovery of bye products from industrial wastewaters. Volume reduction and waste reduction approach for pollution control, concept of end of pipe and cleaner technology.
Combine effluent treatment plants, combined domestic and industrial wastewater treatment plants.
Acclimatization of bio mass for industrial wastewater treatment, addition of nutrients.
Case studies of various industries including textile industry, distilleries, sugar industry, paper and pulp mills, oil and petroleum, dairy, food processing industries.

Books:-

1. Liquid waste of industry- theory practice and treatment: Nelson J Nemerow
2. Industrial water pollution control: W W Eekenfelder
3. Industrial wastewater management by R Mahajan TMC publication
4. Manual of Industrial wastewater by NEERI

Term work:

Five assignments based upon above syllabus. The assignments shall include following topics:

a. Characteristics of wastewater of major industries in India.
b. Pollution impact of major industries on wet land and soil.
c. Integrated water and wastewater management of major industries.
d. Typical problems with wastewater treatment of major industries.
e. Advance treatment methodology for major industrial wastewaters.

In addition to above, students should visit to at least three industrial wastewater treatment plants and submit a report.

4. WATERSHED MANAGEMENT

Lectures – 03 Hours / Week
Tutorial - 01Hours/week
term work 50 marks

Theory 100 marks
min passing 40 marks
Duration - 03Hours

Introduction: scope, objectives significance.

Water in the atmosphere: global distribution and availability of water, precipitation and evaporation, factors affecting them.

Hydrology and water resources development: analysis of runoff and rain fall, storage and regulation of run off, safe yield of streams, estimation of storage requirements. Pollution monitoring in watershed and its control, watershed hygiene.

Hydrology of ground water: common aquifers, exploration of ground water, hydraulics of ground water, measurement of permeability. Design construction and maintenance of wells and infiltration galleries. Salt water infiltration and prevention, ground water recharge.

Watershed development and management: definitions, need, scope, characteristics of watershed criteria survey, basic data collection and interpretation, establishment of watershed resource evaluation and management. Urban watershed management strategy and its necessity in present time. Town planning aspect for watershed management.

Irrigation technology: integrated farming system, prospects of watershed management, methodology for modifying water resource environment, watershed management and large scale changes.

Practice of watershed management: rehabilitation, protection and enhancement.

Rain water harvesting: necessity, methods of rainwater harvesting, community participation, role of NGOs, municipal corporation, Government. Limitations. Quality assurance of storage water. Traditional water harvesting techniques and their relevance.

Design of structures for watershed management including small bandhara, percolation tanks, minor dam.

Term work: Seven assignments based upon above-mentioned syllabus. Site visit to an existing rainwater harvesting site. The assignments should be based upon following topics:

a. Water in the atmosphere
b. Hydrology and water resources development
c. Hydrology of ground water
d. Watershed development and management
e. Irrigation technology
f. Practice of watershed management
g. Rain water harvesting
h. Design of structures for watershed management

In addition to above the candidate should do a case study or design of a watershed management scheme.

Books:

1. Watershed hydrology: Peter E Black.
2. Water resources systems: planning and management: R N Chaturvedi.
3. Watershed Management strategy by S P Shah TM C publication.

ME Civil Engineering (Environmental Engineering)

ELLECTIVE II

1 DESIGN OF WATER SUPPLY AND WASTEWATER STRUCTURES.

Lectures – 03 Hours / Week
Tutorial - 01Hours/week
term work 50 marks

Theory 100 marks
min passing 40 marks
Duration - 03Hours

Introduction to IS codes for practice for steel and concrete tanks and pipes.

Conduits: Stresses in pipes, strength of conduits, Design of concrete and steel pipe for internal and external loads. Anchor blocks.

Tanks: Design of various types of underground tanks, safety analysis, retaining wall and floor junction. Surface resting rectangular and circular tanks in R.C.C. and steel. Over head rectangular and circular tanks in R.C.C. and steel. Intze tanks. Steel and concrete staging.

Treatment Units: Design clarifiers, flocculators, filter house, Hopper bottom tanks. Digesters.

Books:

1. Design of steel structures:- S. Ramamurtham
2. Design of concrete structures: S Ramamrtham
3. Design of concrete structures: Syal and Goel

Term work:

1. Design and detailing with drawings of circular water tank on surface.
2. Design and detailing with drawings of rectangular water tank on surface.
3. Design and detailing with drawings of bracings for overhead water tank.
4. Design and detailing with drawings of Intze type water tank.
5. Design and detailing with drawings of rectangular water tank under ground.
6. Design and detailing with drawings of flocculation unit.
7. Design and detailing with drawings of filtration unit.

Any five assignments of above.

2 ENVIRONMENTAL IMPACT ASSESMENT

Lectures – 03 Hours / Week
Tutorial - 01Hours/week
term work 50 marks

Theory 100 marks
min passing 40 marks
Duration - 03Hours

Development and environment, need for environmental impact assessment, concept of EIA, elements of EIA, environmental attributes, nature of impacts- primary, secondary, tertiary, short term and long term, local and regional, reversible and irreversible impacts.

Overview of impacts- directly and indirectly measurable impacts with respect to air, noise, water, land, biological and socio economic environment.

Screening and scooping in EIA: terms of reference for conducting EIA, methodologies of EIA- check list, matrices, overlays, cost benefit analysis adaptive environment and management network.

Frame work of EIA: scope of EIA, base line data collection, prediction of impacts, evaluation of impacts, Battelle environmental evaluation system, environmental management plan, green belt development, environmental quality monitoring, budgetary provisions for implementing control measures.

Environmental appraisal of project, MOEF questionnaire for environmental clearance, elements of public participation and hearing, case study on EIA of industrial, mining, highway and water resources projects, critical environmental issues and formulation of strategies for EMP for this project.

Environmental legislation- basic concepts, critical issues, civil liabilities, various enactments and their provisions- water act (1974, 1978), forest conservation act (1980), air pollution control act (1981, 1988), water (cess) act 1977, environmental protection act 1986, public liability and insurance act.

Environmental audit- definition, concept of EA, types of environmental audits, benefits of EA, scope and objectives, environmental statement, procedural aspects of conducting EA pre-audit phase, onsite audit phase and post audit phase, water audit,

energy audit, raw material audit and health & safety audit. Conservation of energy and water, waste minimization, economic benefits of EA.

Sustainable development and environmental management: concept of carrying capacity, assimilative and supportive capacity, carrying capacity based developmental planning process, regional EIA and preparation of regional EMP, , development of action plan for critical environmental areas, training needs in EM and Environmental Educational Programs. Environmental management in India.

Resource management: types of resources, terrestrial (soil) resource, mineral plants and animal (biotic) resources, marine fresh water, air and bio energy resources, resource utilization, renewable and non-renewable resources. Optimal use of resources. Depletion of resources, causes and effects.

Human resources: importance of socio economic studies in development projects.

Books:

1. Environmental Impact Assessment by Rau and Woofes.
2. Environmental Impact Assessment by W F Canter, TMC publication.
3. Hand books of pollution control act, central pollution control board, New Delhi.
4. The new environmental age by R K Sapra, S Bhardwaj, Ashish publication house New Delhi.

Term Work:

Five assignments based upon above syllabus. Assignments shall include following topics:

1. Development and environment
2. Overview of impacts
3. Frame work of EIA:
4. Environmental appraisal of project
5. Environmental legislation

In addition to this the candidate must do a minor project of EIA of any industry or any other development project.

3. SOLID WASTE AND MANAGEMENT

Lectures – 03 Hours / Week
Tutorial - 01Hours/week
term work 50 marks

Theory 100 marks
min passing 40 marks
Duration - 03Hours

General: Importance of solid waste, historical background. Over view of solid waste management

Generation of solid waste, quantity of solid waste, sampling of solid waste, characterization of solid waste, characteristics of solid waste, three phase diagram.

Storage systems, multi-bin storage system, levying on solid waste weight, climatic factors, cultural factors, removal of solid waste.

Transportation of solid waste, route optimization, numericals on route optimization and optimum number of transportation facility..

Recovery and reuse of solid waste, waste minimization. Numericals on chemical characteristics of SW.

Disposal methods of solid waste: land filling site selection, advantages and disadvantages of land filling, leachets control, fly and mosquito control at land fill side.

Composting of solid waste, Indore and Banglore methods, future of composting, limitations of composting method.

Vermicomposting: introduction and significance.

Incineration of solid waste: application, design of incinerator.

Dumping of solid waste in sea, grinding and dumping into sewers, hog feeding.

Hazardous wastes.

Socio economic and cultural aspects in solid waste management.

Management of thermal power plant waste, reuse of flyash, economic considerations.

Biomedical waste management, safety precautions, standards, disposal methods.

Term work: ten assignments based upon above syllabus. Visit to a solid waste site.

Books:-

1. Handbook of solid waste management:- Frank Kreith
2. Management of solid waste in developing countries:- Frank Flintoff
3. Solid waste management:- D. Joseph Hagerty, Joseph L.Pavoni

Laboratory Practice II

All assignments are compulsory

1. Assignment No I – Advanced Water Treatment Technology
2. Assignment No 2 – Advanced Waste Water treatment Technology
3. Assignment No 3 – Industrial water and waste water Management
4. Assignment No 4 – Water shed management
5. Assignment No 5- Elective II

Experiments (Minimum Three)

1. Estimation of Hardness
2. Estimation of Ammonia/Nitrogen
3. Estimation of Phosphate
4. Estimation of Heavy metal
5. Estimation of pesticide residue

North Maharashtra University

CIVIL ENGINEERING DEPARTMENT

MASTERS OF ENGINEERING

CIVIL ENGINEERING

(ENIVIRONMENT ENGINEERING)

With effect from Academic year 2010 -2011

North Maharashtra University, Jalgaon
M.E. (Computer Science and Engineering)
Syllabus with effect from Year 2009-10
First Year Term I

Sr. No.	Subject	Teaching Scheme per Week		Examination Scheme				
		L	P	Paper Hr.	Paper	TW	PR	OR
1	Advanced Software Engineering	3	-	3	100	-	-	-
2	Distributed Systems	3	-	3	100	-	-	-
3	Net-Centric Computing	3	-	3	100	-	-	-
4	Applied Algorithms	3	-	3	100	-	-	-
5	Elective- I	3	-	3	100	-	-	-
6	Laboratory Practice-I	-	6	-	-	100	-	50
7	Seminar-I	-	4	-	-	100	-	-
	Total	15	10		500	200		50
	Grand Total	**25**		**750**				

Elective I

1) Embedded Software Design
2) Digital Image & Video Processing
3) Mathematical Foundations of Computer Science
4) Software Project Management

First Year Term II

Sr. No.	Subject	Teaching Scheme per Week		Examination Scheme				
		L	P	Paper Hr.	Paper	TW	PR	OR
1	Advanced Database Management Systems	3	-	3	100	-	-	-
2	Web Engineering	3	-	3	100	-	-	-
3	Parallel Computing	3	-	3	100	-	-	-
4	Soft Computing	3	-	3	100	-	-	-
5	Elective- II	3	-	3	100	-	-	-
6	Laboratory Practice-II	-	6	-	-	100	-	50
7	Seminar-II	-	4	-	-	100	-	-
	Total	15	10		500	200		50
	Grand Total	**25**		**750**				

Elective II

1) Software Testing And Quality Assurance
2) Cryptography and Network Security
3) Pattern Recognition
4) Mobile Computing

Second Year Term I

Sr. No.	Subject	Teaching Scheme per Week		Examination Scheme				
		L	P	Paper Hr.	Paper	TW	PR	OR
1	Seminar-III	-	4	-	-	50	-	50
2	Project Stage –I	-	18	-	-	100	-	-
	Total	-	22	-	-	150		50
	Grand Total	**22**		**200**				

Second Year Term II

Sr. No.	Subject	Teaching Scheme per Week		Examination Scheme				
		L	P	Paper Hr.	Paper	TW	PR	OR
1	Progress Seminar	-	-	-	-	50	-	-
2	Project Stage –II	-	18	-	-	150	-	100
	Total	-	18	-	-	200	-	100
	Grand Total	**18**		**300**				

Rules and Regulations for M.E. in Computer Science & Engineering

1. The post graduate degree in engineering consisting of 2 years (4 terms) shall be designated as Master of Engineering in Computer Science & Engineering.

2. A candidate may be permitted to register him/her self for the M.E. degree in Computer Science and Engineering under the faculty of engineering & technology of North Maharashtra University Jalgaon ,only if the candidate holds a bachelor's degree in Engineering & technology of North Maharashtra University , Jalgaon or its equivalent in Computer Engineering / Computer Science & Engineering / Computer Technology /Information Technology/ Electronics/ Electronics and Telecommunication /Electrical recognized by AICTE & North Maharashtra University , Jalgaon.

3. The student shall be admitted to First Year Term II if his/her Term I is granted.

4. The student shall be admitted to the Second Year when ever he/she clears all the theory papers of First Year. The student in any case should not be allowed to start project work before passing all the subjects of first year. The student will have to work on his/her project for minimum one year after passing first year subjects. He/she will not be allowed to submit his/her thesis/dissertation before that.

5. Every student will be required to produce a record of laboratory work in the form of journal, duly certified for satisfactory completion of the term work by the concerned teacher & head of the department.

6. A student whose term is not granted on account of less attendance (Minimum 80%) or non-submission of term work is required to repeat the term.

7. Any approved guide will not be allowed guide more than 5 students in a particular batch.

8. Each student is required to present Seminar-I in the First Year Term I on any related state of the art topic of his own choice approved by the department.

9. The term-work & presentation of the Seminar-I will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director/Principal of the college as per the recommendation of the Head of the Department.

10. Each student is required to present Seminar-II in the First Year Term II on any related state of the art topic of his own choice approved by the department.

11. The term-work & presentation of the Seminar-II will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director/Principal of the college as per the recommendation of the Head of the Department.

12. Each student is required to present Seminar-III in the Second Year Term I on special topic. The topic should be on any of the area not included in the regular curriculum. The report should include detailed study of specific concept (i.e. analysis, design & implementation.). This can be a theoretical study or practical implementation approved by the department/guide.

13. Guidelines for the Seminar-III in Second Year Term I:

1. Seminar-III should be conducted at the end of Second Year Term I.
2. The term-work of the Seminar-III will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director/Principal of the college as per the recommendation of the Head of the Department.
3. The Seminar-III presentation will be evaluated by examiners appointed by University, one of which should be the guide.
4. Student must submit the Seminar Report in the form of soft bound copy
5. The marks of Seminar-III should be submitted at the end of Second Year Term I to the University.

14. Guidelines for the Progress Seminar in Second Year Term II:

- Progress Seminar should be conducted in the middle of Second Year Term II.
- The Progress Seminar Term-Work will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director/Principal of the college as per the recommendation of the Head of the Department.
- Student must submit the progress report in the form of soft bound copy.
- The marks of progress seminar should be submitted along with the marks of Project Stage-II.

15. Minimum passing marks for all Theory shall be 40% and for Term work and Oral shall be 50%.

16.He/she has to present/publish atleast one paper in reputed National/International Journal/Conference on his/her Project work before submission of his/her Thesis/Dissertation.

17. The Term Work of Project Stage –II will be assessed jointly by the pair of Internal and External examiner along with oral examination of the same.

18. The class will be awarded on the basis of aggregate marks of all four terms, giving equal weightage to all terms as shown below:

a) Less than 50%	: Fail
b) 50% to less than 60%	: Second Class
a) 60% to less than 70%	: First Class
b) 70% & above	: First Class with Distinction.

19. Each student is required to complete his/her master's degree within **Five** academic years from the date of admission, failing which he/she will be required to take fresh admission in first year.

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM I

SUBJECT: ADVANCED SOFTWARE ENGINEERING

Lectures: 3 Hrs per week	**Theory: 100 Marks**

Objective:
After successfully completing the module student should be apply the systematic approach towards the effective software development, also able to demonstrate knowledge of software design, development and processes using software engineering approaches and practices.

Pre-requisites:
Knowledge of Software Engineering.

DETAILED SYLLABUS

1. Introduction to Software Engineering: Software Engineering Processes, Project Management concept, Project Effort estimation, LOC and function point based estimates, Requirement Analysis and Specifications, Formal Requirements, Specifications, Socio-technical Systems, Dependability, Critical Systems Specification, Formal Specification. Analysis Modeling, Elements of Analysis Model.
2. Design Concepts and Principles: Fundamental issues in Software Design, Effective Modular Design, cohesion and coupling. Architectural Design, Distributed Systems Architecture, Application Architectures, Real-time Systems, User Interface Design, Component Level Design, Modeling Language(UML)
3. Software Development Methodologies: Iterative Software Development, Software Reuse, CBSE, Critical Systems Development Software Evolution. Verification and Validation, Software Testing, Software Testing Principles, Alternative Paradigms: Extreme Programming, Agile Software Engineering, Principles behind Agile method, Agile method and Project Management.
4. Object Oriented Software Engineering: Software Process Improvement, Software Economics, Software Quality, Software Metrics, Software Maintenance, Risk management, Requirement Engineering, Object oriented concepts and principles, OO Analysis, OO Design, OO Testing,
5. Advanced Software Engineering Process: Formal Methods, Basic concepts, Mathematical Preliminaries, Clean room Software Engineering, Component Based Software Engineering, Client/Server Software Engineering, Web Engineering, Reengineering

BOOKS

Text Books:

1. K.K Aggarwal & Yogesh Singh," Software Engineering", 3rd Edition, New Age International, 2007

References:

1. Ian Somerville,"Software Engineering", 8th Edition, Addison-Wesley,2006,
2. Roger S Pressman,"Software Engineering: A Practitioner's Approach" 6th Edition, McGraw Hill,2005.
3. Fenton and Pfleeger "Software Metrics:- A Rigorous and Practical Approach" , 2nd Edition , Tomson Learning
4. Grady Booch, Rumbaugh, Jacoboson,"Unified Modeling Language User Guide", Addison Wesley.

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM I

SUBJECT: Distributed Systems

Lectures: 3 Hrs per week	**Theory: 100 Marks**

Objective:
This course aims to build concepts regarding the fundamental principles of distributed systems. The design issues and distributed operating system concepts are covered.

Pre-requisites: Operating Systems and Computer Networks

DETAILED SYLLABUS

1. INTRODUCTION: Definition of a Distributed system, Goal, Types of distributed system

2 .ARCHITECTURES : Architectural styles, System Architectures, Architectures versus Middleware, Self management in distributed systems

3. PROCESSES: Threads, Virtualization, Clients, Servers, Code migration.

4 .COMMUNICATION: Fundamentals, Remote Procedure Call, Message Oriented Communication, Stream oriented communication, Multicast communication.

5. NAMING: Names, Identifiers and Addresses, Flat, Naming, Structured Naming, Attribute based Naming, LDAP

6. SYNCHRONIZATION: Clock Synchronization, Logical Clocks, Mutual Exclusion Global Positioning of nodes, Election Algorithms.

7. CONSISTENCY AND REPLICATION: Introductions, Data Centric Consistency Models, Client Centric Consistency Models, Replica Management, Consistency Protocols.

8. FAULT TOLERANCE: Introduction to fault tolerance, Process resilience, Reliable Client Server Communication, Reliable group, Recovery

9. DISTRIBUTED FILE SYSTEMS: Architecture, Process Communication, Naming, Synchronization, Consistency and Replication, Fault tolerance, Security.

10 DISTRIBUTED COORDINATION-BASED SYSTEMS: Introduction to coordination models- Architectures, Processes communication, Synchronization, Consistency and Replication, Fault tolerance, Security.

BOOKS

Text Books:

1. Andrew S. Tanenbaum, Maarten Van Steen, "Distributed System: Principals and Paradigms", 2/E, PHI.

References:

1. George Coulouris, Jean Dollimore and Tim Kindberg,"Distributed Systems Concepts and Design", Fourth Edition, Pearson Education, 2005**.**
2. Pradeep K. Sinha, "Distributed Operating Systems Concepts and Design" , PHI.
3. Galli D.L., "Distributed Operating Systems: Concepts and Practice", Prentice-Hall,2000

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM I

SUBJECT: NET-CENTRIC COMPUTING

Lectures: 3 Hrs per week	**Theory: 100 Marks**

Objective:
After successfully completing the module student should be :
Familiar with different network technologies, Different Network performance, Modeling and estimation measures, Function and responsibilities of Network Administration, Different Network Design Techniques, Knowledge of High Speed Network, Issues regarding Network Security, Knowledge of IP Telephony, Storage Network and Compression Techniques.

Pre-requisites:
Knowledge of Data Communication and Computer Networks.

DETAILED SYLLABUS

1. Network Technology :
   Introduction, Media Issues, Data Link Protocols, The OSI Model, Networking topologies, Types of Networks, protocols capabilities, NetBIOS, IPX,TCP/IP,CSMA/CD, token passing, frame relay, networking devices, Repeaters, Bridges, Routers, switches, gateways, Network design issues, Data in support of Network Design, Network design tools, protocols and architecture.
2. Network Performance, Modeling and Estimation :
   Issues related with optimizing network performance, probability, stochastic processes, modeling and performance evaluation. Queuing theory, queuing models, estimating model parameters, throughput utilization, modeling network as graph external and internal representation, complexity issues, network traffic controls.
3. Network Administration :
   Function and responsibilities, network issues:-planning, implementation, fault diagnosis and recovery.
4. Network Design :
   Problem definition, multipoint line layout heuristics, CMST algorithms, ESAU-William's algorithm, Sharma's algorithm, unified algorithm, Bin packing algorithm, Terminal assignments and concentrator location.
5. High Speed Networks :
   Need, characteristics, challenges, applications, frame relay, ATM, ISDN, High speed LANs: Ethernet, fiber channel, DQDB, SMDS, B_ISDN, STM, DSL, and DWDM, Architecture Transport, Switching and Routing in optical domain, optical network management, Internetworking.
6. Network security :
   Basic cryptographic techniques, security in OSI architecture, internet and networked computing, Kerberos, firewalls, proxy, etc. Security applications in commerce and banking.
7. IP Telephony :
   VOIP system architecture, protocol hierarchy, structure of a voice endpoint,

Protocols for the transport of voice media over IP networks, Providing IP quality of service for voice, signaling protocols for VOIP,PSTN gateways, VOIP applications.

8. Storage Networks :
   Introduction, challenges, SCSI protocols and architecture: RAID, Backup and mirroring, Fiber channel attached storage. Network attached storage including NFS, CIFS, and DAFS, Management of network storage architectures. New storage protocols, architectures and enabling technologies.
9. Compression :
   Overview of Information Theory, Lossless Compression: Run-Length Encoding, Facsimile compression, String Matching algorithms. Lossy compression: DCT, Wavelet compression.

BOOKS

References:

1. Stallings. W.-"High Speed Networks and Internets: Performance and Quality of service",Pretice Hall 2002
2. Kershenbaum A.-"Telecommunications Network Design Algorithms" Tata McGraw Hill.
3. Ramaswami R. ,Shivrajan K-"Optical Networks", Morgan Kaufmann.
4. Douskalis B.-"IP Telephony: The Integration of Robust VOIP service",Perason Education Asia.
5. Douglas E.Comer-"Computer NetWorks and Internet", Pearson Education Asia.
6. Stallings W.-"High Speed Networks :TCP/IP and ATM Design principles", Prentice Hall,1998.
7. Andrew Tanenbaum- "Computer Network", PHI.

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM I

SUBJECT: APPLIED ALGORITHMS

Lectures: 3 Hrs per week	**Theory: 100 Marks**

Objective:
Algorithm design and analysis is a fundamental and important part of computer science. This course introduces students to advanced techniques for the design and analysis of algorithms, and explores a variety of applications.

Pre-requisites:
Knowledge of Algorithms, Discrete structure and graph theory.

DETAILED SYLLABUS

1. **Introduction**: The role of algorithms in computing, analyzing algorithms, designing algorithms, growth of functions- asymptotic notation,standard notations and common functions, recurrences- the substitution method, the recursion tree method, the master method.
2. **Advanced data structures** Red - black trees- properties of red-black trees, rotations, insertion, deletion, B-trees-definition of B-Tree, basic operations on B-Tree, deleting a key from B-Tree, Binomial heaps- binolial trees and binomial heaps, operations on binomial heaps, Fibonacci heaps- structure of Fibonacci heaps, mergeable heap operations, decreasing a key and deleting a node, bounding the maximum degree.
3. **Advanced Design and Analysis Techniques** Dynamic Programming- assembly line scheduling, matrix chain multiplication, elements of dynamic programming, longest common subsequence, optimal binary search trees, Greedy Algorithms- an activity selection problem, elements of greedy strategy, Huffman codes, Amortized Analysis- aggregate analysis, the accounting method, the potential method.
4. **Graph algorithms** Minimum Spanning Trees- growing a minimum spanning tree, the algorithms of Kruskal and Prim, Single-source shortest paths- the Bellman-Ford algorithm, Single-source shortest path in directed acyclic graphs, Dijkstra's algorithm, all pair shortest paths- shortest path and matrix multiplication, the Floyd-Warshall algorithm, Johnson's algorithm for sparse graphs.
5. **Sorting networks** Comparision networks, the zero-one principle, a bitonic sorting networks, a merging network, a sorting network

BOOKS

Text Books:

1. Corman, Leiserson, Rivest, Stein,"Introduction To Algorithms", PHI, 2nd Edition.
2. Horowitz, Sahni, Rajasekaran,"Fundamentals of Computer Algorithms", Universities Press, 2nd Edition.

References:

1. Aho,"Design and Analysis of Algorithms", Pearson, LPE
2. A V Aho, J. D. Ullman, "Design and analysis of algorithms", Pearson LPE.
3. Bressard, Bratly, "Fundamentals of Algorithms", Pearson LPE/PHI

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM I

SUBJECT: EMBEDDED SOFTWARE DESIGN
(ELECTIVE-I)

Lectures: 3 Hrs per week	**Theory: 100 Marks**

Objective:

After successfully completing the module student should be :
Capable of actively participating or successfully managing a embedded software development project by applying design life cycle concepts, able to demonstrate knowledge of real time constraint with concepts of RTOS as well as porting of any RTOS

Pre-requisites:

Knowledge of Microprocessors and Microcontrollers and their interfacing

DETAILED SYLLABUS

1. Embedded Design Life Cycle: Introduction Product Specification ,Hardware/Software partitioning , Iteration and Implementation, Detailed hardware and software Design, Hardware/Software Integration ,Product Testing and Release, Maintaining and upgrading existing products.

2. Selection Process & Development Environment: RTOS availability, Tool Chain availability, The Execution Environment, On chip Peripherals ,Debugging & Testing : BDM, JTAG, NEXUS & ICE
3. Advanced Embedded Processors: ARM Embedded Systems, ARM Processor Fundamentals, Introduction to the ARM ,Instruction Set, Introduction to the Thumb Instruction Set ,Efficient C Programming Writing and Optimizing ARM Assembly Code, Digital Signal Processing, Exception and Interrupt Handling, Firmware
4. Writing Software for Embedded Systems: The Compilation Process, Native Vs Cross-Compilers, and Runtime Libraries, Writing a Library, Using Alternative Libraries, using a standard library, porting Kernels extensions for embedded systems, Downloading, Emulation and Debugging techniques.
5. RTOS - µC/OS-II: RTOS Services in Contrast to Traditional O.S. Sample Code, Real-Time Systems Concepts, Kernel Structure, Task Management, Time Management, Inter task Communication and Synchronization, , Memory Management, Porting µC/OS -II
6. Understanding Linux Kernel: Introduction, Memory Addressing , Processes , Interrupts and Exceptions, Timing Measurements, Memory Management, Process Address Space, System Calls ,Signals, Process Scheduling, Kernel Synchronization, The Virtual File system, Managing I/O Devices , Disk Caches , Accessing Regular Files, Swapping: Methods for Freeing Memory, The Ext2 Files system, Process Communication , Program Execution, Porting of Linux Kernel
7. Understanding Windows Embedded CE Kernel: Introduction to Windows Embedded CE Kernel , Boot process, Memory Management, Files Database and Registry, Process and Threads, Communications , Porting of Linux Kernel

BOOKS

Text Books:

1. Embedded Systems Design – Introduction to Processes, Tools, Techniques, Arnold S Burger, CMP books
2. Embedded Systems Design by Steave Heath, Newnes.
3. "ARM Systems Developers Guide Designing and Optimizing System Software" By Andrew N Sloss, Dominic Symes & Cheris Wright ELSEVIER Publication.
4. Understanding the Linux Kernel Daniel P. Bovet Marco Cesati Publisher: O'Reilly First Edition October 2000 ISBN: 0-596-00002-2, 702 pages
5. Building Embedded Linux Systems by Karim Yaghmour
6. Inside Microsoft Windows CE By John Murray

References:

1. ARM System on chip architecture by Steve Furbur
2. µC/OS-II by Jean Labrossewww.uCOS-II.com
3. Programming Microsoft Windows Embedded CE

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM I

SUBJECT: DIGITAL IMAGE and VIDEO PROCESSING (ELECTIVE-I)

Lectures: 3 Hrs per week	**Theory: 100 Marks**

Objective: Digital Image Processing is a rapidly evolving field with growing applications in science and engineering. Image processing holds the possibility of developing the ultimate machine that could perform the visual functions of all living beings. There is an abundance of image processing applications that can serve mankind with the available and anticipated technology in the near future.

Pre-requisites: Digital Signal Processing, & Computer Graphics

DETAILED SYLLABUS

1. **Digital Image Processing Systems:** Introduction, Structure of human eye, Image formation in the human eye, Brightness adaptation and discrimination, Image sensing and acquisition, Storage, Processing, Communication, Display. Image sampling and quantization, Basic relationships between pixels
2. **Image Transforms (Implementation):** Introduction to Fourier transform, DFT and 2-D DFT, Properties of 2-D DFT, FFT, IFFT, Walsh transform, Hadamard transform, Discrete cosine transform, Slant transform, Optimum transform: Karhunen - Loeve (Hotelling) transform.
3. **Image Enhancement in the Spatial Domain:** Gray level transformations, Histogram processing, Arithmetic and logic operations, Spatial filtering: Introduction, Smoothing and sharpening filters
4. **Image Enhancement in the Frequency Domain:** Frequency domain filters: Smoothing and Sharpening filters, Homomorphic filtering
5. **Wavelets and Multiresolution Processing:** Image pyramids, Subband coding, Haar transform, Series expansion, Scaling functions, Wavelet functions, Discrete wavelet transforms in one dimensions, Fast wavelet transform, Wavelet transforms in two dimensions
6. **Image Data Compression:** Fundamentals, Redundancies: Coding, Interpixel, Psycho-visual, Fidelity criteria, Image compression models, Error free compression, Lossy compression, Image compression standards: Binary image and Continuous tone still image compression standards, Video compression standards.
7. **Morphological Image Processing:** Introduction, Dilation, Erosion, Opening, Closing, Hit-or-Miss transformation, Morphological algorithm operations on binary images, Morphological algorithm operations on gray-scale images
8. **Image Segmentation:** Detection of discontinuities, Edge linking and Boundary detection, Thresholding, Region based segmentation
9. **Image Representation and Description:** Representation schemes, Boundary descriptors, Regional descriptors
10. **Introduction to Video Processing:** Spatio-temporal sampling, inter frame and intraframe coding, motion estimation techniques, video compression standards.

BOOKS

Text Books:

1. R.C.Gonsales R.E.Woods**, "**Digital Image Processing", Second Edition, Pearson Education
2. Anil K.Jain, "Fundamentals of Image Processing", PHI
3. K. R rao and J.J. Hawang, "Techniques and Standards for Video and Audio Coding", Prentice Hall PTR

References:

1. William Pratt, "Digital Image Processing", John Wiley
2. Milan Sonka,Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis, and Machine Vision" Thomson Learning
3. N Ahmed & K.R. Rao, "Orthogonal Transforms for Digital Signal Processing" Springer
4. B. Chanda, D. Dutta Majumder, "Digital Image Processing and Analysis", PHI.

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM I

SUBJECT: MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE (ELECTIVE-I)

Lectures: 3 Hrs per week	**Theory: 100 Marks**

Objective:
The purpose of this course is to develop mathematical foundations for computer science and computer engineering. In addition, applications of mathematical principles to computer science and engineering are presented.

Pre-requisites:
Knowledge of Theory of Computer Science, Discrete Structure and Graph Theory.

DETAILED SYLLABUS

1. Probability and Information Theory.
Introduction. Basic Concept of Probability. Properties. Basic Calculation. Random Variables and their Probability Distributions. Birthday Paradox. Information Theory. Redundancy in Natural Languages.

2. Computational Complexity.
Introduction. Turing Machines. Deterministic Polynomial Time. Probabilistic Polynomial Time. Non-deterministic Polynomial Time. Non-Polynomial Bounds. Polynomial-time Indistinguishability.

3. Algebraic Foundations.
Introduction. Groups. Rings and Fields. The Structure of Finite Fields. Group Constructed Using Points on an Elliptic Curve.

4. Number Theory.
Introduction. Congruences and Residue Classes. Euler's Phi Function. The Theorems of Fermat, Euler and Lagrange. Quadratic Residues. Square Roots Modulo Integer. Blum Integers.

5. Fuzzy Logic
Operations of fuzzy sets, fuzzy arithmetic & relations, fuzzy relations equations, MATLAB introduction, programming in MATLAB scripts, functions and their Applications
Case study: Development of fruit sorting system using fuzzy logic in MATLAB

BOOKS

Text Books:

1. Modern Cryptography: Theory and Practice by Wenbo Mao, Low Price Edition, Pearson Education

References:

1. Fuzzy logic in engineering by T. J. Ross, Willey Publications
2. Fuzzy sets theory and its applications, H.J. Zimmermann, Kluwer Academic Publications, 4th edition.
3. Elements of Discrete Mathematics, C.L.Liu, TMH, 2nd edition

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM I

SUBJECT: SOFTWARE PROJECT MANAGEMENT
(ELECTIVE-I)

Lectures: 3 Hrs per week	**Theory: 100 Marks**

Objective:

After successfully completing the module student should be :
Capable of actively participating or successfully managing a software development project by applying project management concepts, able to demonstrate knowledge of project management terms and techniques

Pre-requisites:

Knowledge of Software Engineering.

DETAILED SYLLABUS

1. Introduction to Project Management: Importance of software project management, stages and stakeholders of a software project, elements of software project, Importance of software project management, Stages of Project, The Stakeholder of Project, Project Management Framework, Software Tools for Project Management.
2. Project Planning: Integration Management, Scope Management, Stepwise Project Planning, Use of Software (Microsoft Project) to Assist in Project Planning Activities.
3. Project Scheduling: Time Management, Project Network Diagrams, Use of Software (Microsoft Project) to Assist in Project Scheduling.
4. Project Cost Management: Importance and Principles of Project Cost Management, Resource Planning, Cost Estimating, Cost Control, Use of Software (Microsoft Project) to assist in Cost Management.
5. Project Quality Management: Quality of Information Technology Projects, Stages of Software Quality Management, Quality Standards, Tools and Techniques For Quality Control.
6. Project Human Resources Management: Human Resources Management, Keys to Managing People, Organizational Planning, Issues in Project Staff Acquisition and Team Development, Using Software to Assist in Human Resource Management.
7. Project Communication Management: Communications Planning, Information Distribution, Performance Reporting, Administrative Closure, Suggestions for Improving Project Communications, Using Software to Assist in Project Communications.
8. Project Risk Management: The Importance of Project Risk Management, Common Sources of Risk in IT projects, Risk Identification, Risk Quantification, Risk Response Development and Control, Using Software to Assist in Project Risk Management.
9. Project Procurement Management: Importance of Project Procurement Management, Procurement Planning, Solicitation, Source Selection, Contract Administration, Contract Close-out.

10. Project Management Process Groups: Introduction to Project Management Process Groups, Project Initiation, Project Planning, Project Executing, Project Controlling and Configuration Management, Project Closing.

BOOKS

Text Books:

1.Kathy Schwalbe, "Information Technology Project Management", International Student Edition, THOMSON Course Technology
2.Bob Hughes and Mike Cotterell, "Software Project Management" Third Ed., Tata McGraw-Hill
3.Elaine Marmel, "Microsoft Office Project 2003 Bible", Wiley Publishing Inc.

References:

1.Basics of Software Project Management, NIIT, Prentice-Hall India
2.Pankaj Jalote, "Software Project Management in Practice", Pearson Education
3.S.A. Kelkar, "Software Project Management", A Concise Study, Revised Edition,PHI

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM I

SUBJECT: Laboratory Practice-I

Practical: 6 Hrs per week	**Term Work: 100 Marks** **Oral: 50 marks**

DETAILED SYLLABUS

Experiments/Assignments based on

1. Advanced Software Engineering
2. Net-Centric Computing
3. Elective- I

The concerned subject in-charge should frame minimum of six laboratory assignments, two from each subject.

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM I

SUBJECT: Seminar-I

Practical: 4 Hrs per week	**Term Work: 100 Marks**

DETAILED SYLLABUS

Seminar on related state of the art topic of student's own choice approved by the department.

TERM WORK

1.The term-work & presentation of the Seminar-I will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director/Principal of the college as per the recommendation of the Head of the Department.

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM II

SUBJECT: ADVANCED DATABASE MANAGEMENT SYSTEMS

Lectures: 3 Hrs per week	**Theory: 100 Marks**

Objective: The course gives an overview of motivation and background of the new developments, and is intended as an introduction to the most important advances with respect to the classical relational database systems.

Pre-requisites:
Knowledge of Database Management System, Operating System.

DETAILED SYLLABUS

1. **The Extended Entity Relationship Model and Object Model**
(a) The ER model revisited
(b) Motivation for complex data types
(c) User defined abstract data types and structured types
(d) Subclasses
(e) Superclasses
(f) Inheritance
(g) Specialization and generalization
(h) Relationship types of degree higher than two

2. **Object–Oriented Databases**
(a) Overview of object–oriented concepts
(b) Object identity
(c) Object structure and type constructors
(d) Encapsulation of operations
(e) Methods and persistence
(f) Type hierarchies and inheritance
(g) Type extents and persistent programming languages
(h) OODBMS architecture and storage issues
(i) Transactions and concurrency control
(j) Examples of ODBMS

3. **Object Relational and Extended Relational Databases**
(a) Database design for an ORDBMS
(b) Nested relations and collections
(c) Storage and access methods
(d) Query processing and optimization
(e) An overview of SQL3
(f) Implementation issues for extended type
(g) Systems comparison of RDBMS
(h) OODBMS
(i) ORDBMS

4. **Paralled and Distributed Databases and Client–Server Architecture**
(a) Architectures for parallel databases
(b) Parallel query evaluation
(c) Parallelizing individual operations
(d) Sorting Joins
(e) Distributed database concepts
(f) Data fragmentation
(g) Replication and allocation techniques for distributed database design
(h) Query processing in distributed databases
(i) Concurrency control and recovery in distributed databases
(j) An overview of client–server architecture

5**. Enhanced Data Models for Advanced Applications**
(a) Active database concepts
(b) Temporal database concepts
(c) Spatial databases: concept and architecture
(d) Deductive databases and query processing
(e) Mobile databases
(f) Geographic information systems

BOOKS

Text Books:

1.Elmsari and Navathe, Fundamentals of Database Systems
2.Ramakrishnan and Gehrke, Database Management Systems.

References:

1. Korth, Silberschatz, Sudarshan, Database System Concepts
2. Rob and Coronel, Database Systems: Design, Implementation and Management
3. Date and Longman, Introduction to Database Systems

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM II

SUBJECT: WEB ENGINEERING

Lectures: 3 Hrs per week	**Theory: 100 Marks**

Objective:
Provides an introduction to the discipline of Web Engineering. This course aims to introduce the methods and techniques used in Web-based system development. In contrast to traditional Software Engineering efforts, Web Engineering methods and techniques incorporate unique aspects of the problem domain such as: document oriented delivery, fine-grained lifecycles, user-centric development, client-server legacy system integration and diverse end user skill levels.

Pre-requisites:
Knowledge of both Internet communication concepts and an introductory programming knowledge (Java & Javascript).

DETAILED SYLLABUS

1. **An Introduction to Web Engineering:** Categories of Web Applications, Characteristics of Web
2. **Requirements Engineering for Web Applications:** Requirements, Engineering Activities, RE Specifics in Web Engineering, Principles for RE of Web, Adapting RE Methods to Web Application Development, Requirement Types.
3. **Modeling Web Applications:** Modeling Specifics in Web Engineering, Levels, Aspects, Phases,
4. Customization, Modeling Requirements, Content Modeling, Hypertext Modeling, Presentation Modeling, Customization Modeling, Methods and Tools.
5. **Web Application Architectures:** Fundamentals, Specifics of Web Application Architectures, Components of a Generic Web Application Architecture, Layered Architectures, Data-aspect Architectures.
6. **Technology-aware Web Application Design:** Web Design from an Evolutionary Perspective, Presentation Design, Interaction Design, Functional Design, Context-aware Applications, Device-independent Applications, Reusability.
7. **Technologies for Web Applications:** Client/Server Communication on the Web, Client-side Technologies, Document-specific Technologies, Server-side Technologies.
8. **Testing Web Applications:** Fundamentals, Test Specifics in Web Engineering, Test Approaches, Test Scheme, Test Methods and Techniques, Test Automation.
9. **Operation and Maintenance of Web Applications:** Challenges Following the Launch of a Web Application, Promoting a Web Application, Content Management, Usage Analysis, From Software Project Management to Web Project Management.
10. **Web Project Management:** Challenges in Web Project Management, Managing Web Teams, Managing the Development Process of a Web Application.

11. **The Web Application Development Process:** Requirements for a Web Application Development Process, Analysis of the Rational Unified Process, Analysis of Extreme Programming.
12. **Usability of Web Applications:** Design Guidelines, Web Usability Engineering Methods, Web Usability Engineering Trends.
13. **Performance of Web Applications:** System Definition and Indicators, Characterizing the Workload, Representing and Interpreting Results, Performance Optimization Methods.
14. **Security for Web Applications:** Aspects of Security, Encryption, Digital Signatures and Certificates, Secure Client/Server-Interaction, Client Security Issues, Service Provider Security Issues.
15. **The Semantic Web – The Network of Meanings in the Network of Documents:** Fundamentals of the Semantic Web, Technological Concepts, Specifics of Semantic Web Applications.

BOOKS

Text Books:

1. Gerti Kappel, Birgit Pr ¨ oll, Siegfried Reich, Werner Retschitzegger, "Web Engineering: The Discipline of Systematic Development of Web Applications", John Wiley
2. Pressman, Roger S. and Lowe, David, "Web Engineering: A Practioner's Approach",McGraw-Hill Higher Education

References:

1. Mishra, "Web Engineering And Applications", Macmillan Publishers India
2. Emilia Mendes, and Nile Mosley, "Web Engineering", Springer

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM II

SUBJECT: Parallel Computing

Lectures: 3 Hrs per week	**Theory: 100 Marks**

Objective:

Upon completion of this course students will be able to understand and employ the fundamental concepts and mechanisms which form the basis of the design of parallel computation models and algorithms, recognize problems and limitations to parallel systems, as well as possible solutions

Pre-requisites:

Computer architecture, Data structures.

DETAILED SYLLABUS

1.Introduction:
Need, Models of computation, SISD, MISD,SIMD-Shared Memory SIMD, Interconnection network SIMD, MIMD, Programming MIMD, Special Purpose Architecture, Analysis of algorithm, Running time, No of processors, Cost, Other Measures-Area, Length, Period, Expressing Algorithm.

2.Parallel processing:
parallel computer structure, designing of parallel algorithms, analyzing algorithms, general principles of parallel computing.

3. Parallel sorting algorithms
Batcher's bitonic sort, Bitonic sort using the perfect Shuffle, parallel bubble sort, Odd- even transpose sort, Tree sort.

4. Quick Sort:
Parallel Quick sort for CRCW PRAM, Parallel formulation for practical architectures,Shared Address space parallel formulation, message passing parallel formulation, pivot selection.

5. Sorting:
Sorting on the CRCW, CRFW, EREW models, searching a sorted sequence, CREW,CRCW & EREW searching, searching on a random sequence EREW, ERCW, CREW & CRCW searching on SIMD computers, searching on a Tree, mesh, A Network for merging, merging on the CRFW, ERFW models

6. Computing Fourier Transforms:
Computing the DFT in parallel, a parallel FFT algorithm.

BOOKS

References:

1. Design & Analysis of Parallel Algorithm by Salim & Akil, PHI.

2. Design Efficient Algorithm for Parallel Computers by Michel J. Quinn, TMH.

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM II

SUBJECT: SOFT COMPUTING

Lectures: 3 Hrs per week	**Theory: 100 Marks**

Objective:

By the end of the course a student is expected to become able to apply Genetic Algorithms, Fuzzy Logic and Artificial Neural Networks as computational tools to solve a variety of problems in their area of interest ranging from Optimization problems to Pattern recognition and control tasks.

Pre-requisites:

The prerequisite for this course is a basic understanding of problem solving, design and analysis of algorithms and computer programming. A prior course in Artificial Intelligence will be an advantage.

DETAILED SYLLABUS

1. Introduction to soft computing, Biological Neuron, Artificial Neuron, Characteristics of Neural Network, Neural Network Architectures, Learning in Neural Networks, Various learning Methods and Learning Rules, Single layer Perceptron, training and classification, Linear Separable classification, Applications of Neural Networks for Pattern Recognition, Classification and Clustering.
2. Introduction to Multilayer Perceptron, various activation functions, Delta and Generalized Delta Learning rule, Error Back Propagation training and algorithm, Counter Propagation Network, Boltzman Machine.
3. Recurrent Network, configuration, stability, Associative Memory: Concepts, performance analysis, BAM, ART.
4. Self-organizing Networks: Unsupervised Learning, Self-organized Map.
5. Introduction to fuzzy sets and fuzzy logic systems, Fuzzy set definitions, operations, Fuzzy rules, Fuzzy reasoning. Fuzzy inference systems, Fuzzy models.
6. Introduction to Genetic Algorithms, Biological Inspiration, The Genetic Algorithm, Genetic Operators, Genetic Algorithm through example, Sample problems, Genetic Algorithm Implementation, Tweaking the Parameters and Process, Various Problems with Genetic Algorithm.
7. Applications of Neural Network, Fuzzy Logic, Genetic Algorithms: Signal Processing, Image Processing, Pattern Recognitions, communication systems, Biological Sequence Alignment and Drug Design, Robotics and Sensors, Information Retrieval Systems, Share Market Analysis, Natural Language Processing.

BOOKS

Text Books:

1. J.M.Zurda, "Introduction to Artificial Neural Networks", Jaico Publishing House.
2. D. E. Goldberg, "Genetic Algorithms in Search and Optimization, and Machine Learning", Addison-Wesley, 1989.

3. Jang, Sun, & Mizutani, "Neuro-Fuzzy and Soft Computing", PHI.
4. M. Mitchell, "An Introduction to Genetic Algorithms", Prentice-Hall, 1998.

References:

1. S. Haykin, "Neural Networks", Pearson Education, 2nd Ed., 2001.
2. Klir & Yuan, "Fuzzy Sets and Fuzzy Logic", PHI, 1997.
3. Chin-Teng Lin & C. S. George Lee, "Neural Fuzzy Systems", Prentice Hall PTR.
4. S. Rajasekaran & G. A. V. Pai, "Neural Networks, Fuzzy logic, and Genetic Algorithms", PHI.
5. V. Kecman, "Learning and Soft Computing", MIT Press, 2001.
6. S. N. Sivanandam & S. N. Deepa, Principles of Soft Computing, Wiley - India, 2007
7. D. E. Goldberg, Genetic Algorithms in Search, Optimization, and Machine Learning, Addison-Wesley, 1989.

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM II

SUBJECT: SOFTWARE TESTING AND QUALITY ASSURANCE (ELECTIVE-II)

Lectures: 3 Hrs per week	**Theory: 100 Marks**

Objective:
After successfully completing the module student should be apply the testing fundamentals and testing skill to validate and verify the software system, also able to demonstrate knowledge of testing strategies by applying the different testing tools.

Pre-requisites:
Knowledge of Software Engineering.

DETAILED SYLLABUS

1. Software Testing Background: Infamous Software Error Case Studies, What Is a Bug? Why Do Bugs Occur? The Cost of Bugs, What Exactly Does a Software Tester Do? What Makes a Good Software Tester? The Software Development Process, Product Components, Software Project Staff, Software Development Lifecycle, Models, The Realities of Software Testing, Testing Axioms, Software Testing Terms and Definitions.
2. Testing Fundamentals : Examining the Specification, Performing a High-Level Review of the Specification, Low-Level Specification, Test Techniques, Black-Box Testing, Test-to-Pass and Test-to-Fail, Equivalence Partitioning, Data Testing, State Testing, Other Black-Box Test Techniques, Examining the Code, Static White-Box Testing: Examining the Design and Code, Formal Reviews, Coding Standards and Guidelines, Generic Code Review, Checklist, Testing the Software with X-Ray Glasses, Dynamic White-Box Testing, Dynamic White-Box Testing Versus Debugging, Testing the Pieces, Data Coverage, Code Coverage
3. Applying Testing Skills: Configuration Testing, An Overview of Configuration Testing, Approaching the Task, Obtaining the Hardware, Identifying Hardware Standards, Configuration Testing Other Hardware, Compatibility Testing, Compatibility Testing Overview, Platform and Application Versions, Standards and Guidelines, Data Sharing Compatibility, Foreign-Language Testing, Making the Words and Pictures Make Sense, Translation Issues, Localization Issues, Configuration and Compatibility Issues, How Much Should You Test? Usability Testing, User Interface Testing, ,What Makes a Good UI?, Testing for the Disabled: Accessibility Testing,
4. Testing the Documentation: Types of Software Documentation, The Importance of Documentation Testing, What to Look for When Reviewing Documentation, The Realities of Documentation Testing, Testing for Software Security, War Games the Movie, Understanding the Motivation, Threat Modeling, Is Software Security a Feature? Is Security Vulnerability a Bug? Understanding the Buffer Overrun, Using Safe String Functions, Computer Forensics, Website Testing, Web Page Fundamentals, Black-Box Testing, Gray-Box Testing, White-Box Testing, Configuration and Compatibility Testing, Usability Testing, Introducing Automation.

5. Supplementing Testing: Automated Testing and Test Tools ,The Benefits of Automation and Tools, Test Tools, Software Test Automation, Random Testing, Realities of Using Test Tools and Automation, Bug Bashes and Beta Testing, Having Other People Test Your Software, Test Sharing, Beta Testing, Outsourcing Your Testing
6. Working with Test Documentation: Planning Your Test Effort, The Goal of Test Planning, Test Planning, Writing and Tracking Test Cases, The Goals of Test Case Planning, Test Case Planning Overview, Test Case Organization and Tracking, Reporting What You Find, Getting Your Bugs Fixed, Isolating and Reproducing Bugs, Not All Bugs Are Created Equal, A Bug's Life Cycle, Bug-Tracking Systems , Measuring Your Success, Using the Information in the Bug Tracking Database
7. The Future: Software Quality Assurance, Quality Is Free, Testing and Quality Assurance in the Workplace, Test Management and Organizational Structures, Capability Maturity Model (CMM),ISO 9000, Software Quality and Software Metrics.

BOOKS

References:

1.Ron Patton, "Software Testing", Pearson publication.

2.Roger S Pressman, **"**Software Engineering: A Practitioner's Approach" 6th Edition, McGraw Hill,2005.

3.Marine Hutcheson, "Software Testing Fundamentals: Methods and Metrics", John Wiley Publication,2003.

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM II

SUBJECT: CRYPTOGRAPHY AND NETWORK SECURITY
(ELECTIVE-II)

Lectures: 3 Hrs per week	**Theory: 100 Marks**

Objective:

The course introduces the principles of number theory and the practice of network security and cryptographic algorithms. At the end of the course the student will understand: Data Encryption Standard and algorithms, IP and Web Security, Protocols for secure electronic commerce, Concepts of Digital Watermarking and Steganography.

Pre-requisites:

Probability theory and Discrete Mathematics

DETAILED SYLLABUS

1. Foundations of Cryptography and Security Ciphers and Secret Messages, Security Attacks and Services
2. Mathematical Tools for Cryptography Substitutions and Permutations, Modular Arithmetic, Euclid!s Algorithm, Finite Fields, Polynomial Arithmetic, Discrete Logarithms
3. Conventional Symmetric Encryption Algorithms Theory of Block Cipher Design Feistel Cipher Network Structures, DES and Triple DES, Modes of Operation (ECB,CBC, OFB,CFB), Strength (or Not) of DES
4. Modern Symmetric Encryption Algorithms IDEA, CAST, Blowfish, Twofish, RC2, RC5, Rijndael (AES) Key Distribution
5. Stream Ciphers and Pseudo Random Numbers, Pseudo random sequences, Linear Congruential Generators, Cryptographic Generators, Design of Stream Cipher, One Time Pad
6. Public Key Cryptography, Prime Numbers and Testing for Primality, Factoring Large Numbers, RSA, Diffie-Hellman, ElGamal, Key Exchange Algorithms, Public-Key Cryptography Standards
7. Hashes and Message Digests Message Authentication, MD5, SHA, RIPEMD, HMAC
8. Digital Signatures, Certificates, User Authentication, Digital Signature Standard (DSS and DSA), Security Handshake Pitfalls, Elliptic Curve Cryptosystems
9. Authentication of Systems Kerberos V4 and V5, X.509 Authentication Service
10. Electronic Mail Security Pretty Good Privacy (PGP), S/MIME, X.400
11. 12 3/28 IP and Web Security Protocols IPSec and Virtual Private Networks, Secure Sockets and Transport Layer (SSL and TLS)
12. Electronic Commerce Security, Electronic Payment Systems, Secure Electronic Transaction (SET), CyberCash, iKey Protocols, Ecash (DigiCash)
13. Intrusion detection – password management – Viruses and related Threats – Virus Counter measures – Firewall Design Principles – Trusted Systems
14. Digital Watermarking and Steganography, Biometrics for security- signature verification, figure print recognition, voice recognition, Iris recognition system.

BOOKS

Text Books:

1. William Stalling, "Cryptography and Network Security, Principles and Practice", Pearson/PHI Publication
2. B A Forouzan, "Cryptography and Network Security", TMH

References:

1. Bruce Schneier, "Applied Cryptography", John Wiley & Sons Inc
2. Charles B. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Pearson Education
3. D Denning, "Cryptography and Data Security", Addision-Welesly

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM II

SUBJECT: PATTERN RECOGNITION
(ELECTIVE-II)

Lectures: 3 Hrs per week	**Theory: 100 Marks**

Objective: This course teaches the fundamentals of techniques for classifying multi-dimensional data, to be utilized for problem-solving in a wide variety of applications, such as engineering system design, manufacturing, technical and medical diagnostics, image processing, economics, and psychology.

Pre-requisite: Linear Algebra, Probability and Statistics

DETAILED SYLLABUS

1. **Introduction:** Machine perception, Pattern recognition systems, Design cycle, Learning and Adaptation
2. **Bayesian Decision Theory:** Bayesian decision theory: Continuous features, Minimum-error rate classification, classification, Classifiers, Discriminant functions and Decision surfaces, Normal density, Discriminant functions for normal density, Bayes Decision theory: discrete features
3. **Maximum-Likelihood and Bayesian Parameter Estimation:** Maximum likelihood estimation, Bayesian estimation, Bayesian parameter estimation: Gaussian caseand General theory, Prolems of dimentionality, Hidden Markov Model
4. **Nonparametric Techniques:** Density estimation, Parzen windows, k_n-Nearest-Neighbor estimation, Nearest-Neighbor rule, Matrics and Nearest-Neighbor classification
5. **Linear Discriminants Functions:** Linear discriminant functions and decision surfaces, Generalised linear discriminant functions, 2-Category linearly separable case, Minimising the Perceptron criterion function, Relaxation procedure, Non-separable behavior, Minimum squared error procedure, Ho-Kashyap procedures, Multicategory generalizations
6. **Nonmetric Methods:** Decision tree, CART, ID3, C4.5, Gramatical methods, Gramatical interfaces
7. **Algorithm Independent Machine Learning:** Lack of inherent superiority of any classifier, Bias and Variance, Resampling for estimating statistic, Resampling for classifier design, Estimating and comparing classifiers, Combining classifiers
8. **Unsupervised Learning and Clustering:** Mixture densities and Identifiability, Maximum-Likelihood estimations, Application to normal mixtures, Unsupervised Bayesian learning, Data description and clustering criterion function for clustering, Hierarchical clustering
9. **Applications of Pattern Recognition**

BOOKS

Text Books:

1. Duda, Hart, and Stock, "*Pattern Classification*", John Wiley and Sons.
2. Gose, Johnsonbaugh and Jost, "*Pattern Recognition and Image analysis*", PHI

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM II

SUBJECT: Mobile Computing
(ELECTIVE-II)

Lectures: Hrs per week	**Theory: 100 Marks**

Objective:
After successful completion of the course student should get knowledge about: Mobile Computing Architecture, mobile technologies: GSM, Bluetooth, GPRS, CDMA and should be capable to develop mobile computing applications.

Pre-requisites:
Knowledge of Computer Networks.

DETAILED SYLLABUS

1.Introduction: Mobile Computing, Dialogue Control, Networks, Middleware and Gateways, Application and Services, Developing Mobile Computing Applications, Security in Mobile Computing.

2.Mobile Computing Architecture: Internet – The Ubiquitous Network, Architecture for Mobile Computing, Three-Tier Architecture, Design considerations for Mobile Computing, Mobile Computing through Internet, Making Existing Applications Mobile-Enabled.

3.Emerging Technologies: Introduction, Bluetooth, Radio Frequency Identification, Wireless Broadband, Mobile IP, IPV6, Java card.

4 Mobile Transport Layer: Traditional TCP - Congestion Control, Slow Start, Fast Retransmit/Fast Recovery, Implications on Mobility, Classical TCP Improvements - Indirect TCP, Snooping TCP, Mobile TCP, Fast Retransmit/Fast Recovery, Transmission/Time-Out Freezing, Selective Retransmission, Transaction Oriented TCP.

5.Support for Mobility: File Systems – Consistency, Coda, Little work, Ficus, Mio-NFS, Rover, World Wide Web - Hypertext Transfer Protocol, Hypertext Markup Language, Some Approaches that Might Help Wireless Access, System Architectures, Wireless Application Protocol - Architecture, Wireless Datagram Protocol, Wireless Transport Layer Security, Wireless Transaction Protocol, Wireless Session Protocol, Wireless Application Environment, Wireless Markup Language, WML script, Wireless Telephony Application, Push Architecture, Push/Pull Services.

6.Global System for Mobile Communications (GSM): Global System for Mobile Communications, GSM Architecture, GSM Entities, Call Routing in GSM, PLMN Interfaces, GSM Addresses and Identifiers, Network Aspects in GSM, GSM Frequency Allocation, Authentication and Security.

7.General Packet Radio Service (GPRS): Introduction, GPRS and Packet Data Network, GPRS Network Architecture, GPRS Network Operations, Data Services in GPRS, Applications for GPRS, Limitations of GPRS, Billing and Charging in GPRS.

8.CDMA and 3G: Introduction, Spread-Spectrum Technology, Is-95, CDMA versus GSM, Wireless Data, Third Generation Networks, Applications on 3G.

9.Security Issues in Mobile Computing: Introduction, Information

Security, Security Techniques and Algorithms, Security Protocols, Public Key Infrastructure, Trust, Security Models, Security Frameworks for Mobile Environment.
BOOKS
Text Books:
1. Talukder Asoke K. and Yavagal Roopa R ," Mobile Computing (Technology, Applications and Service Creation) ",Tata Mcgraw-Hill. 2. Jochen Schiller, Addison-Wesley, "Mobile Communications ",2nd Edition.

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM II

SUBJECT: LABORATORY PRACTICE-II

Practical: 6 Hrs per week	**Term Work: 100 Marks** **Oral: 50 marks**

DETAILED SYLLABUS

Experiments/Assignments based on

1. Advanced Database Management Systems
2. Soft Computing
3. Elective- II

The concerned subject in-charge should frame minimum of six laboratory assignments, two from each subject.

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM II

SUBJECT: SEMINAR-II

Practical: 4 Hrs per week	**Term Work: 100 Marks**

DETAILED SYLLABUS

Seminar on related state of the art topic of student's own choice approved by the department.

TERM WORK

1. The term-work & presentation of the Seminar-II will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director/Principal of the college as per the recommendation of the Head of the Department.

M.E. COMPUTER SCIENCE & ENGINEERING
SECOND YEAR TERM I

SUBJECT: SEMINAR-III

Practical: 4 Hrs per week	**Term Work: 50 Marks** **Oral: 50 Marks**

DETAILED SYLLABUS

Seminar on special topic. The topic should be on any of the area not included in the regular curriculum. The report should include detailed study of specific concept (i.e. analysis, design & implementation.). This can be a theoretical study or practical implementation approved by the department/guide.

TERM WORK

1. Seminar-III should be conducted at the end of Second Year Term I.
2. The term-work of the Seminar-III will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director/Principal of the college as per the recommendation of the Head of the Department.
3. The Seminar-III presentation will be evaluated by examiners appointed by University, one of which should be the guide.
4. Student must submit the Seminar Report in the form of soft bound copy
5. The marks of seminar-III should be submitted at the end of Second Year Term I to the University.

M.E. COMPUTER SCIENCE & ENGINEERING
SECOND YEAR TERM I

SUBJECT: PROJECT STAGE-I

Practical: 18 Hrs per week	**Term Work: 100 Marks**

DETAILED SYLLABUS

Project will consist of a system Development in Software/Hardware. Project Work should be carried out using Software Engineering principles and practices.

TERM WORK

The term-work of the Project Stage-I will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director/Principal of the college as per the recommendation of the Head of the Department.

M.E. COMPUTER SCIENCE & ENGINEERING
SECOND YEAR TERM II

SUBJECT: PROGRESS SEMINAR

	Term Work: 50 Marks

1. Progress Seminar should be conducted in the middle of Second Year Term II.
2. The Progress Seminar Term-Work will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director/Principal of the college as per the recommendation of the Head of the Department.
3. Student must submit the progress report in the form of soft bound copy.
4. The marks of progress seminar should be submitted along with the marks of Project Stage-II.

M.E. COMPUTER SCIENCE & ENGINEERING
SECOND YEAR TERM II

SUBJECT: PROJECT STAGE-II

Practical: 18 Hrs per week	**Term Work: 150 Marks** **Oral:100 Marks**

DETAILED SYLLABUS

This is continuation of Project Stage-I. The complete System Development in software/hardware carried out using Software Engineering principles and practices is expected. It should be a working system either software or hardware or combination of both.

He/she has to present/publish atleast one paper in reputed National/International Journal/Conference on his/her Project work before submission of his/her Thesis/Dissertation.

TERM WORK

1. The Term Work of Project Stage –II will be assessed jointly by the pair of Internal (Guide) and External examiner along with oral examination of the same.

North Maharashtra University, Jalgaon

M. E. (Electrical Power System)

Examination Scheme & Structure with Effect from Year 2012-13

FIRST YEAR TERM – I

Sr. No.	Subject	Teaching Scheme per week		Examination Scheme				
		L	P	Paper Hrs.	Paper	TW	PR	OR
1	Power System Optimization Techniques	3	--	3	100	--	--	--
2	Microprocessor and Microcontroller	3	--	3	100	--	--	--
3	Power System Planning & Reliability	3	--	3	100	--	--	--
4	Power System Dynamics	3	--	3	100	--	--	--
5	Elective – I	3	--	3	100	--	--	--
6	Laboratory Practice – I	--	6	--	--	100	--	50
7	Seminar – I	--	4	--	--	100	--	--
Total		**15**	**10**	**--**	**500**	**200**	**--**	**50**
Grand Total		**25**		**750**				

Elective – I

1. FACTs & Power Quality
2. Artificial Intelligence and its Applications in Power Systems
3. Renewable Energy Sources
4. Power Sector Economics, Management and Restructuring

FIRST YEAR TERM – II

Sr. No.	Subject	Teaching Scheme per week		Examination Scheme				
		L	P	Paper Hrs.	Paper	TW	PR	OR
1	Computer Methods Power System Analysis	3	--	3	100	--	--	--
2	Digital Signal Processing	3	--	3	100	--	--	--
3	Power System Modeling & Control	3	--	3	100	--	--	--
4	High Voltage Power Transmission	3	--	3	100	--	--	--
5	Elective – II	3	--	3	100	--	--	--
6	Laboratory Practice – II	--	6	--	--	100	--	50
7	Seminar – II	--	4	--	--	100	--	--
Total		**15**	**10**	**--**	**500**	**200**	**--**	**50**
Grand Total		**25**		**750**				

Elective – II

1. Advanced Power System Protection
2. Power Electronics Applications in Power Systems
3. EHV Transmission Systems
4. Power System Design

North Maharashtra University, Jalgaon

M. E. (Electrical Power System)

Examination Scheme & Structure with Effect from Year 2012-13

SECOND YEAR TERM – I

Sr. No.	Subject	Teaching Scheme per week		Examination Scheme				
		L	P	Paper Hrs.	Paper	TW	PR	OR
1	Seminar –III	--	4	--	--	50	--	50
2	Project Stage – I	--	18	--	--	100	--	--
Total		**--**	**22**	**--**	**--**	**150**	**--**	**50**
Grand Total		**22**		**200**				

SECOND YEAR TERM – II

Sr. No.	Subject	Teaching Scheme per week		Examination Scheme				
		L	P	Paper Hrs.	Paper	TW	PR	OR
1	Progress Seminar	--	--	--	--	50	--	--
2	Project Stage – II	--	18	--	--	150	--	100
Total		**--**	**18**	**--**	**--**	**200**	**--**	**100**
Grand Total		**18**		**300**				

SEMESTER-I

1. Power System Optimization Techniques

Teaching Scheme:
Lectures: 3 Hrs. /Week

Examination Scheme:
Theory Paper: 100 Marks
Duration: 3 hours

1) Introduction to optimization and classical optimization techniques, Linear Programming: Standard form, geometry of LPP, Simplex Method P.F. solving LPP, revised simplex method, duality, decomposition principle, and transportation problem.

2) Non-Linear Programming (NLP): One dimensional methods, Elimination methods, Interpolation methods Unconstrained optimization techniques-Direct search and Descent methods, constrained optimization techniques, direct and indirect methods.

3) Dynamic Programming: Multistage decision processes, concept of sub-optimization and principle of optimality, conversion of final value problem into an initial value problem. CPM and PERT

4) Genetic Algorithm: Introduction to genetic Algorithm, working principle, coding of variables, fitness function. GA operators; Similarities and differences between GAs and traditional methods; Unconstrained and constrained optimization.

5) Applications to Power system: Economic Load Dispatch in thermal and Hudro-thermal system using GA and classical optimization techniques, Unit commitment problem, reactive power optimization. Optimal power flow, LPP and NLP techniques to optimal flow problems.

Reference books:

a. "Optimization - Theory and Applications", By S.S.Rao, Wiley-Eastern Limited
b. "Introduction of Linear and Non-Linear Programming", By David G. Luenberger, Wesley Publishing Company
c. "Computational methods in Optimization ",By Polak, Academic Press
d. "Optimization Theory with Applications" By Pierre D.A., Wiley Publications
e. "Operations Research" By D. S. Hira & P. K. Gupta , S Chand Publications

2. Microprocessor and Microcontroller

Teaching Scheme:
Lectures: 3 Hrs. /Week

Examination Scheme:
Theory Paper: 100 Marks
Duration: 3 hours

1) Overview of 8086 : Architecture, instruction including I/O instructions, Addressing modes, interrupt structure, ISR minimum and maximum mode, Assembly Language Programmes on 16-bit multiplication, 16-bit by 8-bit division, bubble sort, palindrome. **Hardware and Software debugging aids**: 1 Pass and 2 Pass assemblers, cross assemblers, circuit emulators, simulators, linkers, loaders, compiler, cross compiler, Types of interfacing devices-→Latches(74373), Buffers(74244/245).

2) **8051 Architecture**: 8051 Microcontroller Hardware, Input/output. Pins, ports, and circuits, External Memory, Counter and Timers, Serial Data input/ output, Interrupts **Assembly language programming concepts :** The mechanics of programming, The assembly language programming process, PAL instructions, Programming tools and techniques, Programming the 8051 **Moving Data :** Addressing modes, external data moves, code memory read only data moves, push and pop -op codes, data exchanges

3) **Logical Operations :** Byte level logical operations, bit level logical operations, rotate and swap operations **Arithmetic Operations :** Flags, incrementing and decrementing, addition, subtraction, multiplication and division, decimal arithmetic **Jumps and Call Instructions :** The jump and call program range, jumps, calls and subroutines, interrupts and returns

4) **8051 Microcontroller Design :** Microcontroller specification, microcontroller design, testing the design, timing subroutines, look up tables for the 8051, serial data transmission

5) **Applications:** Keyboard, displays→LED & LCD, pulse measurement, D/A and A/D conversion, multiple interrupts **Serial Data Communication:** Network Configuration, 8051 Data Communication.

Reference books:

a. "The 8051 Micro Controller : Architecture, Programming," By Kenneth J.Ayala, Penram International, Mumbai.
b. Intel Embeded Micro Controller Data Book, Intel Corporation.
c. "Microprocessor and Digital Systems" By D.V.Hall, ELBS Publication, London.
d. "Advance Microprocessors and Micro Controllers" By B.P.Singh,, New Age International, New Delhi.
e. "Microprocessors and Interfacing" By D.V.Hall, Tata McGraw Hill Publication, New Delhi.
f. "Microcomputer Systems: the 8086/8088 Family, Architecture, Programming and Design" By Y.C.Liu, Gibson, Prentice Hall of India Publications, New Delhi.
g. "Introduction to Microprocessor, Software, Hardware and Programming" By Lance A. Leventhal,
h. "Microprocessor Architecture, Programming and Applications with the 8085" By Ramesh S.Gaonkar, Penram International, Mumbai.
i. "8051 microcontroller and embedded system" By Muhammad Ali Mazidi, Janice Mazidi, Rollin McKinlay, Pearson Second Edition

3. Power System Planning & Reliability

Teaching Scheme:
Lectures: 3 Hrs. /Week

Examination Scheme:
Theory Paper: 100 Marks
Duration: 3 hours

1) **Load Forecasting :** Introduction, Factors affecting Load Forecasting, Load Research, Load Growth Characteristics, Classification of Load and Its Characteristics, Load Forecasting Methods - (i) Extrapolation (ii) Co-Relation Techniques, Energy Forecasting, Peak Load Forecasting, Reactive Load Forecasting, Non-Weather sensitive load Forecasting, Weather sensitive load Forecasting, Annual Forecasting, Monthly Forecasting, Total Forecasting.

2) **System Planning :** Introduction, Objectives & Factors affecting to System Planning , Short Term Planning, Medium Term Planning, Long Term Planning, Reactive Power Planning.
Reliability : Reliability, Failure, Concepts of Probability, Evaluation Techniques (i) Markov Process (ii) Recursive Technique, Stochastic Prediction of Frequency and Duration of Long & Short Interruption, Adequacy of Reliability, Reliability Cost.

3) **Generation Planning and Reliability :** Objectives & Factors affecting Generation Planning, Generation Sources, Integrated Resource Planning, Generation System Model, Loss of Load (Calculation and Approaches), Outage Rate, Capacity Expansion, Scheduled Outage, Loss of Energy, Evaluation Methods. Interconnected System, Factors Affecting Interconnection under Emergency Assistance.

4) **Transmission Planning and Reliability:** Introduction, Objectives of Transmission Planning, Network Reconfiguration, System and Load Point Indices, Data required for Composite System Reliability.

5) **Distribution Planning and Reliability:** Radial Networks – Introduction, Network Reconfiguration, Evaluation Techniques, Interruption Indices, Effects of Lateral Distribution Protection, Effects of Disconnects, Effects of Protection Failure, Effects of Transferring Loads, Distribution Reliability Indices. Parallel & Meshed Networks - Introduction, Basic Evaluation Techniques, Bus Bar Failure, Scheduled Maintenance, Temporary and Transient Failure, Weather Effects, Breaker Failure

Reference Books :

a. “Modern Power System Planning” By X. Wang & J.R. McDonald, McGraw Hill
b. “Electrical Power Distribution Engineering” By T. Gönen, McGraw Hill Book Company
c. “Generation of Electrical Energy” By B.R. Gupta, S. Chand Publications
d. “Electrical Power Distribution” By A.S. Pabla, Tata McGraw Hill Publishing Company Ltd.
e. “Electricity Economics & Planning” By T.W.Berrie, Peter Peregrinus Ltd., London.
f. “Power System Planning” By R.N. Sulivan , McGraw Hill

4. Power System Dynamics

Teaching Scheme:
Lectures: 3 Hrs. /Week

Examination Scheme:
Theory Paper: 100 Marks
Duration: 3 hours

1) Requirement of reliable power system, Basic concepts of stability, Reliable electrical power service, Stability of Synchronous machines, Tie line oscillations, Method of simulation.

2) Synchronous Machines: Review of synchronous machine equations, parameters, Equations in a-b-c phase co-ordinates and Park's co-ordinates, Representation of external system, Low and High order state models, Choice of state variables. Initial state equivalent circuit, Phasor diagram p.u. reactance. System Response to Large Disturbances: System of one machine against infinite bus, Classical Model, Mechanical and electrical torques, Critical clearing angle and time, Automatic reclosing, Pre calculated Swing curves and their use.

3) System Response to Small Disturbances: Two machine system with negligible losses, Clarke diagram for two machine series reactance system, Extension of Clarke diagram to cover any reactance network, Equation for steady State Stability limit, Two-Machine system with losses, Effect of inertia. Effect of governor, action, Conservative criterion for stability, Effect of saliency, saturation and short circuit ratio on steady state power limits.

4) Regulated Synchronous Machines: Demagnetizing effect of armature reaction and effect of small speed changes, Modes of oscillations of unregulated multimachine system. Voltage regulator and governor with delay Distribution of power impacts.

5) Effect of Excitation on Stability: Effect of excitation on generator power limits, transients and dynamic stability, Examination of dynamic stability by Routh's criterion, Root locus analysis of a regulated machine connected to an infinite bus. Approximate System representation, Supplementary Stabilizing Signals, Linear analysis of stabilized generator.

Reference Books :

a. "Synchronous Machines" By C.Concordia, John Wiley & Sons.
b. "Power System Stability" By E.W.Kimbark, Dover Publication, Vol.-3
c. "Power System Control & Stability" By Anderson, Galgotia Publ.
d. "Power System Stability" By S.B. Crary, John Wiley & Sons.
e. "Modern Power System Analysis" By Nagrath I. J. & Kothari D. P.,Tata McGraw Hill Publication New Delhi

ELECTIVE-I

i. FACTs & Power Quality

Teaching Scheme:
Lectures: 3 Hrs. /Week

Examination Scheme:
Theory Paper: 100 Marks
Duration: 3 hours

1) Steady state and dynamic problems in AC systems, Flexible AC transmission systems (FACTS), principles of series shunt compensation.

2) Description of static var compensation (SVC), thyristor controlled series compensation (TCSC) static phase shitters (SPS), static condenser (STATCON), static synchronous series compensator (SSSC) and unified power flow controller (UPFC), modeling and analysis of FACTS controllers, control strategies to improve system stability.

3) Power quality problems in distribution systems, Harmonics, Harmonics creating loads, modeling.

4) Harmonic propagation, series and parallel resonance, harmonic power flow, mitigation of harmonics, filters, passive filters, active filters, shunt and series hybrid filters, voltage sag and swells.

5) Voltage flicker, mitigation of power quality problems using power electronics conditioners, IEEE standards.

Reference Books :

a. "Understanding FACTS" By Hingorani & Gyugui, IEEE press.
b. "FACTS Controllers in Transmission & Distribution" By K. R. Padiyar. New Age Publication.
c. "Power Quality" By G.T.Heydt , Stars in a Circle Publication, Indiana, 1991.
d. "Static Reactive Power Compensation" By E.J.E.Miller John Wiley & Sons, New York, 1982.
e. Recent Publications on Power Systems and Power Delivery.

ii. ***ArtificiaI Intelligence and its Applications in Power Systems***

Teaching Scheme:	***Examination Scheme:***
Lectures: 3 Hrs. /Week	*Theory Paper: 100 Marks*
	Duration: 3 hours

1) **Introduction to Artificial Intelligence:** Introduction, Fuzzy systems, Artificial Neural Network (ANN), Expert Systems, Genetic Algorithm, Evolutionary Programming. Biological neurons: Function of single biological neuron, function of artificial neuron, Basic terminology related to artificial neuron. Characteristics of ANN, Typical applications of ANN such as classification, pattern recognition, forecasting Properties, strength of NN.

2) **Different Architectures of ANN and Learning Processes :** Different architectures of Neural Network, types of activation function, concept of Learning with a Teacher, Learning without a Teacher, Learning Tasks (Any two learning methods and applications)

3) **Single Layer Network and Multi-layer Network :** Single Layer Perception: architecture – training algorithm, Least – Mean square algorithm, learning curves, Learning Rate, Annealing techniques. Feed forward Neural Network(MLP) , Back propagation algorithm. Limitation of Back propagation algorithm. Concept of learning rate, momentum coefficient, Generalization capacity

4) **Fuzzy Mathematics :** Basic concept of Fuzzy Logic, Fuzzy set – Basic definition – Mambership function, Operations of fuzzy sets.

5) **Fuzzy Theory :** Fuzzy relations - Fuzzy graphs - Fuzzy analysis – Propositional logic, predictive logic, Fuzzy set theory.
AI Applications in Power Systems : Application of ANN and Fuzzy logic in Power System Planning, Operation and control – load forecasting, Unit Commitment, Load Dispatch and Protection.

Reference Books:

a. "Neural Networks, Fuzzy Logic & Genetic Algorithms Synthesis & Applications" By S. Rajsekaram, G. A. Vijayalaxmi Pai, Practice Hall India
b. "Introduction to Neural Network Using MATLAB 6.0" By S. N. Sivanandam, S. Sumathi, S. N. Deepa, , Tata McGraw Hill
c. "'Fuzzy Sets, Uncertainty and Information" By George Klir & Tina. A. Folger, Prentice Hall of India Pvt. Ltd
d. "Artificial Intelligence" By G. F. Luger and W. A. Stubblefield, Redwood City, CA: Benjamin Cummings, 1993.
e. "Fundamentals of Artificial Neural Network" By Mohamed H. Hassoun, Practice Hall India.
f. "Introduction to Artificial Intelligence" By Eugene Charniat, Drew McDermott, Pearson Education.
g. "An Introduction to Neural Networks" By James A. Anderson, Practice Hall India Publication.

iii. Renewable Energy Sources

Teaching Scheme:	***Examination Scheme:***
Lectures: 3 Hrs. /Week	*Theory Paper: 100 Marks*
	Duration: 3 hours

1) **Energy Scenario:** Classification of Energy Sources, Energy resources (Conventional and nonconventional), Energy needs of India, and energy consumption patterns. Worldwide Potentials of these sources. Energy efficiency and energy security. Energy and its environmental impacts. Global environmental concern, Kyoto Protocol, Concept of Clean Development Mechanism (CDM) and Prototype Carbon Funds (PCF). Factors favoring and against renewable energy sources.

2) **Solar Energy:** Solar thermal Systems: Types of collectors, Collection systems, efficiency calculations, applications. Photo voltaic (PV) technology: Present status, - solar cells , cell technologies, characteristics of PV systems, equivalent circuit, array design , building integrated PV system, its components , sizing and economics. Peak power operation. Standalone and grid interactive systems.

3) **Wind Energy:** Wind Energy : wind speed and power relation, power extracted from wind, wind distribution and wind speed predictions. Wind power systems: system components, Types of Turbine, Turbine rating Choice of generators, turbine rating, electrical load matching, Variable speed operation, maximum power operation, control systems, system design features, stand alone and grid connected operation.

4) **Other energy sources:** Biomass – various resources, energy contents, technological advancements, conversion of biomass in other form of energy – solid, liquid and gases. Gasifires Biomass fired boilers, Co firing, Generation from municipal solid waste, Issues in harnessing these sources. Hydro energy – feasibility of small, mini and micro hydel plants scheme layout economics. Tidal and wave energy, Geothermal and Ocean-thermal energy conversion (OTEC) systems – schemes, feasibility and viability.

5) **Energy storage and hybrid system configurations:** Energy storage: Battery – types, equivalent circuit, performance characteristics, battery design, charging and charge regulators. Battery management. Fly wheel energy relations, components, benefits over battery. Fuel Cell energy storage systems. Ultra Capacitors.
   Grid Integration : Stand alone systems, Hybrid systems – hybrid with diesel, with fuel cell, solar wind, wind –hydro systems, mode controller, load sharing, system sizing. Hybrid system economics. Grid integration with the system: Interface requirements, Stable operation, Transient-safety, Operating limits of voltage, frequency, stability margin, energy storage, and load scheduling. Effect on power quality - harmonic distortion, voltage transients and sags.

Reference Books :

a. "Wind and solar systems" By Mukund Patel, CRC Press.
b. "Solar Photovoltaics for terrestrials" By Tapan Bhattacharya.
c. "Wind Energy Technology" By Njenkins, John Wiley & Sons,
d. "Non Conventional Energy Resources" by D.S. Chauhan and S.K.Srivastava,.
e. "Solar Energy" By S.P. Sukhatme, Tata McGraw Hill.
f. "Solar Energy" By S. Bandopadhay, Universal Publishing.

iv. **Power Sector Economics, Management and Restructuring**

Teaching Scheme:	***Examination Scheme:***
Lectures: 3 Hrs. /Week	*Theory Paper: 100 Marks*
	Duration: 3 hours

1) **Power Sector in India**
   Introduction to various institutions in Indian Power sector such as CEA, Planning Commissions, PFC, Ministry of Power, state and central governments, REC, utilities and their roles. Critical issues / challenges before the Indian power sector, Salient features of Electricity act 2003, Various national policies and guidelines under this act.
2) **Power sector economics and regulation**
   Typical cost components and cost structure of the power sector, Different methods of comparing investment options, Concept of life cycle cost , annual rate of return , methods of calculations of Internal Rate of Return(IRR) and Net Present Value(NPV) of project, Short term and long term marginal costs, Different financing options for the power sector. Different stakeholders in the power sector, Role of regulation and evolution of regulatory commission in India, types and methods of economic regulation, regulatory process in India.
3) **Power Tariff**
   Different tariff principles (marginal cost, cost to serve, average cost), Consumer tariff structures and considerations, different consumer categories, telescopic tariff, fixed and variable charges, time of day, interruptible tariff, different tariff based penalties and incentives etc., Subsidy and cross subsidy, life line tariff, Comparison of different tariff structures for different load patterns. Government policies in force from time to time. Effect of renewable energy and captive power generation on tariff. Determination of tariff for renewable energy.
4) **Power sector restructuring and market reform**
   Different industry structures and ownership and management models for generation, transmission and distribution. Competition in the electricity sector- conditions, barriers, different types, benefits and challenges Latest reforms and amendments. Different market and trading models / arrangements, open access, key market entities- ISO, Genco, Transco, Disco, Retailco, Power market types, Energy market, Ancillary service market, transmission market, Forward and real time markets, market power.
5) **Electricity Markets Pricing and Non-price issues**
   Electricity price basics, Market Clearing price (MCP), Zonal and locational MCPs. Dynamic, spot pricing and real time pricing, Dispatch based pricing, Power flows and prices. Optimal power flow Spot prices for real and reactive power. Unconstrained real spot prices, constrains and real spot prices. Non price issues in electricity restructuring (quality of supply and service, standards of performance by utility, environmental and social considerations) Global experience with electricity reforms in different countries.

Reference Books :

a. "Know Your Power", A citizens Primer On the Electricity Sector, Prayas Energy Group, Pune
b. Sally Hunt, "Making Competition Work in Electricity", 2002, John Wiley Inc
c. Electric Utility Planning and Regulation, Edward Kahn, American Council for Energy Efficient Economy

LABORATORY PRACTICE-I

Teaching Scheme:
Practical: 6 Hrs. /Week

Examination Scheme:
Term Work: 100 Marks
Oral: 50 Marks

Term work shall consist of record of minimum eight experiments using Engineering Computation Software such as MATLAB, SCILAB, PSCAD, ETAP, with moderate to high complexity /assignments based on syllabus of subjects from Semester-I

SEMINAR-I

Teaching Scheme: *Practical: 4 Hrs. /Week*

Examination Scheme: *Term Work: 100 Marks*

Each student is required to deliver a seminar in first semester on the topic of his/her own choice. The topic of the seminar should be out of the syllabus and relevant to the latest trends in Electrical Power Systems.

The topic will be decided by the student, Guide and Head of department. Each student will make seminar presentation with audio/video aids, for the duration of 45 minutes and seminar work shall be in format of report to be submitted by the student at the end of semester.

The report copies must be duly signed by Guide and Head of department. (One copy for institute, one copy for guide and one copy for candidates for certification). The student is expected to submit the seminar report in standard format. Attendance of all students for all seminars is compulsory.

SEMESTER-II

1. COMPUTER METHODS IN POWER SYSTEM ANALYSIS

Teaching Scheme: *Lectures: 3 Hrs. /Week*

Examination Scheme: *Theory Paper: 100 Marks* *Duration: 3 hours*

1) Representation of power systems for computerized analysis: Mathematical models of synchronous generator for steady state and transient analysis, Transformer with tap changer, transmission line, phase shifter and loads.

2) Topology of Electric Power System-Network Graphs, Incidence matrices, fundamental loop and cutset matrices, primitive impedance and admittance matrices, equilibrium equations of networks. Singular and nonsingular transformation of network matrices.

3) Formation of bus impedance and admittance matrices by algorithm - Modification of bus impedance and admittance matrix to account for change in networks. Derivation of loop impedance matrix. Three phase network elements-transformation matrix - incidence and network matrices for three phase network. Algorithm for formulation of three - phase bus impedance matrix.

4) Short Circuit Studies: Three phase network, Symmetrical components. Thevenin's theorem and short circuit analysis of multi node power systems using bus impedance matrix. Short circuit calculations for balanced and unbalanced short circuits bus impedance and loop impedance matrices, Stability studies- Solution of state equation by modified Eular method and solution of network equations by Gauss-Seidal interactive method

5) Load flow studies : Slack bus, load buses, voltage control buses, Load flow equations, Power flow model using bus admittance matrix, Power flow solution through Gauss-Seidal and N-R methods - sensitivity analysis, Second order N-R method, fast decoupled load flow method - Sparsity of matrix. Multi area power flow analysis with the line control.

Reference Books :

a. "Computer Methods in Power System Analysis" By G.W. Stagg, A.H.Elabiad, McGraw Hill Book Co.
b. "Computer Techniques in Power System Analysis" By M.A. Pai, Tata McGraw Hill Publication.
c. "Electric Energy System Theory" By O.I.Elgard, Tata McGraw Hill Publication.
d. "Computer Aided Power System Operation and Analysis" By R.N.Dhar, Tata McGraw Hill Publication.
e. "Modern Power System Analysis" By I.J.Nagrath, D.E.Kothar, Tata McGraw Hill, New Delhi.

2. Digital Signal Processing

Teaching Scheme:
Lectures: 3 Hrs. /Week

Examination Scheme:
Theory Paper: 100 Marks
Duration: 3 hours

1) Characterization & Classification of Digital Signals. Digital Signal Processing of continuous signals. Discrete time signals - sequences, representation of signals on orthogonal basis, sampling, aliasing, quantization & reconstruction of signals.

2) Discrete systems-attributes, z-transform, analysis of LTI system. Frequency analysis, inverse systems, Discrete Fourier transforms, Fast Fourier implementation of discrete time system.

3) Digital filters - structures, sampling, recursive, non-recursive A to D & D to A conversion. FIR, IIR & lattice filter structures, Design of FIR digital filters. Window method, Park-McCellan's method. Design of IIR digital filters. Butterworth, Chebyshev.

4) Elliptic approximations, low-pass, band-pass, band-stop & high-pass filters. Effect of finite register length in FIR filter design. Multirate signal processing-motivation-application, decimation & interpolation, sample rate conversion, polyphase implementation of sampling rate conversion, Filter bank theory-DFT filter banks, Adaptive filtering theory.

5) DSP Processors and Applications - DSP Microprocessor architectures, fixed point, floating point precision, algorithm design, mathematical, structural and numerical constraints, DSP programming, filtering, data conversion; communication applications. Real time processing considerations including interrupts.

Reference Books :

a. "Digital Signal Processing Principles, Algorithm and Applications" By J.G.Proakis and D.G.Manolakis '' Prentice Hall 1997
b. "Discrete Time Signal Processing" By A.V.Oppenheim, R.W.Schafer, John Wiley.
c. "Introduction to Digital Signal Processing" By J.R. Johnson,Prentice Hall 1992
d. "Digital Signal Processing" By D.J.Defatta, J.G.Dulas. Hodgekiss, J. Wiley and Sons Singapore, 1988
e. "Theory & Applications of Digital Signal Processing" By L.R.Rabiner & B. Gold , Prentice Hall, 1992
f. "Digital Signal Processing:A Practical Approch" By Emmanuel Ifeachor, Prof. Barrie Jervis, Prentice Hall

3. Power System Modeling & Control

Teaching Scheme: *Lectures: 3 Hrs. /Week*

Examination Scheme: *Theory Paper: 100 Marks* *Duration: 3 hours*

1**)** Transient response and concept of stability in Electrical Power System. Modelling of Power System. Control of voltage, frequency and tie-line power flows, Q-V and P-f control loops, mechanism of real and reactive power control.

2) Mathematical model of speed governing system. Turbine governor as affecting the power system dynamics. Transient and steady state response in the interconnected power systems. Excitation systems. Transformation model of exciter system. Analysis using block diagrams.

3) Power systems stabilizers. Dynamic stability (small disturbances), effect of excitation control and turbine dynamics, characteristic equation, method of analysis of the stability of power system. Multi machine systems, Flux decay effects. Multi machine systems with constant impedance loads, matrix representation of a passive network in the transient state, converting to a common reference frame. Converting machine co-ordinates to system reference, relation between machine current and voltages, system order, machine represented by classical methods.

4) Net interchange tie-line bias control. Optimal, sub-optimal and decentralized controllers. Discrete mode AGC. Time - error and inadvertent interchange correction techniques. On-line computer control. Distributed digital control.

5) Data acquisition systems. Emergency control, preventive control, system, System wide optimization, SCADA. Self excited electro-mechanical oscillations in power system and the means for control.

Reference Books :

a. “Transient Processes in Electrical Power System” By V.Venlkov ,Mir Publication, Moscow.
b. “Electric Energy Systems Theory” By Olle I.Elgard , Tata McGraw Hill Pub. Co., New Delhi.
c. “Power System Control and Stability” By Anderson P.M. & Foaud A.A., Galgotia Pub.
d. “Modern Power System Analysis” By Nagrath I.J., Kothari D.P. , Tata McGraw Hill Pub. Co., New Delhi.

4. High Voltage Power Transmission

Teaching Scheme: *Lectures: 3 Hrs. /Week*

Examination Scheme: *Theory Paper: 100 Marks*
Duration: 3 hours

HIGH VOLTAGE AC TRANSMISSION

1) **Engineering Aspects of EHV AC Transmission System:** Principles, configuration, special features of high voltage AC lines, power transfer ability, reactive power compensation, audible noise, corona bundle conductors, electric field, right of way, clearances in a tower, phase to phase, phase to ground, phase to tower, factors to be considered, location of ground wire, angle of protection, tower configuration. Principles of radio interference, origin of radio interference, method of propagation, factors to be considered in line design.

2) **Power System Transients:** Introduction, circuit closing transients, sudden symmetrical short circuit of alternator, recovery transients due to removal of short circuit, traveling waves on transmission lines, wave equation, surge impedance and wave velocity, specifications of traveling waves, reflection and refraction of waves, typical cases of line terminations , equivalent circuit for traveling wave studies, forked lines, reactive termination, successive reflections, Bewley lattice diagram, attenuation and distortion, arcing grounds, capacitance switching, current chopping, lightning phenomenon, over voltages due to lightning, line design based on direct strokes, protection of systems against surges, statistical aspects of insulation co-ordination.

HIGH VOLTAGE DC TRANSMISSION

3) **General Background :** EHV AC versus HVDC Transmission, power flow through HVDC link, equation for HVDC power flow, effect of delay angle and angle of advance, bridge connections, waveform of six pulse and twelve pulse bridge converter, commutation, phase control, angle of extinction, control of DC voltage, connections of three phase six pulse and twelve pulse converter bridges, voltage and current waveforms.

4) Bipolar HVDC terminal, converter transformer connections, switching arrangements in DC yard for earth return to metallic return, HVDC switching system, switching arrangements in a bipolar HVDC terminal, sequence of switching operations, HVDC circuit breakers, DC current interruption, commutation principle, probable types and applications of HVDC circuit breakers, multi-terminal HVDC systems, parallel tapping, reversal of power, configurations and types of multi-terminal HVDC systems, commercial multi terminal systems.

5) Faults and abnormal condition in bipolar, two terminal HVDC system, pole-wise segregation, protective zones, clearing of DC line faults and reenergizing, protection .of converters, transformer, converter valves, DC yards, integration of protection and controls, hierarchical levels of control, block diagram, schematic diagram, current control, power control, DC voltage control, commutation channel, master control, station control, lead station, trail station, pole control, equidistant firing control, synchronous HVDC link, asynchronous HVDC Link.

Reference Books:

a. "An Introduction to High Voltage Engineering" By Subir Ray, Prentice Hall of India Private Limited, New Delhi – 110 001.
b. "HVDC Transmission" By Adamson C., Hingorani N.G., IEEE Press
c. "Power Transmission" By DC Uhimann E.
d. "HVAC and HVDC Transmission, Engineering and practice" By S. Rao, Khanna Publisher, Delhi.
e. "Electric Power Systems" By B.M. Weddy and B.J.Cory, John Wiely and Sons, Fourth edition (2002)
f. "Power System Analysis and Design" By J.Duncan Glover, Mulukutla S.Sarma, Thomson Brooks/cole /Third Edition (2003)
g. "Power System Analysis and Design" By B.R. Gupta, S.Chand and Company (2004)

ELECTIVE-II

i. Advanced Power System Protection

Teaching Scheme:
Lectures: 3 Hrs. /Week

Examination Scheme:
Theory Paper: 100 Marks
Duration: 3 hours

1) Review of principles of power system equipments protection, configuration of various solid state protection scheme, evolution of digital relays from electromechanical relays,

2) performance & operational characteristics of digital protection, Basic elements of digital filtering, analog multiplexers, conversions of system: the sampling theorem, signal aliasing error, sample & hold circuit, multiplexers, analog to digital conversion, digital filtering concepts, A digital relay. Hardware & Software.

3) Mathematical background to protectional algorithm, first derivative (Mann & Morrison) algorithm, Fourier algorithm- full cycle window algorithm, fractional cycle window algorithm,

4) Walsh function based algorithm, least square based algorithm, differential equation based algorithm, travelling wave based technique.

5) Digital differential protection of transformer, digital line differential protection, recent advances in digital protection of power system.

Reference Books:

a. "Digital Protection for Power System" By A.T.Johns and S.K.Salman, Peter, Published by Peter Peregrinus Ltd. on behalf of the IEE, London, U.K.
b. "Power System Protection and Switchgear" By Badri Ram and D.N.Vishvakarma, Tata McGraw Hill, New Delhi.
c. "Transmission Network Protection" By Theory and Practice, Y.G.Paithankar, Marcel Dekker, New York, U.S.A.
d. "Fundamentals of Power System Protection" By Y.G.Paithankar and S.R. Bhide, Prentice Hall of India, New Delhi.

ii. Power Electronics Applications in Power Systems

Teaching Scheme:	***Examination Scheme:***
Lectures: 3 Hrs. /Week	*Theory Paper: 100 Marks*
	Duration: 3 hours

1) **Power Electronic Controllers**: Basics, challenges and needs, static power converter structures, AC controller based structures, D.C. link converter topologies, converter output and harmonic control, power converter control issues.

2) **Shunt Compensation**: SVC and STATCOM: Operation and control of SVC, STATCOM configuration, control & applications.
Series Compensation: Principle of operation, application of TCSC for damping of electromechanical oscillations, application of TCSC for mitigation of sub-synchronous resonance, TCSC layout and protection, static synchronous series compensator (SSSC).

3) **Unified Power Flow Controller:** Steady state operation, control and characteristics, introduction to transient performance, power flow studies in UPFC embedded systems, Operational constraints on UPFC.

4) **Other FACTS Controllers:** Circuit, model and operating features of Dynamic Voltage Regulator(DVR), Thyristor Controlled Braking Resistors (TCBR), Thyristor Controlled Phase Angle Regulator(TCPAR), comparison of all FACTS controllers.

5) **Control Strategies and co-ordination :** Conventional control, Hysterisis control, Artificial Neural Network, fuzzy logic controls, comparison between different control schemes, co-ordination between different FACTS controllers.

Reference Books:

a. "Flexible A.C. Transmission Systems (FACTS)" By Yong Hua Song and Johns (IEE Power and Energy Series 30)
b. "Thyristor based FACTS controllers" By Mathur & Verma (IEEE Press, New York)
c. "Sub-synchronous Resonance" By K.R. Padiyar, B.S. Publications, Hyderabad.
d. "FACT's Controllers in Transmission & Distribution" by K.R. Padiyar New Age Publishers ,Delhi, May 2007

iii. EHV Transmission Systems

Teaching Scheme:
Lectures: 3 Hrs. /Week

Examination Scheme:
Theory Paper: 100 Marks
Duration: 3 hours

1) Basic Aspects of A.C. Power Transmission, Power-Handling Capacity and Line Loss, Surface Voltage Gradient on Conductors, Electrostatic Field of EHV Lines. Measurement of Electrostatic Fields. Electromagnetic Interference. Traveling Waves and Standing Waves, Line Energization with Trapped - Charge Voltage. Reflection and Refraction of Traveling Waves. Transient Response of Systems with Series and Shunt Lumped Parameters. Principles of Traveling-Wave Protection

2) Lightning & Lightning Protection, Insulation Coordination Based on Lightning

3) Over Voltages in EHV Systems Caused by Switching Operations, Origin of Over Voltages and their Types, Over Voltages Caused by Interruption of Inductive and Capacitive Currents, Ferro-Resonance Over Voltages, Calculation of Switching Surges, Power Frequency Voltage Control and Over Voltages, Power Circle Diagram.

4) Reactive Power Flow and Voltage Stability in Power Systems. Steady - State Static Real Power and Reactive Power Stability, Transient Stability, Dynamic Stability. Basic Principles of System Voltage Control. Effect of Transformer Tap Changing in the Post- Disturbance Period, Effect of Generator Excitation Adjustment, Voltage Collapse in EHV Lines, Reactive Power Requirement for Control of Voltage in Long Lines. Voltage Stability.

5) Power Transfer at Voltage Stability Limit of EHV Lines, Magnitude of Receiving End Voltage at Voltage Stability Limit. Magnitude of Receiving End Voltage During Maximum Power Transfer. Magnitude of Maximum Power Angle at Voltage Stability Limit. Optimal Reactive Power at Voltage Stability Limit.

Reference Books:

a. "Performance, operation & control of EHV power transmission system" A. Chakrabarti, D.P. Kothari, A.K. Mukhopadhyay, wheeler publications
b. "Extra high-voltage A.C. transmission Engineering" By Rakash Das Begamudre, New Age International Pvt. Ltd.
c. "EHVAC & HVDC Transmission Engineering & Practice" By S. Rao, Khanna Publications

iv. ***Power System Design***

Teaching Scheme:
Lectures: 3 Hrs. /Week

Examination Scheme:
Theory Paper: 100 Marks
Duration: 3 hours

1) Power System Components, Location of Main Generating Stations and Substations, Interconnections, Load Dispatch Centers

2) Design of Transmission Lines, Selection of Voltage, Conductor Size, Span, Number of Circuits, Conductor Configurations, Insulation Design, Mechanical Design of Transmission Line, Towers, Sag- Tension Calculations

3) Design of EHV Transmission Line Based Upon Steady State Limits and Transient Over Voltage, Design Factors Under Steady States, Design of 400kV, 1000MW Medium and Long Transmission Line Without and with Series Capacitance Compensation and Shunt Reactors at Both Ends, 750KVLong Transmission Line with Only Shunt Reactors. Extra High Voltage Cable Transmission, Design Basis of Cable Insulation, Search Performance of Cable Systems, Laying of Power Cables

4) Vigorous Solution of Long Transmission Line, Interpretation of Long Line Equations, Ferranti Effect, Tuned Power Lines, Equivalent Circuit of Long Line, Power Flow Thorough Transmission Line and Methods of Voltage Control

5) Power System Earthing, Earth Resistance, Tolerable and Actual Step and Touch Voltages, Design of Earthing Grid, Concrete Encased Electrodes, Tower Footing Resistance, Impulse Behavior of Earthing System

Reference Books:

a. "Electrical Power System Design" By M.V. Deshpande, Tata McGraw Hill
b. "Power System Analysis and Design" By B.R.Gupta, Wheeler Publishing co.
c. "Power System Engineering" By I.J.Nagrath & D. P. Kothari, Tata Mc Graw Hill
d. "Extra high-voltage A.C. transmission Engineering" By Rakosh Das Begamudre, New Age International Pvt. Ltd.
e. "EHV AC & HVDC Transmission Engineering & Protection" By S.S.Rao, Khanna Publishers

LABORATORY PRACTICE-II

Teaching Scheme:
Practical: 6 Hrs. /Week

Examination Scheme:
Term Work: 100 Marks
Oral: 50 Marks

Term work shall consist of record of minimum eight experiments using Engineering Computation Software such as MATLAB, SCILAB, PSCAD, ETAP, with moderate to high complexity /assignments based on syllabus of subjects from Semester-II

SEMINAR-II

Teaching Scheme: *Practical: 4 Hrs. /Week*

Examination Scheme: *Term Work: 100 Marks*

Each student is required to deliver a seminar in second semester on the topic of his/her own choice. The topic of the seminar should be out of the syllabus and relevant to the latest trends in Electrical Power Systems.

The topic will be decided by the student, Guide and Head of department. Each student will make seminar presentation with audio/video aids, for the duration of 45 minutes and seminar work shall be in format of report to be submitted by the student at the end of semester.

The report copies must be duly signed by Guide and Head of department. (One copy for institute, one copy for guide and one copy for candidates for certification). The student is expected to submit the seminar report in standard format. Attendance of all students for all seminars is compulsory.

SEMESTER-III

SEMINAR-III

Teaching Scheme:	***Examination Scheme:***
Practical: 4 Hrs. /Week	*Term Work: 50 Marks*
	Oral: 50 Marks

Each student will select a topic in the area of electrical engineering, related to M. E. Project Stage-I.

The topic will be decided by the student, guide and Head of department. Each student will make seminar presentation with audio/video aids, for the duration of 45 minutes and seminar work shall be in format of report to be submitted by the students at the end of semester.

The report copies must be duly signed by guide and Head of department. (One copy for institute, one copy for guide and one copy for candidates for certification). The student is expected to submit the seminar report in standard format. Attendance of all students for all seminars is compulsory.

PROJECT STAGE-I

Teaching Scheme: *Practical: 18 Hrs. /Week*

Examination Scheme: *Term Work: 100 Marks*

Project Stage – I is the integral part of the dissertation project. The project should be based on the knowledge acquired by the student during the coursework and should contribute to the needs of the society.

The project aims to provide an opportunity of designing and preparing complete system or subsystems in an area where the student like to acquire specialized skills. The student should present the progress of the project. It will consist of problem statement, literature survey; project overview and scheme of implementation (block diagram, algorithm, program, PERT chart, etc.)

The term work should be continuously evaluated as per the norms/guidelines.

SEMESTER-IV

PROGRESS SEMINAR

Examination Scheme:
Term Work: 50 Marks

Each student will select a topic in the area of electrical engineering, related to M. E. Project Stage-II.

The topic will be decided by the student, guide and Head of department. Each student will make seminar presentation with audio/video aids, for the duration of 45 minutes and seminar work shall be in format of report to be submitted by the students at the end of semester.

The report copies must be duly signed by guide and Head of department. (One copy for institute, one copy for guide and one copy for candidates for certification). The student is expected to submit the seminar report in standard format. Attendance of all students for all seminars is compulsory.

PROJECT STAGE-II

Teaching Scheme:
Practical: 18 Hrs. /Week

Examination Scheme:
Term Work: 150 Marks
Oral: 100 Marks

The project work will start in second year (Continue to project stage-I).

The term work should be continuously evaluated as per the norms/guidelines.

The project work (dissertation) should be presented in a standard format.
The oral examination shall be conducted with the help of approved external examiner, appointed by university.

STRUCTURE OF

M.E. Electronics & Telecommunication (Digital Electronics)

W.E.F. 2010-2011

The scheme of teaching & examination as per university syllabus applicable to ME Electronics & Telecommunication (Digital Electronics) will be as follows.

STRUCTURE OF
M.E. ELECTRONICS AND TELECOMMUNICATION
(DIGITAL ELECTRONICS)
First Year Term-I

Sr. No.	Subject	Teaching Scheme Hours/week		Examination Scheme				
		L	P	Paper duration hours	Maximum marks			
					Paper	TW	PR	OR
1	Advanced Instrumentation System	3	-	3	100	-	-	-
2	Advanced Digital Signal Processing	3	-	3	100	-	-	-
3	Digital System Design	3	-	3	100	-	-	-
4	VLSI Design	3	-	3	100	-	-	-
5	Elective -I	3	-	3	100	-	-	-
6	Laboratory Practice –I	-	6	-	-	100	-	50
7	Seminar-I	-	4	-	-	100	-	-
Total		**15**	**10**		**500**	**200**		**50**
Grand Total		**25**			**750**			

List of Subjects for Elective – I

1. Parallel Computing
2. Biomedical Instrumentation
3. Wireless & Mobile Communication

STRUCTURE OF
M.E. ELECTRONICS AND TELECOMMUNICATION
(DIGITAL ELECTRONICS)
First Year Term-II

Sr. No.	Subject	Teaching Scheme Hours/week		Examination Scheme				
		L	P	Paper duration hours	Maximum marks			
					Paper	TW	PR	OR
1	Image Processing & Pattern Recognition	3	-	3	100	-	-	-
2	Embedded System Design	3	-	3	100	-	-	-
3	Microelectronics Circuit Design	3	-	3	100	-	-	-
4	Advanced Computer Network	3	-	3	100	-	-	-
5	Elective –II	3	-	3	100	-	-	-
6	Laboratory Practice –II	-	6	-	-	100	-	50
7	Seminar-II	-	4	-	-	100	-	-
Total		**15**	**10**		**500**	**200**		**50**
Grand Total		**25**			**750**			

List of Subjects for Elective – II

1. Advanced Digital Communication.
2. Artificial Intelligence
3. Modeling and Simulation Techniques

STRUCTURE OF
M.E. ELECTRONICS AND TELECOMMUNICATION
(DIGITAL ELECTRONICS)
Second Year Term-I

Sr. No.	Subject	Teaching Scheme Hours/week		Examination Scheme				
		L	P	Paper duration hours	Maximum marks			
					Paper	Term work	Practical	Oral
1	Seminar –III	-	04	-	-	50	-	50
2	Project Stage - I	-	18	-	-	100	-	-
Total		**-**	**22**	**-**	**-**	**150**	**-**	**50**
Grand Total		**22**		**200**				

STRUCTURE OF
M.E. ELECTRONICS AND TELECOMMUNICATION
(DIGITAL ELECTRONICS)
Second Year Term-II

Sr. No.	Subject	Teaching Scheme Hours/week		Examination Scheme				
		L	P	Paper duration hours	Maximum marks			
					Paper	Term work	Practical	Oral
1	Project Seminar	-	-	-	-	50	-	-
2	Project Stage - II	-	18	-	-	150	-	100
Total		**-**	**18**	**-**	**-**	**200**	**-**	**100**
Grand Total		**18**		**300**				

Grand Total : 2000

M.E. ELECTRONICS AND TELECOMMUNICATION
(DIGITAL ELECTRONICS)
First Year Term-I

Subject Laboratory Practice-I

Practical: 6 Hrs Per week	**Term work:** 100 Marks **Oral:** 50 Marks

Detailed syllabus

Experiment/ Assignments based on

1. Advanced Instrumentation System
2. Advanced Digital Signal Processing
3. Digital System Design

Note: The concern subject incharge in consultation with H.O.D, should frame minimum of six laboratory assignments, two from each subject.

Subject Seminar-I

Practical: 4 Hrs Per week	**Term work:** 100 Marks

Detailed syllabus

Seminar on related state of art topic of students of own choice approved by the department.

Term work

The Term work and presentation will be evaluated by departmental committee consisting of two faculty members of the department appointed by Principal as per the recommendation of the Head of the Department.

M.E. ELECTRONICS AND TELECOMMUNICATION
(DIGITAL ELECTRONICS)
First Year Term-II

Subject Laboratory Practice-II

Practical: 6 Hrs Per week	**Term work:** 100 Marks **Oral:** 50 Marks

Detailed syllabus

Experiment / Assignments based on

1. Image Processing & Pattern Recognition
2. Embedded System Design
3. Advanced Digital Communication.

Note: The concern subject incharge in consultation with H.O.D, should frame minimum of six laboratory assignments, two from each subject.

Subject Seminar-II

Practical: 4 Hrs Per week	**Term work:** 100 Marks

Detailed syllabus

Seminar on related state of art topic of students of own choice approved by the department.

Term work

The Term work and presentation will be evaluated by departmental committee consisting of two faculty members of the department appointed by Principal as per the recommendation of the Head of the Department.

M.E. ELECTRONICS AND TELECOMMUNICATION
(DIGITAL ELECTRONICS)
Second Year Term-I

Subject Seminar –III

Practical: 4 Hrs Per week	**Term work:** 50 Marks **Oral:** 50 Marks

Detailed syllabus

Seminar on special topic. The topic should be on any of the area not included in the regular curriculum. The report should include detailed study of specific concept (i.e analysis, design and implementation). This can be a theoretical study or practical implementation approved by the guide and department.

Term work

1. Seminar III should be conducted at the end of Second Year Term-I
2. The term-work of the Seminar-III will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director / Principal of the college as per the recommendation of the Head of the Department.
3. The Seminar-III presentation will be evaluated by the examiners appointed by University, one of which should be guide.
4. Student must submit the seminar report in the form of soft bound copy.
5. The marks of seminar-III should be submitted at the end of the Second Year Term-I to the University.

Subject Project Stage-I

Practical: 18 Hrs Per week	**Term work:** 100 Marks

Detailed syllabus

Project stage-I It is the integral part of the dissertation project. The project should be based on the knowledge acquired by the student during the course work and should contribute to the needs of the society. The project aims to provide an opportunity of designing and building, complete system or subsystem in an area where the student like to acquire specialized skills. Project will consist of a system development in Software/ Hardware. The student should present the progress report of the project. It will consist of problem statement, literature survey; project overview and scheme of implementation.

Term work

The term-work of the project stage-I will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by the Director/Principal of the college as per the recommendation of the Head of the Department.

M.E. ELECTRONICS AND TELECOMMUNICATION
(DIGITAL ELECTRONICS)
Second Year Term-II

Subject Project Seminar

	Term work: 50 Marks

1. The Project Seminar should be conducted at the middle of Second Year Term-II
2. The Project Seminar term-work will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director / Principal of the college as per the recommendation of the Head of the Department.
3. Student must submit the Project Seminar report in the form of soft bound copy.
4. The marks of seminar-III should be submitted at the end of the Second Year Term-I to the University.

Subject Project Stage-II

Practical: 18 Hrs Per week	**Term work:** 150 Marks **Oral:** 100 Marks

Detailed syllabus

This is continuation of Project Stage-I. The complete system development in software / Hardware carried out using Electronics and Telecommunication Engineering principles and practices is expected. It should be working system either software or hardware or combination of both.

He/ She has to present / publish atleast one paper in reputed National / International Journal/ Conference on his/ her project work before submission of his / her Thesis/ Dissertation.

Term work

1. The term-work of the Project Stage-II will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director / Principal of the college as per the recommendation of the Head of the Department.
2. The Project Stage-II oral will be evaluated by the examiners appointed by University, one of which should be guide.

NORTH MAHARASHTRA UNIVERSITY JALGAON
M.E. ELECTRONICS AND TELECOMMUNICATION (Digital Electronics)
W.E.F : 2010-11
Term – I

ADVANCED INSTRUMENTATION SYSTEM

Teaching scheme:
Lectures: 3 hrs / week

Examination scheme:
Theory Paper : 100 Marks (3 Hours)

Digital Instruments:- Introduction, Digital Panel Meters, Digital Frequency Meters, Basic Circuit for Frequency measurements, High Frequency measurements, Digital Measurements of time, Period Measurement, Ratio and Multiple Ratio Measurement, Universal Counter, Digital Measurement of Mains Frequency.

Signal Analyzer :- Wave Analyzer, Harmonic Distortion Analyzer, Spectrum Analyzer, Network Analyzer, Logic Analyzer, Protocol Analyzer.

PC Based Data Acquisition System: - PC Based Instrumentation System, Introduction to PC Based Data Acquisition System.
Introduction to Smart Sensors:- Digital Sensors, Case Studies of Real Time PC Based Instrumentation System, Virtual Instruments, Intelligent Instruments.

Automated Measurement System :- Need And Requirement Automatic Test Equipments (ATE) Computer Based And Computer Controlled ATE Switches in ADTE , ATE For PCB Testing, ATE for Component Testing, IEEE- 488 Electronic Instruments BUS Standards.

Computer Control :- Hierarchy of Computer Control For Industry , Direct Digital Control, Distributed Digital Control, Supervisory Control And Data Acquisition System (SCADA), NC, CNC.

Introduction to process control :- Control System, Process Control Principles, Servo mechanism, Discrete Control System, Process Control Block Diagram , Anlog and Digital Processing , Feedback Control, Basic Principle of Single Loop Controller , Two Position Control, Mutiposition Control, Proportional ,Integral , Derivative Controller (Overview), Multivariable Control , Cascade Control, Ratio Control , Feed Forward Control.
Control Modes:- Close loop Response , Control loop transfer function, Analysis of Chemical Reactor.

Intelligent Controller :- Programmable Logic Controller, PLC Programming Technique , Fuzzy Logic Controller.
Industrial Control Application:- Cement Plant , Thermal Power Plant, Irrigation Cannal Management, Steel Plant.

References :

1. Clyde E. Coombs, Electronic Instruments Handbook(3/e), McGraw Hill International.
2. Mc Lachlan & Buchla, Applied Electronic Instrumentation & Measurement , 1992, Prentice Hall International..
3. Pallas Areny & Webstor, Sensors & Signals Conditioning , (2/e)1994, J.Wiley & sons
4. Critis Johnson, Process control Instrumentation Technology, PHI
5. H.S.Kalasi, Electronic Instrumentation (2/e), Tata McGraw Hill International
6. Bela G. Liptak, Butterworth Heinemann, Instrument Engineer's Handbook (3/e) Process Control,
7. Aibert D. Helfric, William D. Cooper, Modern Electronic Instrumentation And Measurement Technique
8. Krishna Kant, Computer Based Industrial Control.

NORTH MAHARASHTRA UNIVERSITY JALGAON
M.E. ELECTRONICS AND TELECOMMUNICATION (Digital Electronics)
W.E.F : 2010-11
Term – I

ADVANCED DIGITAL SIGNAL PROCESSING

Teaching scheme:
Lectures: 3 hrs / week

Examination scheme:
Theory Paper : 100 Marks (3 Hours)

Discrete time signal & systems, its representation, types of discrete time system,DFT, IDFT, FFT(DIF&DIT). Realization of FIR and IIR filter

Multirate digital signal processing-decimation by factor D, interpolation, filter design & implementation, sampling rate conversion, application of multirate signal processing.

Power spectral estimation- parametric & nonparametric method for power spectral estimation, minimum variance, and realization of FIR & IIR filters.

Least mean square Adaptive filter: Overview of the structure, operation of the LMS algorithm, LMS adaptive algorithm, statistical LMS theory, Comparison of the LMS algorithm with the steepest Descent algorithm, Computer experiment on adaptive prediction, Computer experiment on adaptive equalization, Computer experiment on a minimum- variance distortion less response beam former, Directionality of convergence of the LMS algorithm for Nonwhite Inputs, Robustness of the LMS filter, Upper bound on the step size Parameters for Different Scenarios, Transfer function approach for deterministic input summary problems.

Design of digital filters-symmetric & antisymmetric, linear phase, optimum, Equiripple, FIR differentiation, Hilbert's transformers.

Design of IIR filters-impulse invariance, bilinear transformation, matched transformation, frequency transformation in analog & digital domain.

Design of digital filters based on least square method.

Application of DSP to speech processing & radar signal processing.

Introduction to TMS320c62XX DSP processors.

References :

1. John Proakis, Digital Signal Processing Prentice Hall
2. A.V.Oppenhiem & R.W.Schafer, Digital Signal Processing - Prentice Hall
3. L.R.Rabiner & B.Gold,Theory & application of digital signal processing- Prentice Hall
4. A.Antiniou, Digital Filters; analysis, design & application- Mcgraw Hill
5. Salivahanan,vallavaraj,gnanapriya, Digital Signal Processing-TMH
6. S.K.Mitra, Digital Signal Processing - TMH

NORTH MAHARASHTRA UNIVERSITY JALGAON
M.E. ELECTRONICS AND TELECOMMUNICATION (Digital Electronics)
W.E.F : 2010-11
Term – I

DIGITAL SYSTEM DESIGN

Teaching scheme:
Lectures: 3 hrs / week

Examination scheme:
Theory Paper : 100 Marks (3 Hours)

Design of synchronous and asynchronous sequential logic circuits working in the fundamental mode and pulse mode. Essential hazards Unger's theorm. Map entered variable and synthesis of random logic. Fault detection and error correction.
Register- transfer level systems, Execution Graph, Organization of System, Implementation of RTL Systems, Analysis of RTL Systems, Design of RTL Systems.
Data Subsystems, Storage Modules, Functional Modules, Data paths, Control Subsystems, Micro programmed Controller, Structure of a micro programmed controller, Micro instruction Format, Micro instruction sequencing, Micro instruction Timing, Basic component of a micro system, memory subsystem.
I/O subsystem, Processors, Operation of the computer and cycle time. Binary Decoder, Binary Encoder, Multiplexers and Demultiplexers, Floating Point Arithmetic-Representation of Floating Point Number, Floating Point Multiplication.
Logic simulation: General fault simulation techniques, statistical fault analysis. Testing for single stuck fault: Basic issues, ATG for SSF in combined circuits. ATG for SSFs in sequential circuits. PLA testing.
Design for Testability: Classical testability scan design, compressing tech. built in self test logic level diagnosis, self checking design.
Specific digital system: Deign such as digital IS tester Microcontroller cards, PC add on cards design, PLA based product design.

References:

1. M. Ercegovac, T. Lang and L.J. Moreno, "Introduction to Digital Systems", Wiley,2000
2. John F. Wakerly,"Digital Design principles and practices",3rd edition, PHI publications.
3. Melvin A Breuer, Arthur D Friedmen, MironAbra MOVICI jaico Publishing.
4. House- Digital system testing and testable design.
5. B Holdsworth Digital Logic Design.
6. Puri V.K Digital Electronics
7. Z. Navabi, " VHDL-Analysis and Modeling of Digital Systems", TMH

8. Norman - Digital Logic design principal John Wiley Pub.
9. Samual – Digital Circuit logic design –PHI.
10. Charles H. Roth, ”Digital system design using VHDL”, Thomson Publication.
11. Balabanian,”Digital logic design principles”,Wiley publication.
12. Stephen Brown, “Fundamentals of digital logic”, TMH publication.

NORTH MAHARASHTRA UNIVERSITY JALGAON
M.E. ELECTRONICS AND TELECOMMUNICATION (Digital Electronics)
W.E.F : 2010-11
Term – I

VLSI DESIGN

Teaching scheme:
Lectures: 3 hrs / week

Examination scheme:
Theory Paper : 100 Marks (3 Hours)

Review of VHDL Verilog Programming, Hardware modeling with Verilog / VHDL, different verilog /VHDL constructs, and Logic Synthesis. Levels of abstraction, Elements (Data flow, Behavioral, Structural, Mixed and switch level Description).

simulation process, types of simulators FSM modeling, test benches, generics & attributes, synthesis tools features & optimization in VHDL, Synthesis guidelines, Timing issues: terminology, flow diagram, clock, gated clock, setup & hold time, violation,Meta stability, Static & Dynamic timing analysis.

CMOS & Bi-CMOS logic families & PLD architecture, Power dissipation, noise and ESD issues, clock distribution, signal connections, synchronous and asynchronous design features, and memory system design. CMOS systems Design, CMOS Testing. Classification of CPLD architecture, CPLD 9500 series, Xilinx FPGA –XC4000 series,

Designing steps in ASIC, Physical Design flow, Different type of ASIC, CAD Tools, System Partitioning, Estimating ASIC size, Power dissipation, FPGA partitioning methods,

Floor planning, Placement Physical design flow; Information Formats; global routing, detailed routing; special routing; circuit extraction and DRC

References :

1. Douglas Perry, VHDL - McGraw Hill Publication
2. Janic Bergerson, VHDL Using Testbenches
3. Yu. Chin Hsu, K. Tsai, VHDL Modeling for Digital Design Synthesis.- Kluwer publishers.
4. Xilinx PLD data manual
5. Michael John sebastiab smith, “Application specific IC”, Addison Wesley publication.

6. K. K. Parhi , “VLSI Digital signal processing systems Design & Implementation” John Wiley & Sons
7. Neil Weste and Eshraghian, “Principles of CMOS VLSI Design “(Second Edition) Pearson
Education Asia (Addison – Wesley Publication Company)
8. James E Buchnan – BiCMOS-CMOS system design McGraw Hill Publication.

NORTH MAHARASHTRA UNIVERSITY JALGAON
M.E. ELECTRONICS AND TELECOMMUNICATION (Digital Electronics)
W.E.F : 2010-11
Term – I

Elective – I

PARALLEL COMPUTING

Teaching scheme:
Lectures: 3 hrs / week

Examination scheme:
Theory Paper : 100 Marks (3 Hours)

Parallel Computer Models: The state of computing, Multiprocessors and multi-computers, Multivector and SIMD computers, Architectural development tracks

Program And Network Properties: Conditions of parallelism, Data and resource dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain size and latency, Program flow mechanisms, Control flow versus data flow, Data flow architecture, Demand driven mechanisms, Comparisons of flow mechanisms

System Interconnect Architectures: Network properties and routing, Static interconnection networks, Dynamic interconnection Networks, Multiprocessor system interconnects, Hierarchical bus systems, Crossbar switch and multiport memory, Multistage and combining network.

Processors and Memory Hierarchy: Advanced processor technology, Instruction-set Architectures, CISC Scalar Processors, RISC Scalar Processors, Superscalar Processors, VLIW Architectures, Vector and Symbolic processors Memory Technology: Hierarchical memory technology, Inclusion, Coherence and Locality, Memory capacity planning, Virtual Memory Technology.

Backplane Bus System: Backplane bus specification, Addressing and timing protocols, Arbitration transaction and interrupt, Cache addressing models, direct mapping and associative caches.

Pipelining: Linear pipeline processor, Nonlinear pipeline processor, Instruction pipeline design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch handling techniques, Arithmetic Pipeline Design, Computer arithmetic principles, Static arithmetic pipeline, Multifunctional arithmetic pipelines.

Vector Processing Principles: Vector instruction types, Vector-access memory schemes.

Synchronous Parallel Processing: SIMD Architecture and Programming Principles, SIMD Parallel Algorithms, SIMD Computers and Performance Enhancement

References:

1 Kai Hwang, “Advanced Computer Architecture”, Parallelism, Scalability, Programmability”, McGraw Hill Inc. Ed. 1993.
2 V. Rajaranam & C.S.R.Murthy, “Parallel Computer”; PHI.
3 William Stallings, “Computer organization & Architecture”, PHI, New Delhi, 6th edition.
4 Dezso’Sima, “Kalsuk’Advanced computer Architectures”, Terence Fountain & Peter Pearson’s Edation. (2nd Edition)
5 Hwang and Degroot, “Parallel Processing for Supercomputers and AI”, (Eds) McGraw Hill.
6 J. P. Hayes, “Computer Architecture And Organization”; MGH.
Harvey G. Cragon, “Memory System and Pipelined Processors”; Narosa Publication.
7 R. K. Ghose, Rajan Moona & Phalguni Gupta, “Foundation of Parallel Processing”; Narosa Publications. Kai Hwang and Zu, “Scalable Parallel Computers Architecture”; MGH.

NORTH MAHARASHTRA UNIVERSITY JALGAON
M.E. ELECTRONICS AND TELECOMMUNICATION (Digital Electronics)
W.E.F : 2010-11
Term – I

Elective - I

BIOMEDICAL INSTRUMENTATION

Teaching scheme:
Lectures: 3 hrs / week

Examination scheme:
Theory Paper : 100 Marks (3 Hours)

Measuring, Recording and Monitoring Instruments

Anatomy and Physiology, Physiological Systems of the Body, Basic Medical Instrumentation System, Performance Requirements of Medical Instrumentation System, Intelligent Instrumentation System, General Constraints in Design of Medical Instrumentation System, Regulation of Medical Devices.

Physiological transducers: Displacement, position and motion transducers, Pressure transducers, Transducers for Body Temperature Measurement, Photoelectric transducers, Optical Fibre sensors, Biosensors

Recording systems: Basic Recording systems, Biomedical signal Analysis Techniques, Signal Processing Techniques, Potentiometric Recorders, Digital Recorders, Instrumentation tape Recorders,

Biomedical Recorders: Electrocardiograph, Vectorcardiograph (VCG), Phonocardiograph (PCG), Electroencephalograph (EEG), Electromyograph (EMG), Other Biomedical Recorders, Biofeedback Instrumentation

Patient Monitoring Systems: Bedsides Patient Monitoring Systems, Central Monitors, Measurements of Heart Rate, Measurements of Pulse Rate, Blood Pressure Measurement, Measurement of Temperature, Measurement of Respiration rate

The Matched Filter, Detection of the P Wave,Homomorphic Filtering, Application- ECG Rhythm Analysis, Identification of Heart Sounds, Waveshape and waveform Complexity, Analysis of Event-related Potentials, Morphological Analysis of ECG Waves, Envelope Extraction and Analysis of Activity, Application- Normal and Ectopic ECG Beats, Analysis of Exercise ECG.

Modern Imaging Systems: X-ray Machines and Digital Radiography Portable and mobile X-ray units, Digital Radiography, X-ray Computed Tomography, Computed Tomography, System components, Gantry Geometry, Patient Dose in CT Scanners, Nuclear Medical Imaging System, Radiation Detectors, Pulse Height Analyzer, Uptake Monitoring Equipment, Radio-isotope Rectilinear Scanner, The Gamma Camera, Emission Computed Topography (ECT) Single Photon Emission Computed Topography (SPECT), Positron Emission Topography (PET scanner)

Ultrasonic Imaging Systems: Diagnostic Ultrasound, Medical Ultrasound, Basic Pulse-echo Apparatus, A-Scan, B-Scanner.

Laser Applications In Biomedical Field: The laser, Pulsed Ruby laser, ND-YAG laser, Helium –Neon Laser, Argon Laser, CO2 Laser, Excimer Lasers, Semiconductors Laser, Laser Safety

References:

1. Cromwell - Biomedical Instrumentation, Pearson
2. Khandpur - Handbook of Biomedical Instrumentation
3. Webster - Biomedical Instrumentation, Wiley
4. R. M. Rangayyan “Biomedical Signal Analysis- A case study approach”, Wiley Publications.
5. Eugene N Bruce “Biomedical signal processing and signal modeling”, Wiley publications.

NORTH MAHARASHTRA UNIVERSITY JALGAON
M.E. ELECTRONICS AND TELECOMMUNICATION (Digital Electronics)
W.E.F : 2010-11
Term – I

Elective - I

WIRELESS & MOBILE COMMUNICATION

Teaching scheme:
Lectures: 3 hrs / week

Examination scheme:
Theory Paper : 100 Marks (3 Hours)

Basics: History of wireless communication, and future trends, Wireless Generations and Standards, Cellular Concept and Cellular System Fundamentals, Trunking Cell Splitting and Sectoring, Mobile Radio signal propagation, path loss and channel models.

Speech coding for wireless system and application like PCM, DPCM, DM, Vocoder & Linear Predictive coding. Performance comparison.

Wireless LAN
IEEE802-11Hiper LAN, Bluetooth, Adhoc Network: Characteristic, Performance issue, Routing in mobile host.

Wireless Networking:
Difference between wireless & fixed telephone n/w, development, transmission hierarchies, traffic routing, wireless data services, common channel signaling, ISDN, SS7, global cellular network, Interoperability, PCS/PCNs, Protocols for n/w access and n/w data base, UMTS.

Wireless systems and standards:
AMPS, ETACS, United state of digital cellular, (IS 54 and IS 136) GSM, CDMA (IS95), CT2 Standards for cordless telephone, Digital European cordless telephone , PACs, PDC, Personal handy phone systems, US PCS & ISM bands, US wireless cable TV, IEEE802.11.

References:

1. Walker, J.: Mobile Information Systems. Artech House, Inc. 1990, Boston London
2. Mehrotra, A.: GSM System Engineering. Artech House, Inc. 1997, Boston London

3. Redl, S.M., Weber, M.K., Oliphant, M.W.: An Introduction to GSM. Artech House, Inc. 1995, Boston London
4. Feher, Wireless Digital Communication- 1991, PHI.
5. Vijay K. Garg, and J.E. Wilkes, Principles & applications of GSM –1999 – Prentice hall PTR.
6. Roger L. Freeman, Telecom Transmission handwook 4th ed 1998 John Wiley & Sons. Inc. New York.
7. Lee, Mobile Cellular Telecomm, 1995 Mc Graw Hill Inc.
8. J. Schiller, Mobile Communication, Addision Wiley
9. William C.Y. Lee, Mobile Comm. Design Fundamental. John wiley.
10. Mark Ceampa, Design & Implementation of Wireless LANs, Thomson Learning.

NORTH MAHARASHTRA UNIVERSITY JALGAON
M.E. ELECTRONICS AND TELECOMMUNICATION (Digital Electronics)
W.E.F : 2010-11
Term – I I

IMAGE PROCESSING AND PATTERN RECOGNITION

Teaching scheme:
Lectures: 3 hrs / week

Examination scheme:
Theory Paper : 100 Marks (3 Hours)

Digital Image fundamentals : Basic Image Processing steps, image acquisition, presentation of gray scale and modeling. Human visual perception, sampling and quantization, basic relationships between pixels. Histogram analysis and equalization, geometric image

Applications of pattern recognition, statistical decision theory, image processing and analysis.

Probability: Introduction, probability of events, random variables, Joint distributions and densities, moments of random variables, estimation of parameters from samples, minimum risk estimators Statistical Decision Making: Introduction, Baye's Theorem, multiple features, conditionally independent features, decision boundaries, unequal costs of error, estimation of error rates, the leaving-one—out technique. Characteristic curves, estimating the composition of populations.

Nonparametric Decision Making: Introduction, histograms, Kernel and window estimators, nearest neighbor classification techniques, adaptive decision boundaries, adaptive discriminate Functions, minimum squared error discriminate functions, choosing a decision making technique.

Clustering: Introduction, hierarchical clustering, partitional clustering Artificial Neural Networks, PCA, ICA, SVM.

References:

1) R. C. Gonzalez & Woods, "Digital Image Processing" – Addison Wesley IIIrd Ed.
2) A. K. Jain, "Fundamentals of Digital Image Processing"– Prentice Hall Inc.
3) Robert Jschalkoff, "Digital Image Processing & Computer vision : An introduction to theory & Implementation"– John wiley & Sons Inc.
4) K. R. Castleman, "Digital Image Processing" – PHI
5) W. K. Pratt, "Digital Image Processing" .(3 Ed.) John.Wiley.
6) B. Chanda and D.Mujumdar,"Digital Image Processing & Analysis".-PHI, New Delhi, 2000.

NORTH MAHARASHTRA UNIVERSITY JALGAON
M.E. ELECTRONICS AND TELECOMMUNICATION (Digital Electronics)
W.E.F : 2010-11
Term – I I

EMBEDDED SYSTEM DESIGN

Teaching scheme:
Lectures: 3 hrs / week

Examination scheme:
Theory Paper : 100 Marks (3 Hours)

Embedded system Introduction:
Introduction to Embedded System, History, Design challenges, optimizing design metrics, time to market, applications of embedded systems and recent trends in embedded systems, embedded design concepts and definitions, memory management, hardware and software design and testing, communication protocols like SPI, SCI, I2C, CAN etc

System Architecture:
ARM7/ARM9 architecture, instruction set, thumb Instruction set, Pipeline, memory management, Bus architecture, Programming concepts, Embedded programming in c and C++.

Multiprocessors Scheduling: Model of multiprocessor & distributed systems, Multiprocessor priority ceiling protocol, Elements of scheduling algorithms for end-to-end periodic tasks, Schedulability of fixed priority end-to-end periodic tasks, end-to-end tasks in heterogeneous systems.

Real Time systems: Characterizing real time systems & tasks, Performance measures, Estimating program runtimes, Task assignment & scheduling, Real time operating systems (RTOS), Task management, Race condition, Inter-task communication, Implementation aspects & estimation modeling in embedded systems, Validation & debugging of embedded systems, Real time communication, Hardware-software co-design in an embedded system, Applications of Real time systems.

References:

1. Krishna & Shin, Real -Time Systems, (McGraw Hill International)
2. Rajkamal, Embedded systems, (Tata - McGraw Hill)
3. Valvano, Embedded Microcomputer systems, (Thomson Delmar publishing)
4. Atmel/ARM Data books.
5. Iyer &Gupta, Embedded Real Time Systems Programming, (Tata McGraw Hill)

6. Lewis Daniel, Fundamentals of Embedded software, (Prentice Hall India)
7. Jane Liu, Real Time Systems, (Pearson India low cost edition)

NORTH MAHARASHTRA UNIVERSITY JALGAON
M.E. ELECTRONICS AND TELECOMMUNICATION (Digital Electronics)
W.E.F : 2010-11
Term – I I

MICROELECTRONICS CIRCUIT DESIGN

Teaching scheme:
Lectures: 3 hrs / week

Examination scheme:
Theory Paper : 100 Marks (3 Hours)

Types of modeling, Models of diode, BJT and FET, CMOS device modeling: Simple MOS Large-signal Model, Simple MOS Small-signal Model,
Analog IC Design : Differential Amplifier, Cascode Amplifer, Current Amplifiers, Output Amplifers, High gain amplifier Architecture,
Operation Amplifier Design of CMOS op-amp, Compensatio of op-amps,
Design of two stage op-amps, PSRR of two stage op-amps, Cascode op-amps, Simulation and Measurement of Op-amps, Micromodels of Op-amps, Switch Capacitor Circuits, Switch Capacitor Amplifiers, Switch Capacitor Integrator, z Domain Models of two phase switched capacitor circuits, First and Second order switched capacitor circuits, Switched capacitor filter.
High frequency amplifier, Mixer, R.F. Power amplifier, Phase- Locked Loops.

References:

1) Phillip E. Allen and Douglas R. Holberg, CMOS Analog Circuit Design,2nd ed. New York : Oxford University Press, 2004
2) Thomas H. Lee, "The Design of CMOS Radio – Frequency Integrated Circuit", Cambridge University Press
3) B. Razavi "RF Microelectronics" PHI 1998
4) R. Jacob Baker, H.W. Li, D.E. Boyce " CMOS Circiut Design, layout and Simulation"
PHI 1998
5) Y.P. Tsividis "Mixed Analog and Digital Devices and Technology" TMH 1996

NORTH MAHARASHTRA UNIVERSITY JALGAON
M.E. ELECTRONICS AND TELECOMMUNICATION (Digital Electronics)
W.E.F : 2010-11
Term – I I

ADVANCE COMPUTER NETWORK

Teaching scheme:
Lectures: 3 hrs / week

Examination scheme:
Theory Paper : 100 Marks (3 Hours)

Review of computer networking concepts
Topology, LAN, WAN, MAN, Internet, OSI/ISO, TCP/IP reference models, Point to point protocols. ARQ: Retransmission strategies. Functional elements : Multiplexing, Switching , Networks Management & traffic controls. Delay models in Data Networks Switching techniques: Performance measures & architectural issues.

Internetworking
TCP/IP Internet architecture, IPV4, IPV6, IP addressing & related issues, IP address resolution techniques (ARP). IP datagram & forwarding, routing algorithms.

Multiple access techniques
ALOHA, CSMA, CSMA/CD, CSMA/CA, CDMA, OFDM, Delay throughput characteristics, WLAN-Protocols, multiple access, Ad-hoc networks, Bluetooth Specifications, WAP.

Network security issues
Ciphers, DES, Public key cryptography, RAS algorithm, Digital Watermarking, Attacks and Counter Measures , Service Authentication Performa.

References:

1) Dimitri Bertisekas & Robert Gallager, “Data Networks” PHI
2) Gerd E Kieser, “Local Area Networks”,– Mc-Graw-Hill
3) D.E.Comer, “Computer Networks and Internetworking” Pearson Education
4) William Stallings, “Cryptography and Network Security: Principles and Practice”, Pearson Education
5) Steele, “GSM, CDMA and 3G Systems” , Wiely Students Edition
6) Anurag kumar, D. Manjunath & Joy Kuri– Morgn, “Communication Networking” An analytical approach” – Kaufmann publishers

NORTH MAHARASHTRA UNIVERSITY JALGAON
M.E. ELECTRONICS AND TELECOMMUNICATION (Digital Electronics)
W.E.F : 2010-11
Term – II

Elective - II

ADVANCED DIGITAL COMMUNICATION

Teaching scheme:
Lectures: 3 hrs / week

Examination scheme:
Theory Paper : 100 Marks (3 Hours)

Signal spectra & Random Processes:
Basics of Fourier series & Fourier transform, Probability, Random Variables and processes, Digital PAM & PAM formats, Line coding spectral representation, AT & T and CCITT hierarchies.

Digital CW modulation an overview, BPSK, DPSK, DEPSK, OPSK, M'ary PSK, QASK constellation pattern, BFSK, GMSK, Doubinary encoding, QPR coherent & non coherent systems, Bandwidth & spectrum representation, error probabilities in BPSK, DPSK, QPSK, FSK, 16 QAM, MSK, their performance evaluation in presence of AWGN.

Matched correlation, optimum filters, Integrate & Dump, their transfer function, error probabilities, error rate etc.

Spread spectrum techniques: DS, FH, CDMA based system, Performance of DS-SS & FH-SS, generation of PN sequence code.

Error Control Coding**:** Introduction to algebra**,** Group rings, Galois field, two arithmetic GF, Linear block codes: Structure matrix description, Syndrome decoding, Hamming codes, Perfect & Quest, perfect odes, Cyclic codes: Polynomial description, division algorithm, matrix description, fire codes, golay codes, cyclic Redundancy check codes, circuit implementation of cyclic codes.

Encoding and Decoding of BCH and RS codes, MDS Codes, Nested codes, Convolutional Encoders, Tree & Trellis diagram, Veterbi decoding algorithms, Sequential decoding algorithms.

References :

1. J. G. Prokais, "Digital Communications", McGraw Hill Inc.

2. Bernad Sklar, “Digital Communication: Fundamentals & Applications”, Pearson Education Asia (LPE).
3. A. B. Carlson, “Communication System”, Mc Graw Hill Inc.
4. Amitabh Bhattacharya, “Digital Communication”, TMH.
5. T. S. Rappaport, “Wireless Communication”, Pearson Education.
6. Simon Haykin, “Digital Communications”, John Wiley & Sons
7. Taub &Schilling, “Principle of Communication System”, TMH.

NORTH MAHARASHTRA UNIVERSITY JALGAON
M.E. ELECTRONICS AND TELECOMMUNICATION (Digital Electronics)
W.E.F : 2010-11
Term – I I

Elective - II

ARTIFICIAL INTELLIGENCE

Teaching scheme:
Lectures: 3 hrs / week

Examination scheme:
Theory Paper : 100 Marks (3 Hours)

Fuzzy Logic Introduction to Fuzzy sets, Fuzzy set Theory, Fuzzy relation, Membership functions, fuzzification, defuzzification, fuzzy rule based system fuzzy inference system.

Fuzzy Decision Making, Fuzzy modeling, Fuzzy reasoning, compositional rules of inference, Fuzzy systems as function estimators, Fuzziness as multivalence, Adaptive neuro fuzzy inference system, cognitive neurofuzzy modelling, Neuro fuzzy control, Application of neuro fuzzy control

Neural Network Fundamental of Artificial Neural Network : Artificial Neuron model. Learning process, Single layer and multilayer feed forward network, training by back propagation, Hop-field model basic concept of
Bidirectional associative memory, self organization map, optimization model.
Recurrent Networks, Hamming Net and MAXNET, Feature mapping, counter propagation networks, cluster discovery Network (ART),
Applications of Neural Network Characters Recognition Network, Neural Network control Application, Network for Robot kinematics, Hand written Numeral recognition.

References:

1 Limin Fu , "Neural Networks in Computer Intelligence", McGraw Hill Inc., 1994.
2 N. K. Bose, P. Lling , "Neural Network Fundamentals", McGraw Hill.
3 Zurada "Artificial Neural Networks",
4 Timothy J. Ross , " Fuzzy Logic with Engg. Applications", McGraw Hill.
5 Jang, Sun, Mezutani "Neuro Fuzzy and Soft computing", TMH
6 Bart Kasko, "Fuzzy Engineering", PHI
7 S. Hykin , "Neural Networks", Pearson Education.
8 J.A.Freeman and B.M.Skapure, "Neural Networks, Algorithms Applications and programming Techniques", Addison – Wesely, 1990

9 Laurence Fausett, “Fundamental of Nerual Networks: Architecture, algorithms and application”,Prentice Hall, 1994.

NORTH MAHARASHTRA UNIVERSITY JALGAON
M.E. ELECTRONICS AND TELECOMMUNICATION (Digital Electronics)
W.E.F : 2010-11
Term – II

Elective - II

Modeling and Simulation Techniques

Teaching scheme:
Lectures: 3 hrs / week

Examination scheme:
Theory Paper : 100 Marks (3 Hours)

Introduction Models and their applications, Common types of mathematical models used for engineering systems, Derivation of models from physical relations, Model determination from input- output observation, Basic principle of simulation, Analog and digital simulation techniques, Models: Structural, Process, Continuous, Discrete, Deterministic,Random, input/output, static, dynamic, multilevel.

Classical and Semi-classical models:
Boltzmann transport equation, classical semiconductor equations- drift diffusion approximation, generation and recombinations, different generation and recombination mechanisms, limitations of drift-diffusions, energy transport, semiclassical and hot electron models, hydrodynamic and semi-classical semiconductor equations, modeling of semiconductor laser diode, general aspects, static models and dynamic models, model verification and validation.

Numerical Techniques: Finite difference methods, first order and second order derivatives and discrimination, finite element method, solution of poison's equation, solution of steady state continuity equation for electrons and holes, advantages and disadvantages of finite element method, Monte Carlo simulation techniques, basic concepts, Random variables, random number generation and testing, analysis of simulation results, confidence intervals, variance reduction techniques. Case studies of analytical and simulation studies

Modeling of Semiconductor Devices p-n junction, p-n junction C-V characteristics, breakdown, Schottky diodes, Hetero-structure diodes, Simulation of above device characteristics in graphical format, Simulation of simple laser diode and plot its characteristics by considering appropriate materials and parameters, PIN diode, Avalanche Photodiode, Quantum transport modeling, 1D models, discretized Schrodinger equation, Transmission matrix formation, I-V characteristics.

Universal FET modeling

sub threshold regime, unified charge control model, short channel effects, I-V modeling.Capacitance modeling (Ward Dutton and Meyer models) Universal models for MOSFET,MESFET, HFET and TFT.

References:

1. Modeling of CMOS G.Gordon, 'System Simulation', 2nd ed., Prentice Hall
2. Narsing Deo, 'System Simulation with Digital Computers', Prentice Hall
3. R. Leigh, 'Modelling and Simulation', Peter Peregrims Ltd.,. 1983.
4. M.Law, W.D.Kelton, 'Simulation Modelling and Analysis, Mcgraw Hill, 1982.
5. Raj Jain, The Art of Computer Systems Performance Analysis, John Wiley and Sons, New York, USA, 1991
6. Trivedi, K.S, Probability and Statistics with Reliability, Queueing and computer science Applications, Prentice Hall of India, Reprinted in 1990.

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

MASTER OF ENGINEERING (M.E.)

(MECHANICAL ENGINEERING)
(MACHINE DESIGN)

W.E.F.: 2010-11

North Maharashtra University, Jalgaon
M.E. (Machine Design)
Examination scheme and Structure with effect from Year 2010-11
First Year Term I

Sr No	Subject	Teaching Scheme per week		Examination Scheme				
		L	P	Paper Hr.	Paper	TW	PR	OR
1	Advanced Mechanical Engineering Design of Equipment	3	-	3	100	-	-	-
2	Computer Methods in Mechanical Design	3	-	3	100	-	-	-
3	Vibration Engineering	3	-	3	100	-	-	-
4	Tribology	3	-	3	100	-	-	-
5	Elective-I	3	-	3	100	-	-	-
6	Laboratory Practice-I	-	6	-	-	100	-	50
7	Seminar-I	-	4	-	-	100	-	-
	Total	15	10		500	200		50
	Grand Total	25		750				

Elective I

1) Design of Pressure Vessel
2) Instrumentation and Automatic Control System
3) Design of Material Handling Equipment

First Year Term II

Sr No	Subject	Teaching Scheme per week		Examination Scheme				
		L	P	Paper Hr.	Paper	TW	PR	OR
1	Design and synthesis of Mechanism	3	-	3	100	-	-	-
2	Optimization Techniques in Design	3	-	3	100	-	-	-
3	Machine Tool Design	3	-	3	100	-	-	-
4	Mechatronic Product Design	3	-	3	100	-	-	-
5	Elective-II	3	-	3	100	-	-	-
6	Laboratory Practice-II	-	6	-	-	100	-	50
7	Seminar-II	-	4	-	-	100	-	-
	Total	15	10		500	200		50
	Grand Total	25		750				

Elective II

1) Automotive Design
2) Robotics
3) Design for Manufacture and Assembly

Second Year Term I

Sr No	Subject	Teaching Scheme per week		Examination Scheme				
		L	P	Paper Hr.	Paper	TW	PR	OR
1	Seminar-III	-	4	-	-	50	-	50
2	Project Stage-I	-	18	-	-	100	-	-
	Total	-	22	-	-	150		50
	Grand Total	22		200				

Second Year Term II

Sr No	Subject	Teaching Scheme per week		Examination Scheme				
		L	P	Paper Hr.	Paper	TW	PR	OR
1	Progress Seminar	-	-	-	-	50	-	-
2	Project Stage-II	-	18	-	-	150	-	100
	Total	-	18	-	-	200	-	100
	Grand Total	18		300				

NORTH MAHARASHTRA UNIVERSITY, JALGAON
M.E. (MACHINE DESIGN)
W.E.F.: 2010-11
FIRST YEAR TERM I
ADVANCED MECHANICAL ENGINEERING DESIGN OF EQUIPMENT

Exam Scheme :

Lectures – 03 hours/week.

Theory – 100 marks
Min passing – 40 marks
Duration – 3 Hours

Material selection in Mechanical design: - Design process, Engineering material and their properties, Material property charts, material selection procedure and case studies, Process selection procedure & case studies, Multiple constraints & objectives, selection of shape, designing hybrid materials.

Advanced Design: - Load analysis for two & three dimensional static, dynamic and vibrating loading, Deflection in beam, Castigliano's method, Torsion, Combined stress, Stress concentration, Failure theories, Von Mises – Hencky theory, Fracture mechanics, fatigue failure mechanism & models, Notches & stress concentration, Residual stress, design for high cycle fatigue, design for fully reversed uniaxial stress, Design for fluctuating uniaxial stress, Design for multiaxial stress

Reference:

1) Machine Design By Robert L Norton
2) Mechanical Engineering Design By J.E.Shigley & C R Mischke
3) Selection of engineering material by Gladius Levis

NORTH MAHARASHTRA UNIVERSITY, JALGAON
M.E. (MACHINE DESIGN)
W.E.F.: 2010-11
FIRST YEAR TERM I
COMPUTER METHODS IN MECHANICAL DESIGN

Exam Scheme :

Lectures – 03 hours/week.

Theory – 100 marks
Min passing – 40 marks
Duration – 3 Hours

Advanced Computer Graphics: - review of 2D & 3D geometric transformation, Modeling of curves, cubics, splines, beziers and b-splines, Modelling of surface, modeling of solids, brep, CSG, octree, feature based modeling, Windowing and view porting
Finite Element Analysis : - Principle of potential energy, 1D elements, Derivation of stiffness & mass matrices for a bar, beam and shaft, solution for static problems,
Case studies in stress analysis of mechanical components, FEA using 2D & 3D elements, plain strain & stress problems, FEA using plate & shell, Finite element mesh, Automatic meshing technique, case studies using FE for design of geometrics such as tapered bar, plate with hole, spanner etc. Introduction to dynamic analysis, Basic equation,undamped free vibration, damping, Harmonic response analysis, thermal problem, formulation procedure, 1D & 2D heat transfer problems.

Reference:

1) Introduction to finite element method by C S Desai & J.F Abel
2) Concept & application of finite Element Analysis by Robert Cook
3) CAD/CAM by Groover & Zimmer

NORTH MAHARASHTRA UNIVERSITY, JALGAON
M.E. (MACHINE DESIGN)
W.E.F.: 2010-11
FIRST YEAR TERM I
VIBRATION ENGINEERING

Exam Scheme :

Lectures – 03 hours/week.

Theory – 100 marks
Min passing – 40 marks
Duration – 3 Hours

Introduction to vibration , free vibration and forced response solution of single and multiple degree freedom, of numerical method of finding natural frequencies and mode shape , vibration instrumentation ,vibration design and control, vibration isolation , passive control of , vibration absorber , active control of vibration , whole body vibration perception ,health effect of whole body vibration, motion sickness .

Reference:

1.Engineering vibration By Daniel .J. Inman
2.Mecanical vibration control engineering By S.Rao
3.Noise &vibration control engineering By Ver Beranek

NORTH MAHARASHTRA UNIVERSITY, JALGAON
M.E. (MACHINE DESIGN)
W.E.F.: 2010-11
FIRST YEAR TERM I
TRIBOLOGY

Exam Scheme :

Lectures – 03 hours/week.

Theory – 100 marks
Min passing – 40 marks
Duration – 3 Hours

Friction & Wear : -Types of wear ,theories of friction & wear, dry friction & boundary friction

Viscosity:- Petroff's law, Hagen Poisenille law, variation of viscosity ,

Hydrodynamic Lubrication: - Reynold's Eq. Solution for short & long finite bearing, load carrying capacity, flow rate, hydrodynamic thrust bearing, behaviour under variable laod, squeeze film, thermal equilibrium of sliding system, elasto hydrodynamic lubrication

Hydrostatic Lubrication: -Pressure distribution in hydrostatic thrust bearing, pumping power & capacity, hydrostatic formal & thrust bearing

Gas Lubrication: -Merits & Demerits, aerodynamic and aerostatic journal bearing ,Reynolds equation.

Reference:

1) Principles of tribology by J.Hamrock
2) Tribology in machine Design by T A solarski
3) Principles of Tribology by J.Hasting

NORTH MAHARASHTRA UNIVERSITY, JALGAON
M.E. (MACHINE DESIGN)
W.E.F.: 2010-11
FIRST YEAR TERM I
ELECTIVE – I
DESIGN OF PRESSURE VESSEL

Exam Scheme :

Lectures – 03 hours/week.

Theory – 100 marks
Min passing – 40 marks
Duration – 3 Hours

Introduction: Revision of stress and strain in thick and thin cylinder and pressure vessel. Criteria in vessel design, excessive elastic deformation, plastic instability, brittle, rupture, creep

Design of pressure vessel, internal pressure, construction feature, code, design of shell, types of heads, thickness of heads.

Design of storage vessel, storage of non volatile liquids and gases, code for storage, bottom and shell design

Design of vessel under external pressure, vacuum stress analysis, stiffness , design of circumferential stiffeners, design of covers, pipes and tubing

Design of High Pressure Vessel, autoclave

Support for vessel, types, leg support skirt, support design.

Reference:

1) Process Equipment Design by N.V .Joshi
2) Process equipment design by L.E.Browr ,E.H.Yovng
3) Introduction to process Equipment Design by B.C. Bhattacharya

NORTH MAHARASHTRA UNIVERSITY, JALGAON
M.E. (MACHINE DESIGN)
W.E.F.: 2010-11
FIRST YEAR TERM I
ELECTIVE – I
INSTRUMENTATION AND AUTOMATIC CONTROL SYSTEM

Exam Scheme :

Lectures – 03 hours/week.

Theory – 100 marks
Min passing – 40 marks
Duration – 3 Hours

Classification and representation of control systems,Influence of type control on steady state and transient responce,Time and frequency domain analysis,Stability analysis using Rough Phi Nyquist criteria,Root locus method,Modern control theory,Sequence control and programmable logic controllers,Control components,Comparators,Hydraulie,Neumatic and Electrical type of controllers,Servomotors.

Computer bvased data aquisition system,A-D and D-A convertors,Microprocessor application in measurement and control,Static and dynamic analysis of instrument system,FFT analysers,Current development in measurement and control of motion ,Force torque,pressure,temperature,floe,noice

Reference:

1.Measurement System By Ernest O Josbelin
2.Modern Control Systems ByRichard C Dorf, Robert H Bishop

NORTH MAHARASHTRA UNIVERSITY, JALGAON
M.E. (MACHINE DESIGN)
W.E.F.: 2010-11
FIRST YEAR TERM I
ELECTIVE – I

DESIGN OF MATERIAL HANDLING EQUIPMENT

Exam Scheme :

Lectures – 03 hours/week.

Theory – 100 marks
Min passing – 40 marks
Duration – 3 Hours

Introduction to material handling equipment, interplant transporting facilities, types of equipment,
Working principle, Construction and Design of: - Flexible hoisting application, pulley system,load handling equipment, arresting gears,hoisting gears,traveling gears, luffing gear,various types of drives, crane frame structure, stability of crane, elevators, electromagnetic hoisting equipment, various types of conveyors .

Reference:

1) Material handling equipment by Rudenko
2) Material handling equipment by John R Immer

NORTH MAHARASHTRA UNIVERSITY, JALGAON
M.E. (MACHINE DESIGN)
W.E.F.: 2010-11
FIRST YEAR TERM I
LABORATORY PRACTICE - I

Exam Scheme :

Practical's – 06 hours/week. Term-work – 100 marks
Oral- 50 marks

Experiments/Assignments based on

1) Computer Methods in Mechanical Design
2) Vibration Engineering
3) Tribology

The concerned subject in-charge should frame minimum of six laboratory Experiments / Assignments, two from each subject.

Note: Oral will be based on the prescribed term-work presented in the form of certified journal.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
M.E. (MACHINE DESIGN)
W.E.F.: 2010-11
FIRST YEAR TERM I
SEMINAR-I

Practical's – 06 hours/week. Term-work – 100 marks

Seminar-I should be based on the literature survey on any topic relevant to Design Engineering. It may be leading to selection of a suitable topic of dissertation. Each student has to prepare a write-up of about 25 pages. The report typed on A4 sized sheets and bound in the necessary format should be submitted after approved by the guide and endorsement of the Head of Department. The student has to deliver a seminar talk in front of the teachers of the department and his classmates. The Guide based on the quality of work and preparation and understanding of the candidate shall do an assessment of the seminar

The report copies must be duly signed by the guide and Head of department (one copy for institute, one copy for guide and one copy for the candidate for certification). Attendance of all students for all seminars is compulsory

NORTH MAHARASHTRA UNIVERSITY, JALGAON
M.E. (MACHINE DESIGN)
W.E.F.: 2010-11
FIRST YEAR TERM II
DESIGN & SYNTHESIS OF MECHANISM

Exam Scheme :

Lectures – 03 hours/week.

Theory – 100 marks
Min passing – 40 marks
Duration – 3 Hours

Kinematics analysis of planer mechanism, graphical & analytical methods of velocity & acceleration analysis

Curvature Theorem, fixed & moving centroids, inflection circle, Euler Savary equation, Bobillier construction, cubic & stationary curvature, dwell mechanism

Kinematic synthesis, Dimensional synthesis, function generation, path generation, accuracy point, Chebychev spacing, graphical synthesis for function generation with two, three, four accuracy points, Bermester points

Analytical Synthesis of four bar and slider crank mechanism, Frendenstein equation.

Coupler Curves: - Equation of coupler curves, Robber Chebychev theorem, kinematics analysis of spatial mechanism, Denavit Hartenberg parameters, matrix method.

Reference:

1) Design of Machaniry- An introduction to synthesis & analysis of mechanics & machines by R.L.Norton
2) Mechanism Design - Analysis & synthesis by A.G.Edman & G.N.Sandor
3) Theory of Mechanics & Mechanism by J.E.Shigley & J.J.Ucker

NORTH MAHARASHTRA UNIVERSITY, JALGAON
M.E. (MACHINE DESIGN)
W.E.F.: 2010-11
FIRST YEAR TERM II
OPTIMIZATION TECHNIQUES IN DESIGN

Exam Scheme :

Lectures – 03 hours/week.

Theory – 100 marks
Min passing – 40 marks
Duration – 3 Hours

Optimum design formulation,Problem formulation process;Graphical optimisation;optimum design concepts,Global and local minima,Unconstrained optimum design problems,Constrined optimum design problems,Postoptinality analysis,Linear programming methods for optimum design numerical methods for unconstrined optimisation,Numerical method for constrained optimisation;Multiobjective optimum design concepts and methods,Genetic algorithms,Weighted sum method,Weighted minimum-maximum method;Global optimisation concepts and methods for optimum design,Deterministic method,Stochontic method

Reference:

1.Mechanical design of mechanical element-R.C.Thomson
2.Optimisation concept and application in engineering-Balegundu & Chandrupatla
3.Engineering optimisation-S.S.Rao

NORTH MAHARASHTRA UNIVERSITY, JALGAON
M.E. (MACHINE DESIGN)
W.E.F.: 2010-11
FIRST YEAR TERM II
MACHINE TOOL DESIGN

Exam Scheme :

Lectures – 03 hours/week.

Theory – 100 marks
Min passing – 40 marks
Duration – 3 Hours

Introduction, trends in machine tool design, design specification, working principle,
Kinematics of machine tool, different drives, cutting speeds, gear boxes, ray diagram,
Force analysis, forces for different machining operation, design of beds, columns, tables, support, rigidity consideration,
Vibration in machine tool, vibration of column beds, vibration damping,
Design of side ways & guide ways, types of guide, pressure distribution, wear, accuracy, lubrication .
Design of power screws, design features, strength, rigidity, efficiency, backlash,
Design of spindles, balancing of spindles, strength & wear resistance,
CNC machine tool, CAD/CAM system, programming.

Reference:

1) Machine tool design by N.K.Mehta
2) Design principles of metal cutting—machine tool by F Koenigs Berger

NORTH MAHARASHTRA UNIVERSITY, JALGAON
M.E. (MACHINE DESIGN)
W.E.F.: 2010-11
FIRST YEAR TERM II
MECHATRONIC PRODUCT DESIGN

Exam Scheme :

Lectures – 03 hours/week.

Theory – 100 marks
Min passing – 40 marks
Duration – 3 Hours

Introduction to mechanical system, principles of basic electronics, microprocessor and their application, integrated, circuits, sensors, actuators, other electrical / electronic hardware in mechatronic system communication .

Interfacing DA & AD converters, software and hardware principles and tools to build mechatronic system. Design and selection of mechatronic elements namely sensors like encoders and resolvers stepper and servomotor.

Role of controls in mechatroincs role of modeling in mechatronics design, design optimizations of mechatronics systems.System interface, Data acquisition, Instrumentation system.

Reference:

1) Mechatronics by W. Bolton
2) Mechatronics System Design by Shetty D and Kolk R. A.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
M.E. (MACHINE DESIGN)
W.E.F.: 2010-11
FIRST YEAR TERM II
ELECTIVE – II
AUTOMOTIVE DESIGN

Exam Scheme :

Lectures – 03 hours/week.

Theory – 100 marks
Min passing – 40 marks
Duration – 3 Hours

Design requirements of automobile, engines as a system and its subsystem, lubrication system, fuel injection system, cooling system. Design requirements of automobile transmission, automatic transmission; Dynamic consideration in designing of suspension system, modern system of suspension, kinematic requirements of steering mechanism, need for power steering, braking requirements of automobile. Brake materials, modeling and simulation of different subsystems, instrumentation and control, microprocessor controlled units, safety and comfort in automotive component design.

Reference:

1) Design of Machinery By Robert L Norton
2) Machine Component Design By Willian Orthweein.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
M.E. (MACHINE DESIGN)
W.E.F.: 2010-11
FIRST YEAR TERM II
ELECTIVE – II
ROBOTICS

Exam Scheme :
Lectures – 03 hours/week.

Theory – 100 marks
Min passing – 40 marks
Duration – 3 Hours

Introduction: - Historical perspective, advantage, application
Basic component: -Manipulator sensory devices, controller, power conversion unit
Mechanical system: - translation & linear motion, motion conversion, modeling kinetic chain, end effectors
Control of actuator: - Closed loop control, control of robotics joint, stepper motor, direct drive, hydraulic actuator
Sensory devices: - Non-optical position sensor, optical position sensor, velocity sensor, accelarometer, proximity sensors, touch & slip sensor
Vision of robotics system: - Imaging component, picture coding, object recognition
Computer: -Hardware & software

Reference:
1) Robotics engineering by Richard Klafter
2) Robotics for Engineer by Yoram Korem
3) Robot Control by spong, lewis, Abdallah

NORTH MAHARASHTRA UNIVERSITY, JALGAON
M.E. (MACHINE DESIGN)
W.E.F.: 2010-11
FIRST YEAR TERM II
ELECTIVE – II

DESIGN FOR MANUFACTURE AND ASSEMBLY

Exam Scheme :

Lectures – 03 hours/week.

Theory – 100 marks
Min passing – 40 marks
Duration – 3 Hours

Life cycle of mechanical equipment design, Requirement of life cycle personnel like customer, management, marketing, manufacturing, transportation etc. Need to meet constraints of manufacturing, Advantages of designing for manufacturing and assembly to improve product quality, cost and time to market, Design for manufacture & assembly (DFMA) strategies, DFMA application and case studies, product design for manual assembly, Design for high speed automatic & robot assembly, design for machining, design for injection moulding, die casting and powder metal processing, Design for sheet metal for mechanical system design

Reference:

1) Process and Design for manufacturing by Sherif D EL Wakil
2) Manufacturing, Planning and control systems by Thomas E Vollmann, Willam L Beroy
3) Automation, Production System and Computer Integrated Manufacturing by Mikell P Groover.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
M.E. (MACHINE DESIGN)
W.E.F.: 2010-11
FIRST YEAR TERM II
LABORATORY PRACTICE - II

Exam Scheme :

Practical's – 06 hours/week. Term-work – 100 marks
Oral- 50 marks

Experiments/Assignments based on

1) Mechatronic Product Design
2) Design and Synthesis of Mechanism
3) Optimization Techniques in Design

The concerned subject in-charge should frame minimum of six laboratory Experiments / Assignments, two from each subject.

Note: Oral will be based on the prescribed term-work presented in the form of certified journal.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
M.E. (MACHINE DESIGN)
W.E.F.: 2010-11
FIRST YEAR TERM II
SEMINAR-II

Exam Scheme :
Practical's – 06 hours/week. Term-work – 100 marks

Seminar-II should be based on the literature survey on any topic relevant to Design Engineering. It may be leading to selection of a suitable topic of dissertation. Each student has to prepare a write-up of about 25 pages. The report typed on A4 sized sheets and bound in the necessary format should be submitted after approved by the guide and endorsement of the Head of Department. The student has to deliver a seminar talk in front of the teachers of the department and his classmates. The Guide based on the quality of work and preparation and understanding of the candidate shall do an assessment of the seminar

The report copies must be duly signed by the guide and Head of department (one copy for institute, one copy for guide and one copy for the candidate for certification). Attendance of all students for all seminars is compulsory

NORTH MAHARASHTRA UNIVERSITY, JALGAON
M.E. (MACHINE DESIGN)
W.E.F.: 2010-11
SECOND YEAR TERM I
SEMINAR-III

Exam Scheme :

Practical's – 04 hours/week. Term-work – 50 marks
Oral – 50 marks

Seminar - III should be based on the literature survey on any topic relevant to Design Engineering. It may be leading to selection of a suitable topic of dissertation. The report shall contain some contribution by the candidate in the form of experimental results, deductions, compilation and inferences etc.

Each student has to prepare a write-up of about 25 pages. The report typed on A4 sized sheets and bound in the necessary format should be submitted after approved by the guide and endorsement of the Head of Department. The student has to deliver a seminar talk in front of the teachers of the department and his classmates. The Guide based on the quality of work and preparation and understanding of the candidate shall do an assessment of the seminar.

The report copies must be duly signed by the guide and Head of department (one copy for institute, one copy for guide and one copy for the candidate for certification). Attendance of all students for all seminars is compulsory

NORTH MAHARASHTRA UNIVERSITY, JALGAON
M.E. (MACHINE DESIGN)
W.E.F.: 2010-11
SECOND YEAR TERM I
PROJECT STAGE - I

Exam Scheme :
Practical's – 18 hours/week. Term-work – 100 marks

The candidate shall submit the synopsis of the dissertation work to the evaluation committee at the starting of FIRST YEAR TERM III.

It shall include the problem definition, literature survey, approaches for handling the problem, finalizing the methodology for the dissertation work and design calculations / experimental design etc.

A report of the work shall be submitted at the end of Semester III after approval by the Guide and endorsement of the Head of Department. It will be assessed for term work, by the evaluation committee appointed by the Head of the Department, for appropriateness, sufficiency of contents and offer suggestions if any.

The candidate shall prepare a report of about 50 pages. The report typed on A4 sized sheets and bound in the prescribed format shall be submitted after approval by the Guide and endorsement of the Head of Department. It will be assessed for term work by the evaluation committee appointed by the Head of the Department.

The report copies must be duly signed by the guide and Head of department (one copy for institute, one copy for guide and one copy for the candidate for certification). Attendance of all students for all seminars is compulsory

NORTH MAHARASHTRA UNIVERSITY, JALGAON
M.E. (MACHINE DESIGN)
W.E.F.: 2010-11
SECOND YEAR TERM II
PROGRESS SEMINAR

Exam Scheme :
Practical's – 04 hours/week. Term-work – 50 marks

Progress Seminar shall be based on topic of the Dissertation Work. It may include literature review, required theoretical input, study and comparison of various approaches for the proposed dissertation work. The candidate shall prepare a report of about 25 pages. The report typed on A4 sized sheets and bound in the prescribed format shall be submitted after approval by the Guide and endorsement of the Head of Department. It will be assessed for term work by the evaluation committee appointed by the Head of the Department.

The report copies must be duly signed by the guide and Head of department (one copy for institute, one copy for guide and one copy for the candidate for certification). Attendance of all students for all seminars is compulsory

NORTH MAHARASHTRA UNIVERSITY, JALGAON
M.E. (MACHINE DESIGN)
W.E.F.: 2010-11
SECOND YEAR TERM II
PROJECT STAGE - II

Exam Scheme :
Practical's – 18 hours/week. Term-work – 100 marks

The candidate shall submit the detailed report as per the synopsis approved by the evaluation committee, of the dissertation work in the prescribed format after approval by the Guide and endorsement by the Head of the Department. It will be assessed for term work by the evaluation committee appointed by the Head of the Department, for completion of the proposed work.

Note: - The evaluation committee shall consist of the Guide, one senior expert faculty member and the Head of the Department or his/her representative.

Rules and Regulations for M.E. in ((Machine Design):-

1.The post graduate degree in engineering consisting of 2 years (4 terms) shall be designated as Master of Engineering in Mechanical Engineering.
2. A candidate may be permitted to register him/her self for the M.E. degree in (Machine Designing) under the faculty of engineering & technology of North Maharashtra University, Jalgaon only if the candidate holds a bachelor's degree in Engineering & technology of North Maharashtra University, Jalgaon or its equivalent in Appropriate/Allied branch, recognized by AICTE/UGC & North Maharashtra University, Jalgaon.
3. The student shall be admitted to First Year Term II if his/her Term I is granted.
4. The student shall be admitted to the Second Year when ever he/she clears all the theory papers of First Year. The student in any case should not be allowed to start project work before passing all the subjects of first year. The student will have to work on his/her project for minimum one year after passing first year subjects. He/she will not be allowed to submit his/her thesis/dissertation before that.
5. Every student will be required to produce a record of laboratory work in the form of journal, duly certified for satisfactory completion of the term work by the concerned teacher & head of the department.
6. A student whose term is not granted on account of less attendance (Minimum 75%) or non-submission of term work is required to repeat the term.
7. Any approved guide will not be allowed to guide more than 5 students in a particular batch.
8. Each student is required to present Seminar-I in the First Year Term I on any related state of the art topic of his own choice approved by the department.
9. The term-work & presentation of the Seminar-I will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director/Principal of the college as per the recommendation of the Head of the Department.
10. Each student is required to present Seminar-II in the First Year Term II on any related state of the art topic of his own choice approved by the department.
11. The term-work & presentation of the Seminar-II will be evaluated by the departmental committee consisting of guide and two faculty members of the department appointed by Director/Principal of the college as per the recommendation of the Head of the Department.
12. Each student is required to present Seminar-III in the Second Year Term I on special topic. The topic should be on any of the area not included in the regular curriculum. The report should include detailed study of specific concept (i.e. analysis, design & implementation). This can be a theoretical study or practical implementation approved by the department/guide.
13. Guidelines for the dissertation Seminar-III in Second Year Term-I:

1. Seminar-III should be conducted at the end of Second Year Term I.
2. The term-work of the Seminar-III will be evaluated by departmental committee consisting of guide & two faculty members of the department appointed by Director/Principal of the college as per the recommendation of the Head of the Department.
3. Seminar-III presentation will be evaluated by examiners appointed by University, one of which should be guide.
4. Student must submit the Seminar Report in the form of soft bound copy.

5. The marks of Seminar-III should be submitted at the end of Second Year Term I to the University.

14. Guidelines for the Progress Seminar in Second Year Term-II:
    1. Progress seminar should be conducted in the middle of Second Year Term-II.
    2. The Progress Seminar Term-Work will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director/Principal of the college as per the recommendation of the Head of the Department.
    3. Student must submit the Progress Report in the form of soft bound copy.
    4. The marks of Progress Seminar should be submitted along with the marks of Project Stage-II.

15. Minimum passing marks for all Theory shall be 40% and for Term-Work and Oral shall be 50%.
16. He/she has to present/publish at least one paper in reputed National/International Journal/Conference on his/her Project work before submission of his/her Thesis/Dissertation.
17. The Term-Work of Project Stage-II will be assessed jointly by the pair of Internal & External examiner along with oral examination of the same.
18. The class will be awarded on the basis of aggregate marks of all four terms, giving equal weightage to all terms as shown below:
    a) Less than 50% : Fail
    b) 50% to less than 60% : Second Class
    c) 60% to less than 70% : First Class
    d) 70% & above : First Class with Distinction.

19. Each student is required to complete his/her master's degree within Five academic years from the date of admission, failing which he/she will be required to take fresh admission in first year.

School of Management Studies,
North Maharashtra University, Jalgaon

Syllabus for
P.G. Department of Management

(Under Academic Flexibility)

First Year M. B. A. First Semester

(With Effect from June 2013)

Faculty of Commerce and Management

2013-14

North Maharashtra University, Jalgaon

(NACC Accredited 'B' Grade University)

School of Management Studies

MASTER IN BUSINESS ADMINISTRATION (M.B.A.)

(FACULTY OF COMMERCE & MANAGEMENT)

(Under Academic Flexibility)

COURSE STRUCTURE WITH CREDIT

Semester I					
Paper	**Paper Name**	**Credits**	**Maximum Marks**		
			Internal	**External**	**Total**
101	Management Science –I	4	25	75	100
102	Accounting For Management	4	25	75	100
103	Organizational Behavior	4	25	75	100
104	Basic Economics for Management	4	25	75	100
105	Quantitative Techniques	4	25	75	100
106	Computer applications in Business	4	25	75	100
107	Communication Skills	4	25	75	100
Semester II					
201	Management Science-II	4	25	75	100
201	Management Accounting & Financial Management	4	25	75	100
203	Marketing Management	4	25	75	100
204	Human Resource Management	4	25	75	100
205	Operations & Material Management	4	25	75	100
206	Advance Research Methods	4	25	75	100
207	Ethical Practices in Business	4	25	75	100
Semester III					
301	Strategic Management	4	25	75	100
302	Business Law-I	4	25	75	100
303	Current Business Scenario	4	25	75	100
304	Specialization I	4	25	75	100
305	Specialization II	4	25	75	100
306	Specialization III	4	25	75	100
307	Specialization IV	4	25	75	100
Semester IV					
401	International Business Management	4	25	75	100
402	Business Law-II	4	25	75	100
403	Management Information System and E-Commerce	4	25	75	100
404	Specialization I	4	25	75	100
405	Specialization II	4	25	75	100
406	Specialization III	4	25	75	100
407	Specialization IV (Project Viva-Voce)	4	25	75	100
	Total	**112**			**2800**

1. TITLE OF THE DEGREE

This degree shall be titled as Master in Business Administration (MBA) with the mention of Major Specialization in the bracket as "MBA (Specialization)". This new curricula shall be effective from July 2010.

2. DURATION

The regular Full Time Course shall be of 2 Years duration; comprising of 4 Semesters through Theory papers, Sessional, Practical, Project report, Viva-voce, and such other Continuous Evaluation Systems as may be prescribed, in this respect, from time to time.

3. ELIGIBILITY FOR ADMISSION

As per admission rule framed by Directorate of Technical Education (DTE) the Government of Maharashtra AICTE and North Maharashtra University

4. PATTERN & GRADING SYSTEM

A. Features of the CGPA System :

1. Master's degree courses namely, M.B.A. run in Department of Management Studies would be of **28 credits** for each **Semester** that is **112 credits** for whole **Degree Course**

2. One credit for the theory course shall be of the **15 clock hours** (Each course being taught in the semester will be of **4 credits**) that is each course will be of **60 hours**.

3. Out of this 4 credits for each course **3 credits (45 Hours)** allotted to **External Theory Exam** and **1 credit (15hours)** is for **Internal Assessment**.

4. **4 credits** shall be awarded to the Project course, which will commence after completion of II Semester (During vacation falling after the end of first year) and the final work and report will be submitted during IV Semester. The marks and the credits will be allotted in IV Semester.
5. Academic calendar showing dates of commencement and end of teaching, internal assessment tests and term end examination shall be duly notified before commencement of each semester every year by the Department.

B. Evaluation of the student :

(a) The evaluation of the student shall be divided into two parts viz. **Internal Assessment** and **Term End Examination (final semester examination)** with a weightage in the ratio of 25:75

(b) Standard of passing –

(i) There shall not be pass or fail for the internal assessment. However, the attendance for the internal assessment shall be compulsory.

(ii) Minimum marks for passing the Term End Examination in theory/project course shall be 40%.

(iii) Minimum marks for passing the theory/project course (i.e. sum of the marks obtained in internal and term end examination) shall be 40%.

(c) The distribution of marks for each theory paper of **4 credits** at term (Semester) end examination and for continuous internal assessment shall be as follows :

Theory Examination	Maximum marks
Internal assessment	25
Term end examination	75
Total marks	100

(d) The **Project course** will commence after completion of II Semester (During vacation falling after the end of first year) and the final work and report will be completed during IV Semester. The marks and the credits will be allotted in IV Semester. The distribution of marks for Project course of **4 credits** is as follows

Project Examination	Maximum marks
Internal assessment	50
Viva - voce	50
Total marks	100

(e) Internal Assessment:

For the internal assessment **1 credit (15 Hours)** shall be assign. The internal assessment includes:

Heads	Marks	Evaluating Authority
Internal test/Computer Practical	15	Concerned Faculty
Presentation, Seminar, Assignment, Case Study, Research Paper	10	
Total marks	25	

(i) Two internal tests conducted by the subject teacher. Each test shall be of **15 marks and the concerned teacher shall consider either best of two or average.** The duration of the each test will be of 60 minutes.

(ii) The marks for each test shall be displayed on notice board within seven days of conducting the test.

(iii) It is mandatory to show the answer sheets of all tests to the students.

(f) Term end examination :

(i) The term end examination for 75 marks per course would be held about a week after completion of teaching for the semester.

(ii) The term end examination of maximum marks 75 and its assessment work shall be conducted by the department under the academic flexibility granted to the department by the University authorities.

(iii) Each theory paper of 75 marks shall be of the three hours duration.

C. Grades:

(i) Marks for each course would be converted to grades as shown in Table 1.

Table 1: Conversion of marks to grades in credit system

Marks obtained	Grade	Grade Points
90-100	A+	10
80-89	A	9
70-79	B+	8
60-69	B	7
55-59	C+	6
45-54	C	5
40-44	D	4
39 and less	F	0

(ii) The grade point will be given on the total marks (sum of mark obtained in internal assessment and term end examination) obtained in the said subject.

(iii) A student who fails in a course (i.e. he scores less than 30 out of 75 marks in the Term End Examination or less than 40 out 100 marks) shall be given FC grade. Student with FC grade in course would be granted credit for that course but not the grade for that course and shall have to clear the concerned course within 3 (Three) year from appearing for first time in the concerned paper.

(iv) The **total grade points earned in each course** shall be calculated as –

Grade points obtained (vide Table-1) X Credits for the course
Maximum grade points that can be earned in a semester are 320.

(v) **Semester Grade Point Average (SGPA)** –

The performance of a student in a semester is indicated by a number called SGPA. SGPA is the weighted average of the grade points obtained in all courses registered by the student

during the semester. It shall be calculated as follows-

$$SGPA = \frac{\sum_{j=1}^{m} c_i p_i}{\sum_{j=1}^{m} c_i}$$

where C_i = the number of credits earned in the i^{th} course of a semester for which SGPA is to be calculated

p_i = grade point earned in the i^{th} course

i = 1,2,3……n represent the number of courses in which a student is registered in the concerned semester.

That is,

$$SGPA = \frac{\text{Total earned grade points for the semester}}{\text{Total credits for the semester}}$$

The SGPA is rounded upto two decimal places.

(vi) **Final result** – Up to date assessment of the overall performance of a student from the time of his/her first registration is obtained by calculating a number called Cumulative Grade Point Average (CGPA), which is weighted average of the grade points obtained in all courses registered by the student since he/she entered the School/Department.

$$CGPA = \frac{\sum^{m} j=1 \; c_j p_j}{\sum^{m} j=1 \; c_j}$$

where C_j = the number of credits earned in the j^{th} course up to the semester

p_j = grade point earned in the j^{th} course. A letter grade lower than D (i.e. grade point < 4) in a course shall not be taken into consideration for the calculation of CGPA.

j = 1, 2,3……m represent the number of courses in which a student is registered up to the semester for which the CGPA is to be calculated

The CGPA is rounded upto two decimal places.

(vii) The final grade earned shall be as per Table 2 given below-

Table-2

CGPA	Grade
9.0-10	A+
8.0-8.9	A
7.0-7.9	B+
6.0-6.9	B
5.5-5.9	C+
4.5-5.4	C
4.0-4.4	D
0 -3.9	F

5. GUIDELINES FOR TEACHING

5.1. There shall be 60 (45 for Teaching Sessions & 15 for Continuous Assessment) lecture hours per semester per course. The duration of the lectures shall be 60 minutes each. There shall be at least 14-16 weeks of teaching before commencement of examination of respective semester.

5.2. There shall be 4 lectures / week / paper.

5.3. The semester workload is balanced with 7 full papers of 100 marks each / semester. Thus 315 lectures hours are considered for teaching sessions and 105 hours shall be used for continuous assessment.

5.4. Self study shall be natural requirement beside the time table. The Faculty will have to exert a little extra for cultivating reading habits amongst the students.

5.5. The teaching method shall comprise a mix of Lectures, Seminars, Group discussions, Brain storming, Game playing, Interactions with Executives etc. so as to prepare the students to face the global challenges as business executive for this Audio- visual aids and Practical field work should be a major source of acquiring knowledge.

5.6. Case study method preferably shall be used wherever possible for the better understanding of the students.

5.7. Department shall issue annual souvenir/ placement brochure separately and a copy of the same shall be submitted to the university before the end of the year.

6. PRACTICAL TRAINING AND SUMMER INTERNSHIP PROJECT

6.1. Each student shall have to undergo a practical training for a period of not less than 7 weeks during vacation falling after the end of first year.

6.2. In the Fourth semester examination student has to do "Project Work" individually on the basis of specialization. No group work is allowed in this. The topic should be decided in consultation with the guidance of internal teacher of the Institute at the end of the first year, so that the student can take up the training during the vacations. The Project should be necessarily Research oriented, Innovative and Problem solving. No teacher shall be entrusted with more than 15 students for guidance and supervision.

6.3. The Academic committee shall submit the detailed list of candidate with Project Titles, name of the organization, internal guide & functional elective to the Examination committee on or before 31st March of the second year.

6.4. The student has to write a report based on the actual training undergone during the vacations at the specific selected business enterprise, get it certified by the concerned teacher that the Project report has been satisfactorily completed and submit THREE typed copies of the same to the Head of the Department.

6.5. Two copies of the report submitted by the student shall be forwarded to the Examination committee by the Academic committee before 31st January.

6.6. The project work will carry maximum 100 marks, of which internal teacher shall award marks out of maximum 50 marks on the basis of project work done by the student as a continuous assessment. Remaining marks shall be awarded out of maximum 50 marks by examining the student during Viva-voce, by the panel of the external examiners to be appointed as per university norms.

6.7. No students will be permitted to appear for Viva- voce and Semester IV examinations, unless and until he/she submits the project report before the stipulated time.

7. ADDITIONAL SPECIALIZATION

7.1 The student who has passed MBA of this University with a specific specialization may be allowed to appear for MBA examination again, with other specialization by keeping term for the IIIrd and IVth semester for the so opted 8 papers of additional specialization. (S)He has to appear for 8 papers including Project report of the additional specialization so opted.

7.2 He shall be given exemption for all other papers.

7.3 The student has to pay only Tuition fees for one year as may be prescribed from time to time for this purpose.

7.4 The student is not entitled to receive separate Degree Certificate or Class for this additional specialization.

8. STRUCTURE OF THE QUESTION PAPER

8.1 Each question paper shall be of 75 marks and of 3 hours duration.

8.2 **For Theory papers** there will be 2 Sections. In section I candidate required to answer 3 questions out of 5 questions & in section II candidate required to answer 2 questions out of 3 questions. All questions shall carry equal marks i.e. 15 marks each.

8.3 **For Composite papers (theory and practical / problems)** there will be 2 sections. In section I (practical/problem) student required to answer 3 questions out of 5 questions & in section II (Theory) student required to answer 2 questions out of 3 questions. All questions shall carry equal marks i.e. 15 marks each.

8.4 **For papers including case studies** there shall be 2 Sections. In Section I (Theory) a student shall be required to answer 3 questions out of 5 questions & in Section II (Case studies) 2 case Studies out of 3 case studies to be attempted by the students. All questions shall carry equal marks i.e. 15 marks each.

Syllabus:

Keeping in view the professional nature of examinations, students are required to equip themselves as per the prescribed syllabus and questions can be asked according to the course structure. The department **also reserves the right to vary the syllabus / rules from time to time**, as the department is carrying out this course under Academic Flexibility as per the direction of the university. Any alterations made will be notified from time to

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: First Year M.B.A. (W.E.F. June -2013)

Paper: 101 Management Science I

(75 + 25 Pattern: External Marks 75+Internal Marks 25 = Maximum Total Marks: 100)

Required Lectures: 45+15 hours

Unit 1: Introduction to Management **(05)**

1.1 What is Management?
1.2 The Management Process.
1.3 The functions of Management.
1.4 Who are managers & what they do?
1.5: Types of managers
- Corporate level Manager

- Business Level Manager
- Functional Manage
- Frontline Manager

1.6: Managerial Roles & skills
- Interpersonal Roles
- Informational Roles
- Decision Roles
- Managerial skills, values and motivation

1.7 Management Yesterday & Today
1.7.1. The evolution of Management Theories.
1.7.2. The Pre classical Contributors.
1.7.3. The Classical viewpoints.
1.7.4. Behavioural viewpoints.
1.7.5. Contemporary viewpoints.
1.7.6. Managing in the 21st Century.

Unit 2: Planning **(05)**
2.1 Planning within the organisation & levels of Planning
2.1.1 Strategic Plans
2.1.2 Operating Plans
2.2 Types of plans.
2.3 The overall planning process.
2.4 The nature of organizational goals.
2.5 Linking goals & plans.
2.6 Objectives.
2.7 Evolving concepts in management by objectives.

Unit 3: Decision Making **(05)**
3.1 Rationality in decision making.
3.2 Steps in effective decision making.
3.3 Development of alternatives & the limiting factor.
3.4 Approaches to selecting an alternative.
3.5 Programmed & non programmed decisions.
3.6 Decision making under certainty, uncertainty & risk.
3.7 Decision making heuristics & cognitive biases.
3.8 Prospect theory.
3.9 Promoting innovation. The creativity factor in decision making

Unit 4: Planning & decision aids **(05)**
4.1 Forecasting
4.2 Project planning & control models.
4.3 Other planning techniques.
4.3.1. Linear programming.
4.3.2. Queuing or waiting lines
4.3.3. Models Routing.
4.3.4. Simulation models.
4.4 Quantitative aids for decision making.

Unit 5: Organisational Architecture **(08)**
5.1. Organizational structure defined.
5.2. The organizational Chart.
5.3. Job design.
5.4. Departmentalization.
5.5. Methods of Vertical Co-ordination.
5.5.1. Formalization.

5.5.2. Span of Management.
5.5.3. Downsizing.
5.5.4. Centralization Vs Decentralization.
5.5.5. Delegation.
5.5.6. Line & Staff Positions.
5.6. Methods of Horizontal Co-ordination.
5.6.1. Slack resources.
5.6.2. Information systems.
5.6.3. Lateral resources.
5.7. Designing organization structures.
5.8. Assessing structural alternatives
5.8.1. Functional Structure.
5.8.2. Divisional Structure.
5.8.3. Emerging structures.
5.8.3.1. Virtual organizations
5.8.3.2. Boundary less organization.
5.9. An organizational environment for Entrepreneuring & Intrepreneuring.
5.10. Reengineering the organization.

Unit 6: Motivation **(07)**
6.1. Nature of Motivation.
6.2. Need theories
6.2.1. Hierarchy of Needs Theory.
6.2.3. Two factor Theory.
6.2.3. ERG Theory.
6.2.4. Acquired Needs Theory.
6.3. Cognitive Theories.
6.3.1. Expectancy theory.
6.3.2. Equity theory.
6.3.3. Goal setting theory.
6.4. Reinforcement Theory.
6.5. Social Learning Theory.
6.6. Managing motivation through extrinsic & intrinsic rewards.
6.7. Self motivation.

Unit 7: Leadership **(05)**
7.1. Leadership defined.
7.2. Ingredients of Leadership
7.3. Leadership behavior& styles.
7.4. The Managerial Grid.
7.5. Leadership theories.
7.5.1. Fiedler's Contingency Model.
7.5.2. Normative Leadership Model.
7.5.3. Situational Leadership Model.
7.5.4. Path goal theory.

Unit 8: Controlling **(05)**
8.1. The basic control process.
8.2. Critical control points, standards & benchmarking.
8.3. Control as a feedback system.
8.4. Real time information & control.
8.5. Feed forward & preventive control
8.6. Managerial approaches to implementing controls.

8.6.1. Bureaucratic control
8.6.2. Clan control.
8.6.3. Market control.
8.7. Requirement for effective control.

Reference:

1. Management' - Kathryn Bartol & David Martin lrwin- McGraw Hill.
2. 'Management - A global & entrepreneurial Perspective'-Heinz Weihrich, Mark Cannice, Haroldkoontz- Tata Mc-Graw Hill
3. 'Principles of Management '- Charles WL Hill, Steven L Mcshane- Tata McGraw Hill.
4. 'Management'- Stephan Robbins, Mary Coulter-Prentice hall India.
5. Management' – Stoner, Freeman, Gilbert- Prentice hall India.

Additional Readings in Management- An Indian Perspective

1. Business Maharajas-Gita Piramal- Penguin Book.
2. The India Way – Peter CappelliHarbir Singh, Jitendra Singh, Michael Useem-Harvard business press.
3. Indian railways turnaround-R.N.Mishra-Jaico Publishing House

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: First Year M.B.A. (W.E.F. June -2013)

Paper: 102 Accounting for Management

(75 + 25 Pattern: External Marks 75+Internal Marks 25 = Maximum Total Marks: 100)

Required Lectures: 45+15 hours

Unit 1: Accounting Principal and Concept (08)

Meaning and scope of Accounting – Definition of Accounting – Steps of accounting – Function of Accounting – Objectives of Accounting – Book Keeping – Limitations of Accounting; Branches of Accounting; Relationship between Management Accounting and Financial Accounting, Relationship between Cost Accounting and Management Accounting; Accounting Principles - Accounting Concepts – Entity concept- Dual Aspect concept – Accounting Period Concept – Going concern Concept – cost Concept – money Measurement Concept – Matching Concept – Realization – accrual Concept – Rupee Value Concept; Accounting Conventions –Conventions of Disclosure – Convention of Conservation – Convention of Consistency –Convention of Materiality; Tools and Techniques of Management Accounting

Unit 2: Financial statements: Analysis and Interpretation (08)

Introduction – Definition of Financial statements – Objectives of Financial statements – Nature of Financial statements – Requisites, attributes or Essential Requirements of financial Statements– Importance of Financial statements – Limitation of Financial statements – Recent trends in Presenting Financial statements – Basic Financial statements or Packages of Financial, Statements – Format of Profit and Loss Account – Position Statement or Balance Sheet – Form or Performa of a Balance sheet – Elements of Balance Sheet. Analysis and Interpretation- Meaning – Types of Analysis and Interpretations- Internal Analysis – External Analysis- Horizontal Analysis – Vertical analysis-Methods of Analysis and Interpretation – comparative Financial Statement – Common Size Statements – Trend Analysis.

Unit3: Fund Flow Statement (08)

Introduction – Meaning of Fund – Flow of Fund and No Flow of Fund – Statement of Change in Financial Position – Flow of Fund Chart – No Flow of Fund Chart – Examples Flow of fund –Components of Flow of Fund – Current Assets – Current Assets – Current Liabilities - Non-Current Assets – Non-Current Liabilities – Fund Flow Statement Vs Balance Sheet – Preparation of Fund Flow Statement; Fund from Operations- Statement of Change in Working Capital –Fund Flow Statement - Meaning – Specimen Format- Purposes- Calculation of fund From Operation- Practical Problem.

Unit 4: Cash Flow Statement (06)

Meaning – Purpose of Cash Flow statement – Difference between Cash Flow statement and Fund Flow statement- Limitation – Preparation of Cash Flow statement- Flow of Cash under Noncurrent Items- Flow of Cash due to operations – Non- cash Items – Specimens Form at calculation of Cash Received from Operation - Practical Problem

Unit 5: Ratio Analysis **(08)**

Meaning and Definition of Analysis and Interpretations of Ratio – Principles of Ratio Selection-Advantages- limitations of Ratio Analysis: Classification of Ratios- Liquidity ratios-Current ratio-Quick ratio- Absolute Liquid Ratio; Profitability ratios- Gross Profit Ratio- Net Profit Ratio-Return on Investment-Operating ratio- Operating Profit ratio-Return on capital Employed Ratio- Earning per share Ratio- Dividend Yield Ratio- Price earnings Ratio- Net profit to Net Worth ratio; Turnover ratios- stock turnover ratio – debtors turnover ratio- debt collection period ratio- creditor turnover ratio- Average payment period- working capital turnover ratio- fixed assets turnover ratio- capital turnover ratio; Solvency ratios- debt equity ratio- proprietary ratio – capital gearing ratio-debt service ratio; Practical Problems

Unit 6: Cost Accounting& Cost sheet Analysis **(07)**

Objective of Cost Accounting – Advantages and Limitation of Cost Accounting –Installation of Cost Accounting System- Practical difficulties in Installation of Costing system. Cost sheet – Meaning – Element of Cost – Direct Cost – Indirect cost - Overheads- Prime Cost-Works cost – Cost of Production- Cost of Sales – Importance of Cost sheet – Specimen Format of Cost Sheet- Preparation of Cost sheet- Practical Problem.

References:

1. "Management Accounting",M. E. ThukaramRao, New Age International Publishers.

2. "Financial Cost and Management Accounting", Dr P. Periasamy, Himalaya Publication House.

3. "Financial Management", Ravi M Kishor, Taxman Publication

4. "Financial Management", IM Pandey, Vikas Publishing House.

5. "Financial Management", Khan & Jain", MC Graw Hill Publishing House.

6. "Cost Accounting", M.C Shukla, T.S. Grewal, M.P. Gupta, S.Chand Publishing house.

7. "Cost and Management Accounting", Ravi. M. Kishore, Taxman Publication.

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: First Year M.B.A. (W.E.F. June -2013)

Paper: 103 Organisational Behaviour

(75 + 25 Pattern: External Marks 75+Internal Marks 25 = Maximum Total Marks: 100)

Required Lectures: 45+15 hours

Unit 1: Introduction to the Field of Organizational Behaviour (06)

1.1 Field of organization behaviour.
1.2 Emergence of O.B as a discipline.
1.3 Importance of organizational behaviour.
1.4 Foundation of O.B.
1.5 Anchor of Organizational Behaviour.
1.6 Interdisciplinary Influences on O.B.

Unit 2: Individual Processes and Behaviour (10)

2.1 MARS Models of Individual Behaviour
2.2 Types of Individual Behaviour in Organization.
2.3 Individualism and Collectivism
2.4 Personality in Organization
2.5 Personality Theories
2.6 Big five personalities Dimension.
2.7 Perception and perceptual process.
2.8 Social Identity and Attribution theory of perception.
2.9 Perpetual Errors and Perception Improvement.
2.10 Learning in organization.

Unit 3: Values and Attitudes (06)

3.1 Nature and components of attitude
3.2 Attitudes and attitude formation.
3.3 Functions of attitude
3.4 How attitude can be change
3.5 Job satisfaction and work behaviour
3.6 Values: Personal and organizational values
3.7 Attitude, values and OB
3.8 Managing emotion in the workplace.

Unit 4: Motivation, Leadership and Trust at work (08)

4.1 Motivation and work behaviour
4.2 Different Theories of motivation
4.3 MBO Approaches to motivation.
4.4 Motivation Programme for employee.
4.5 Reward Practices and Empowerment Practices.
4.6 Contemporary issues in leadership.
4.7 Trust and leadership.

Unit 5: Organizational Change and Stress Management **(08)**

6.1 Forces for change.
6.2 Managing Planed Change.
6.3 What can change agents change?
6.4 Resistance to change.
6.5 Approaches' to managing organizational change.
6.6 Stress, Consequences of stress, Sources of stress.

Unit 6: Power & Conflict in the Workplace **(07)**

7.1 Model for Power in organization
7.2 Sources of Power in organization
7.3 Contingencies of Power
7.4 Influence Tactics and Organizational Politics
7.5 Conflict Process
7.6 Source and Conflict Management Style

References

1. Organization behaviour by Debra L. Nelson & James Campbell, Cengate Publication
2. Organization behaviour by Stephen Robins, Timothy A Judge, Seema Sanghi, Pearson Education
3. Organization behaviour by Suja R. Nair, Himalaya Publication House
4. Organization behaviour by M. N. Mishra, Vikas Publication House
5. Organization behaviour by Steven L. McShane, Mary Ann Von Gliow

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: First Year M.B.A. (W.E.F. June -2013)

Paper: 104 Basic Economics for Management

(75 + 25 Pattern: External Marks 75+Internal Marks 25 = Maximum Total Marks: 100)

Required Lectures: 45+15 hours

Unit I- Fundamental concepts of Economics (10)

1.1 Definition, Basic economic problems of economics importance and scope of economics .

1.2 Early theories- Adam Smith, Alfred Marshall, Lionel Robins.

1.3 Subject Matter of-

a) Micro Economics- Nature, scope, Importance and limitations.

b) Macro Economics- Utility and Need

c) Capitalism- Definition Features.

d) Socialism- Definition, Features, Merits & Demerits

e) Mixed economy and Indian economy-Bases of Indian economy, Nature, Scope, Problems. Determination of national income and GDP. Unemployment And Trade cycles and its impact on National policies.

Unit 2: Managerial Economics (05)

2.1 Nature & Scope of Managerial Economics

2.2 Managerial decisions under Factor markets- Perfect competition, monopolistic, Monopoly, Oligopoly

2.3 Decisions under Risk: Maximization of Expected Value, Mean-Variance Analysis, Co-Efficient of Variation Rule, Expected Utility

2.4 Criterion's of Decision Making under Uncertainty

Unit 3: Law of Demand and Supply (06)

3.1 Defination,Types of demand, Law of demand, exceptions to the law of Demand.

3.2 Determinants and Elasticity of demand,

3.3 Demand Curves, Demand estimation And Forecasting Methods

3.4 Demand- led Business Strategy

3.5 Consumers Equilibrium

3.6 Supply: Determinants and Its Elasticity

Unit 4: Costs, Revenue and pricing practices (06)

4.1 Costs Curves

4.2 Average and Marginal Revenue Curves

4.3 Pricing Practices: Price Discrimination, Full Cost Pricing, Product Life Cycle Pricing, Transfer Pricing, Modern Theory of Factor Pricing

4.4 Various Concepts of Profits: Determinants of Profits.

Unit 5 The factors of production (05)

5.1 Production function: content, importance

5.2 Peculiarities of Land, Labour.

5.3 Meaning of Rent: Quasi-rent- Theories of Rent: Ricardian Theory; Modern Theory of Rent Relationship between Rent and Price: Ricardian Analysis;

5.4 Concept of Wages: Difference between Real Wages and Nominal Wages, Theories of Wages: Bargaining Theory of Wages; Morden Theory of Wages

Unit 6: Economics of Regulation (06)

6.1 The Role and need of the Government, Problem with Regulation and Cost of the Regulation

6.2 Regulatory Response: Incentive Failures: Property, Rights & Regulation, Patents & Tort System, Subsidy & Tax Policy

6.3 Deregulation Movement & Regulatory Reforms: Government Failures, Deregulation and Privatization, Regulatory Reforms for Promoting Competition

Unit 7: Financial repressions and Financial reforms (07)

7.1 Monetary economy-

a) Concept, scope, Function and Importance of Money in Modern economy, Demand and Supply of money

b) Gold Standards, exchange rate regime since 1973 Currency,

c) Exchange rate determination- theory of equilibrium rate of exchange, Currency exchange standards, Factors influencing Exchange rates.

d) Public Debt, Supply of Loans and Demand for deposits.

e) Measures of Inflation and stagflation

7.2 Fiscal Policy measures:

a)Deficit financing and fiscal policy,

b)Role of government in economic planning

c) Balance of payments

7.3 Development planning:

a) Finance: Savings, Public Revenue, FI,FDI

b) Balanced and Unbalanced growth- types of strategies.

References:

1. Modern Economic Theory: K.K.Dewett, S.Chand publications. New Delhi.
2. Indian Economy: Mishra- puri, Himalaya publication ltd.
3. Managerial Economics: H.Craig Peterson,W.Cris Lewis,Prentice- Hall Of India,3rd Ed.
4. Macro Economics: Erol D' Souza, Pearson Education. New Delhi.
5. Micro Economics:Robert S. Pindyick, Daniel L. Rubinfed, Prem L. Mehta, 7th edition,Pearson Education. New Delhi.
6. Managerial Economics: Mishra, Puri, Himalaya Publications.Ltd
7. Managerial Economics (theory and applications):Dr. D.M. Mithani, Himalaya Publications.Ltd.
8. International Financial Management, V.S. Sharan, Printice hall of India Pvt. Ltd. New Delhi, Third edition.

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: First Year M.B.A. (W.E.F. June -2013)

Paper: 105 Quantitative Techniques

(75 + 25 Pattern: External Marks 75+Internal Marks 25 = Maximum Total Marks: 100)

Required Lectures: 45+15 hours

Unit: 1 Basic Statistical Concept **(04)**

1.1 statistics:- meaning, function and limitation of statistics and its characteristics
1.2 Measures of Central Tendency, Mean, Mode, Median
1.3 standard Deviation and Application of standard deviation
1.4 Frequency Distribution and cumulative frequency distribution

Unit: 2 Correlation and Regression analysis **(06)**

3.1 Meaning- Properties and types of correlation
3.2 Scatter Diagram
3.3 Karl Pearson's coefficient of correlation
3.4 Probable error
3.5 Meaning and properties of Regression analysis
3.6 Line of Regression
3.7 Coefficient of Regression
3.8 Relation between correlation and regression.
3.9 Simple numerical problems on above concept.

Unit: 3 Probability **(06)**

2.1 Introduction, Basic Probability concept, Types of Probability
2.2 permutation and combination
2.3 Concept of Probability Distribution
2.4 Conditional Probability, computation of conditional probability.
2.5 statistical or empirical probabilities
2.6 Axiomatic probability
2.5 Statement of addition and multiplication, Theory of Probability.
2.6 Numerical Problems on the above concept.

Unit: 4 Determinants and Matrices **(06)**

4.1 Meaning and tabular presentation of matrices
4.2 Types of Matrices
4.3 Matrix Operations
4.4 Determinant – Basic concept of Determinants
4.5 Properties of determinant
4.6 Cramer's rule & Matrix Inversion Method to solve matrices
4.7 Numerical problem on above concepts.

Unit: 5 Linear Programming Problems **(07)**

5.1 Introduction
5.2 Formulation of linear programming problems

5.3 Assumption underlying linear programming
5.4 Methods of LLP-Graphical Method and simplex method
5.5 Solution of only maximization problems
5.6 Concept of Duality
5.7 Some real life problems.

Unit: 6 Assignment Problems **(06)**
6.1 Introduction
6.2 Mathematical statement of the problem
6.3 Solution of assignment problem by Hungarian method
6.4 variations of the assignment problem: Multiple option solution, maximization case in assignment, unbalanced assignment problem
6.4 Some special cases.

Unit: 7 CPM and PERT **(05)**
7.1 Introduction
7.2 PERT/CPM Network
7.3 Network analysis
7.4 Resource analysis and allocations
7.5 Programme evaluation and review techniques.
7.6 Difference between CPM and PERT.

Unit: 8 Decision theory and decision Trees **(05)**
8.1 Introduction: steps in decision theory
8.2 Decision Making under uncertainty
8.3 Maximax criteria, Maximin criteria, Minimax criteria, Laplace criteria.
8.4 Decision Making under certainty: Expected monetary value criteria, EVPI
8.5 Decision tree analysis.

References
1. Quantitative techniques in management –N.D.Vohra- Tata McGraw Hill
2. Quantitative Techniques- L.C.Jhamb-Everest Publishing House.
3. Quantitative techniques for decision making-Anand Sharma-Himalaya Publishing House
4. Business Statistics-S.P.Gupta-Sultan Chand & Sons.
5.Quantitative techniques for Managerial decisions by J.K. Sharma

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: First Year M.B.A. (W.E.F. June -2013)

Paper: 106 Computer Applications in Business

(75 + 25 Pattern: External Marks 75+Internal Marks 25 = Maximum Total Marks: 100)

Required Lectures: 45+15 hours

Unit: 1 Computer Fundamentals (08)

Computer-meaning, definition, characteristics, types of computer, classification of computer, basic components, basic computer operations, memory system, and practical data processing applications in business, computer Applications in various areas of business, Components of computer-Computer memories, primary storage, secondary storage, Introduction to input /output Device

Unit: 2 Introduction to software (06)

Software types, system software, classification of Operating system, Application software, Introduction to programming language, types of programming language, Algorithm, flowcharts, Types of flowcharts ,Program development

Unit: 3 Introduction to Database Management system (08)

Data processing-Introduction, cycle, operations, types, objective, methods, role of data Processing applications in business, Data base- Introduction, characteristics, objectives Database Management system-Introduction, objective, components functions, advantages

Unit: 4 Computer Communications (08)

Introduction, data communication, Computer network, Advantages of networking, Types of network, Telecommunication –Introduction, Media, Channel, Software, types of data transmission, modems and multiplexers

Unit: 5 Introductions to Internet (08)

Internet-Introduction, history, features, Internet software, Applications of internet and WWW, Extranet and E-mail, Introduction to web Browsers, Intranet, internet, extranet
Cyber Crime: meaning, measures for prevention, cyber laws, cyber warfare
Information Security: concept, meaning, goals for security, security threats, computer viruses, security procedures, computer and cyber forensic

Unit: 6 Microsoft Office-2007 (07)

MS-Word-Creating and editing document, Formatting characters and paragraphs, formatting and enhancing a document, formatting with special features
MS- Excel-Analyzing data using Excel, Editing and formatting worksheets, using functions, word and excel
MS-Power Point-Preparing a presentation, editing and enhancing slides, customizing a presentation, word, excel and PowerPoint
MS-Access-Maintaining a data in Access tables, creating tables and relationships, creating queries, forms and reports, word excel and Access

Reference

1. Computer Application in business-S. Sudalaimuthu, S. Anthony Raj-Himalaya
2. Publishing House
3. Fundamentals of Computers-C.S.V. Murthy- Himalaya Publishing House
4. Ms-Word 2007-A visual approach to learning computer skills-BPB publication
5. Ms-EXCEL 2007-A visual approach to learning computer skills-BPB publication
6. Ms-Power Point 2007-A visual approach to learning computer skills-BPB publication
7. Ms-ACCESS 2007-A visual approach to learning computer skills-BPB publication
8. Computer Applications for management-Vishal Soni- Himalaya Publishing House
9. Fundamentals of Computers, V. Rajaraman,Prentice-Hall.
10. Cyber Security in the 21st Century, Nina Verma, Global Vision Publishing House
11. Inside Cyber warfare, Carr, Kitab Mahal, New Delhi
12. Information Security: Principles and Practices, Pearson publisher
13. Cybre Security: Understanding cyber crimes, computer forensic and legal practices, Wiley India Pvt. Ltd.

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: First Year M.B.A. (W.E.F. June -2013)

Paper: 107 Communication Skills

(75 + 25 Pattern: External Marks 75+Internal Marks 25 = Maximum Total Marks: 100)

Required Lectures: 45+15 hours

Unit 1 Understanding Business Communication **(08)**

1.1 Model of Communication Process
1.2 Effective Business communication
1.2 Verbal and Non-Verbal Communication
1.3 Formal and Informal Communication
1.4 Communication barriers & breakdowns
1.5 Mastering Listening
1.6 Communicating in teams
1.7 Negotiation Skill
1.8 Planning, Conducting and Recording meetings
1.9 Communicating Cross-culturally

Unit 2 Effective Writing **(08)**

2.1 Format and Layout of Business Documents.
2.2 Planning Business Messages
2.3 Writing Business Messages
2.4 Completing Business Messages

Unit 3 Writing Brief Message **(07)**

3.1 Formats for Letters and Memos
3.2 Writing Messages for Electronic Media
3.3 Writing Routine and Positive Messages
3.4 Writing Negative Message
3.5 Writing Persuasive Messages

Unit 4 Report Writing **(06)**

4.1 Report Structure
4.2 Short Reports
4.3 Long – Formal Reports
4.4 Writing a Summer Project Report

Unit 5 Oral and Online Presentation **(06)**

5.1 Creating and developing oral and online Presentation
5.2 Public Speaking and Oral Reporting

Unit 6 Building Careers **(04)**

6.1 Writing Resumes
6.2 Attending GDs
6.3 Interviewing for Employment

Unit 7 Written Analysis of Cases **(03)**

7.1 What is a Case?
7.2 How to do a Case analysis?
7.3 Process of Analysis a Case

7.4 Requirement for a Case Analysis

Unit: 8 Technology enabled Communication **(03)**
Application of Technology in Communication

Reference Books:
1. “Basic Business Communication Skill For Empowering The Internet Generation” Lesikar F Lately, Tata McGraw Hill Edition.
2. “Business Communication Today”, Cortland Bovee, John V Thill, MukeshChaturvedi,Pearson Edition.
3. “Business Communication – Building Critical Skills”, Kity O Locker, Stephen Kyo Kaczmarek, Tata McGraw Hill Edition.
4. “Business Communication – Concept, Cases and Applications”, P .D Chaturvedi and MukeshChaturvedi, Pearson Edition.
5. “Contemporary Business Communication”, Scot Ober AIPD (All India Publishers and Distributors Regd)
6. “Strategic Communication in Business and the Profession” Dan O’Hair, Gustar Friedrich, Lynda Dixon, Pearson Edition.

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: First Year M.B.A. (W.E.F. June -2013)

Paper: 201 Management Science II

(75 + 25 Pattern: External Marks 75+Internal Marks 25 = Maximum Total Marks: 100)

Required Lectures: 45+15 hours

Unit -1: Globalization & the Managers (10)

1.1 Managing in a Global Environment.
1.2 The Process of Globalization.
1.3 Constraints on Globalization.
1.4 The Benefits of Going Global.
1.5 Management Challenges in a Global Enterprise.
1.6 Understanding Global Environment.
1.7 Legal- Political Environment.
1.8 Economic Environment.
1.9 Cultural Environment.
1.10 Technological Environment.
1.11 Ecological Environment.
i. Regional Trading Alliances
ii. Different Types of Global Organisation.

Unit- 2: Productivity, Operations Management & Total Quality Management (10)

2.1 Productivity Problems and Measurement
2.2 Production & Operations Management: Manufacturing & Service
2.3 Quality Measurement in the Information Age
2.4 The Operations Management System
2.5 Tools and Techniques for Improving Productivity
2.6 Overview of the Related Concepts
i. Total Quality Management,
ii. Value Engineering
iii. Value Chain Management
iv. Supply Chain Management
v. Six Sigma
vi. Benchmarking
vii. Just In Time
viii. Kanban
ix. Knowledge Management

Unit- 3: Entrepreneurial Development & Management (07)

3.1 Entrepreneur & Entrepreneurship: Definition, Concept, Traits, Characteristics, Skills, Nature & Importance, Concept & Theories of Entrepreneurship
3.2 Entrepreneurship Development: Training, Institutions In Aid of Entrepreneurship Development
3.3 Project Management: Search & Identification of Business Idea, Project Formulation& Preparation of Project Report.

Unit -4: Types of Entrepreneurship **(08)**

4.1 Rural Entrepreneurship: Meaning, Need, Concept of Rural Industrialization, Problems of Rural Entrepreneurship, NGO's & Rural Entrepreneurship

4.2 Women Entrepreneurship: Concept of Women Entrepreneurship, Functions of Women Entrepreneur, Challenges & Problems of Women Entrepreneurs in India, Factors Responsible for growth of Women Entrepreneurs

4.3 Social Entrepreneurship: Need, Characteristics of Social Entrepreneur, Importance & Scope of Social Entrepreneurship in India

4.4 E- Entrepreneur: Meaning & Concept

Unit- 5: Essentials of Entrepreneurship **(05)**

5.1 Factors affecting Entrepreneurship in India: Economic Factors, Non-Economic Factors, Government Actions

5.2 Entrepreneurship Cycle

5.3 Entrepreneurship Development Programmes: Phases, Issues, Content & Methods

Unit- 6: Case Studies Based On 101,201 * **(05)**

References:

1. Principles Of Management Tata- Mcgraw Hill Charles W.L.Hill, Steven L. Mcshane
2. Management- Prentice Hall India Stephen Robbins –Mary Coulter
3. Management-A Global & Entrepreneurial Perspective-Welhrich, Cannice, Koontz
4. Global Management Solutions Demystified- Thomson Publication. Dinesh Seth, Subhash Rastogi
5. Management- Prentice Hall, Stonner, Freeman, Gilbert
6. Management- Irwin Macgraw Hill Kathryan Bartol, David Martin
7. The Dynamics Of Entrepreneurial Development & Management- Himalaya Publishing House 5th Edition , Vasant Desai
8. Business Law- Himalaya Publishing House Dr. S.N. Maheshwari & Dr.S.K.Maheshwari.
9. Financial Management- Ravi Kishor.
10. Entrepreneurship- Robert D. Hisrich, Michael P. Peters,Tata Mc Graw Hill Pub.
11. Entrepreneurship Development in India-Gupta, Srivivasan- Sultan Chand & Sons
12. Entrepreneurship Development -Cynthia L. Greene, Cenage Lear ning
13. Entrepreneurship Development – S.S. Khanka,S.Chand

Additional Reading

1) The Six Sigma Way-Tata Mcgraw Hill , Peter S. Pande, Robert P. Neuman, Roland R. Cavanagh
2) A Passion for Excellence - Viva Books Pvt. Ltd. Tom Peters, Nancy Austin
3) Built To Last- Collins Jim Collins, Jerry Porras.

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: First Year M.B.A. (W.E.F. June -2013)

Paper: 202 Financial Management & Management Accounting

(75 + 25 Pattern: External Marks 75+Internal Marks 25 = Maximum Total Marks: 100)

Required Lectures: 45+15 hours

Unit-1: Scope and Objectives of Financial Management (08)

1.1 Approaches to Financial Management: Traditional View-Modern View-Investment Decisions-Dividend Decisions-Liquidity and Profitability

1.2 Comparison with Accounting and Economics: Financial Management and accounting - Financial Management and Economics-Financial Management-Science or Art

1.3 Financial Management's Importance in Business: Significance of Financial Controller-Finance Manager as a Facilitator- Organization Chart of Finance Function- Reason for Centralizing Finance Function

1.4 Financial Objectives of Business Firm: Profit Maximization, Wealth Maximization, Value Maximization, Other Maximization Objectives.

1.5 Agency theory of Firm

Unit-2: Project Planning and Control (08)

2.1 Capital Investment Process and Kinds of Project: Meaning of Capital Budgeting- Capital Investment Process- Kinds of Projects, Classification of Projects, Forward and Backward Integration, Rationale for Diversification, New Concepts in Financing and Execution of Projects

2.2 Project Organization Structure and Management Systems: Project Organization Structure, Benefits of Project Management, Project Management Information System,

2.3 Stages in Setting up of a Project: Initial Selection of Project Ideas, Selection of Project Location, Selection of Project Site, SWOT Analysis, Reasons of Project Failure, Techniques for Project Control

2.4 Cost Benefits Analysis: CBA and Investment Decisions, CBA Procedure Techniques of CBA, Benefits and Limitations of CBA, Social Cost and Benefit Analysis, Indicators of Social Desirability of a Project

Unit-3: Sources of Finance (07)

3.1 Need for long term finance

3.2 Sources of long term financing and short term financing

3.3 Financial Implications of long term financing

3.4 Long term financing and debt equity ratio

3.5 Short term V/s long term financing

3.6 Venture capital

Unit-4: Marginal Costing & Cost Volume Profit Analysis (08)

4.1 Absorption Costing & Marginal Costing

4.2 Similarities and Dissimilarities between Absorption and Marginal Costing

4.3 Cost Behaviour and Its Impact over Marginal Costing, Marginal Cost Equation, Marginal Costing and Valuation of Finished Stock

4.4 Utility-Advantages and Limitations of Marginal Costing, Precautions to Be Taken While Adopting Marginal Costing, Applications of Marginal Costing
4.5 Objectives of CVP Analysis, Assumptions of CVP Analysis, Limitations of CVP Analysis
4.6Algebraic Method of Presenting CVP Analysis, Profit Volume Ratio or Contribution, Sales Percentage, Graphic Method of Presenting CVP Analysis

Unit-5: Standard Costing (07)
5.1 Historical Costing, Standard Cost and Standard Costing
5.2 Standard Costing and Standardized Costing, Advantages and Limitations Of Standard Costing, Preliminaries in Establishing A System of Standard Costing, Standard Hour, Standard Cost Card, Procedure for Introducing Standard Costing, Variance Analysis-Material -Labour-Overhead

Unit-6: Budget and Budgetary Control (07)
6.1 Budget and Budgetary Control, Objectives of Budgetary Control
6.2 Essential Requirements of Budgetary Control, Advantages and Limitations of Budgetary Control
6.3 Organization for Budgetary Control, Rolling Budget, Types Of Budget, Zero Base Budgeting, Budget Report

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1. Cost and Management Accounting –M. E. Thukaram Rao, New Age International publisher
2. Cost Accounting-M. N. Arrora, Himalaya Publishing House
3. Practical Costing-B. S. Khanna, I. M. Pandey, G.K.Ahuja, S. C. L.Batra, S. Chand
4. Cost Accounting-M. C.Shukla,T.S.Grewal,M.P.Gupta, S. Chand
5. Cost Accounting- Jawahar Lal, Srivastava, Tata McGraw Hill
6. A Textbook of Financial, Cost and Management Accounting-Dr.P.Periasamy, Himalaya Pub. House.
7. Management Accounting-I.M.Pandey

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: First Year M.B.A. (W.E.F. June -2013)

Paper: 203 Marketing Management

(75 + 25 Pattern: External Marks 75+Internal Marks 25 = Maximum Total Marks: 100)

Required Lectures: 45+15 hours

Unit- 1: Foundation to Marketing **(05)**

1.1 What Is Marketing?
1.2 Nature, Scope & Importance of Marketing
1.3 Evolution of Marketing
1.4 Understanding the Market Place & Customer Needs
1.5 The Marketing Concept
1.6 The Changing Marketing Landscape

Unit- 2: Environmental Variables & Marketing Mix **(05)**

2.1 Environmental Monitoring
2.2 External Macro Environment
2.3 External Micro Environment
2.4 Organization Internal Environment
2.5 Responding to the Marketing Environment
2.6 Marketing Mix

Unit- 3: Segmenting & Targeting the Market **(05)**

3.1 Market Segmentation:
i. Segmenting Consumer Market
ii. Segmenting Business Market
iii. Requirement for Effective Segmentation
3.2 Market Targeting: Target Market Strategies
3.3 Differentiation & Positioning
i. Position Maps
ii. Choosing a Differentiation & Positioning Strategy

Unit- 4: Product & Product Related Strategies **(05)**

4.1 Product: Meaning & Classification
4.2 New Product Development
i. New Product Development Process
ii. New Product Adoption & Diffusion
4.3 Product Life Cycle: Product Life Cycle Strategies
4.4 New Product Mix Strategies
i. Product Mix & Product Line
ii. Product Mix Strategies

Unit- 5: Price **(05)**

5.1 Price Determination
i. Meaning & Importance of Price

ii. Pricing Objectives
Iii. Factors Influencing Price Determination
5.2 Pricing Strategies
i. Price vs. Non Price Competition
ii. Market Entry Strategies
iii. Discounts & Allowances
Iv. Geographic Pricing Strategies & Situations

Unit- 6: Channels of Distribution & Physical Distribution **(05)**
6.1Channels of Distribution
i. Middlemen & Distribution Channels
ii. Designing Distribution Channels
iii. Selecting the Type of Channels
iv. Determining the Intensity of Distribution
v. Conflict & Control in Channels
vi. Legal Considerations In Managing Channels
6.2 Physical Distribution
i. Nature & Importance Of Physical Distribution
ii. Tasks In Physical Distribution Management

Unit- 7: Integrated Marketing Promotion **(05)**
7.1 The Role of Promotion in Marketing
7.2 Promotion Methods
7.3 Integrated Marketing Communication
7.4 The Communication Process & Promotion
7.5 Determining the Promotion Mix
7.6 The Promotion Budget

Unit- 8: Social Responsibility & Ethics in Marketing **(05)**
8.1 Social Criticism of Marketing
8.2 Ethics & Marketing
8.3 Consumer Action to Promote Sustainable Marketing
8.4 Business Action toward Sustainable Marketing
8.5 Ecological Marketing

Unit- 9: Strategic Marketing Planning & Implementation **(05)**
9.1Strategic Marketing Planning Process
i. Implementation
ii. Organizing for Implementation
iii. Post Sale Follow Trough
9.2 Evaluating Marketing Performance

Reference
1. Principles of Marketing-A South Asian Perspective Pearson, 13th Edition, Philip Kotler, Gary Armstrong, Prafulla Agnihotri, Ehsan UlHaque
2. Marketing-(Special Indian Edition) Mac Graw Hill 14th 2 Edition Michael Etzel, Bruce Walker, William Stanton,
3. Marketing Management -Ajay Pandit the Mac Graw Hill Cos. RajanSaxena
4. Marketing Management-Planning, Implementation& Control Global Perspective, Indian Context, Macmilln Business Books, V.S Ramaswamy, S. Namakumari

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: First Year M.B.A. (W.E.F. June -2013)

Paper: 204 Human Resource Management

(75 + 25 Pattern: External Marks 75+Internal Marks 25 = Maximum Total Marks: 100)

Required Lectures: 45+15 hours

Unit-1: Human resource management -an overview (8)

1.1 Meaning, Definition, Nature, Scope & Objectives of HRM
1.2 Characteristic & Significance of Human Resource
1. 3 Functions of HRM
1.4. HRM vs. Personnel Management, HRM vs. HRD
1.5. Challenges before HRM
1.6 Human resource Environment
1.6. Human Relations- Human Relations Movement, Group Dynamics, Approaches, Challenges

Unit-2: Human resource planning and Process (14)

2.1 Human Resource Planning
i. Concept & Need of HRP
ii. Process of Human Resource Planning
iii. Manpower Demand and supply,
iv. Prerequisites of HRP
2.2 Process of Procurement: Recruitment, Concept, Purpose & Factors Affecting Recruitment, Sources of Recruitment, Process of Recruitment
2.3 Selection: Concept Selection process, barriers of selection
2.4 Placement: Concept & Problems
2.5 Induction: Concept, Objective & Steps in Induction, Problems in Induction

Unit-3: Human Resource Development (10)

3.1 Performance appraisal: Definitions, Objective & Process of Performance Appraisal,
3.2 Methods of Performance Appraisal: a) Traditional Methods: Ranking, Paired Comparison, Grading, Critical Incident, Force Choice, Checklist, Graphic Rating, Essay Evaluation, Confidential Reports, b) Modern Methods: MBO, BARS, 360 Degree Appraisal System, Problems with Performance Appraisal
3.3 Post Appraisal Analysis
3.4 Employee Training
i. Meaning, Need and Objective of Training
ii. Methods of Training: On the Job & Off the Job
iii. Evaluation of Training
iv. Executive Development

Unit-4: Wages & Salary Administration & Employee Motivation & Morale (8)

4.1 Nature, Purpose and Objectives of W & S Administration
4.2 Factors Influencing Wages Policy

4.3Time & Piece Rate System of Wages
4.4 Wage Differentials: reasons and types.
4.5 Incentives: Meaning, types and importance
4.6 Meaning &Importance of Motivations & Theories of Motivation
4.7Meaning & Causes of Morale, Indications of High & Low Morale

Unit-5: Recent Trends in HRM **(10)**

5.1 HR as distinctive competitive advantage
5.2 Human Resource Accounting and Audit
5.3 Human Resource Information System
5.4 Employer branding
5.5 Human Resource Research
5.6 Moonlighting by employees
5.7 Competency Mapping
5.8 Flexi time & Flexi work
5.9 e-HRM, e-recruitment, e-training & e-learning

References:

1. Human Resource Management, Text & Cases by Dr. V.S.P Rao - Excel Books
2. Essentials of Human Resource Management by P. Subba Rao – Himalaya Publishing House
3. Human Resource Management by S.S.Khanka – S Chand & Sons
4. Human Resource Management by Dr K. Ashwathappa – Tata McGraw Hill
5. Comprehensive Human Resource Management by P.L.Rao - Excel Books
6. Human Resource Management by A M Sharma – Himalaya Publishing
7. Managing Human Resources by Fisher- Cengage Learning
8. Human Resource Management by Dr. C.B. Gupta – Sultan Chand & Sons
9. Human Resource Management by Gary Dessler.- Pearson/ Prentice Hall
10. Personnel Management: - C. B. Mamoria Himalaya Publishing

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: First Year M.B.A. (W.E.F. June -2013)

Paper: 205 Operations and Materials Management

(75 + 25 Pattern: External Marks 75+Internal Marks 25 = Maximum Total Marks: 100)

Required Lectures: 45+15 hours

Unit-1: Production and operation Management **(07)**

1.1 Meaning, scope, functions of production management,
1.2 life cycle concept extended to Production system,
1.3 Historical evolution of production management, recent trend in production,
1.4 Automation.
1.5 Decision making in Production and Operation Management
1.6 Difference between operation and production
1.7 The role and challenges facing operations managers.

Unit-2: Production System and Demand Forecasting **(07)**

2.1 A production system model: production system Diversity
2.2 elements and types of production systems
2.3 Productivity-measures and its uses, Factors affecting productivity.
2.4 Meaning, need, objective for demand forecasting
2.5Types of forecast
2.6 Steps in forecasting process

Unit-3: Capacity Planning **(07)**

3.1 Concept- Meaning,
3.2 Types of capacity,
3.3 Measurement of capacity,
3.4 long term capacity planning,
3.5Capacity planning
3.5 Capacity requirement planning strategies
3.6 Balancing capacity, economic run length.

Unit-4: Facility planning and plant layout **(07)**

4.1 Introduction –factor affecting plant location,
4.2 Localization-needs for location decision selection of site,
4.3 Method of evaluating location alternatives,
4.4 Recent trends in location of industries.
4.5 Government Control on Location of Industries
4.6 Importance of facility layout

Unit-5 Plant layout and plant Maintenance **(06)**

5.1 Meaning-need-importance-objectives, Plant layout factors,
5.2 Types of plant layout,
5.3 Layout tools and techniques,
5.4 Layout and computers.
5.5 Plant Maintenance and Materials Handling

i. Meaning – Necessity –objectives
ii. Types of maintenance, Preventive, predictive and overhaul

iii .Selection of Good Materials Handling equipment
Iv. Trends in maintenance,

Unit-6: Work study **(06)**

6.1 Meaning, importance, objectives of work study.
6.2 Work study procedure, organizing for work study
6.3 Duties and responsibilities of industrial engineering department, standard time,
6.5 Method Study – Need, Objectives, Advantages and Method Study Procedures
6.6 Work Measurement – Definition, Objectives, Steps in Work Measurement,
Techniques of Work Measurement – Time Study, Synthesis Method, Analytical Estimation, Pre-determined Motion Time Study System (PMTS), work sampling.

Unit 7 Quality Control and Quality Assurance **(05)**

7.1 Definition of Quality, inspection and quality control.
7.2 Quality control, benefits and objects of quality control
7.3 Total quality Management: Principles and elements of TQM
7.4 Types of acceptance sampling plans-single sampling, double sampling sequential sampling, quality Circle.
7.5 Six sigma theme, quality certification, ISO 9000 certification and benefits.

Books

1. K. Sridhara Bhat-Production & Operations Management, 2009 (4th Edition), Himalaya Publishing House
2. S. A. Chunawalla, D. R. Patel-Production & Operation Management, 2006, Himalaya Publishing House
3. K. Ashwathappa & K. Sridhara Bhat-Production & Operations Management, 2008,(2nd Edition),Himalaya Publishing House
4. Kanishka Bedi – Production and Operations Management , 2007,(2nd edition); Oxford University Press
5. Buffa, E. S. and Sarin, R. K. – Modern Production /Operations Management; John Wiley
6. Chary, S.N. – Production and Operations Management (3rd edition); TMH
7. Chase, Jacobs, Aquilano and Agarwal – Operations Management for Competitive Advantage (11th edition); TMH
8. Production/operation Management by Dr. B.S. GOEL
9. Evans and Lindsay – The Management and Control of Quality (6th edition); Cenage Learning
10. Gaither and Frazier – Operations Management (9th edition); Thomson Learning
11. Gopalakrishnan and Sundaresan – Materials Management: An Integrated Approach; TMH

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: First Year M.B.A. (W.E.F. June -2013)

Paper: 206 Advance Research Methods

(75 + 25 Pattern: External Marks 75+Internal Marks 25 = Maximum Total Marks: 100)

Required Lectures: 45+15 hours

Unit-1: Introduction (06)

Meaning, Types, Criteria of good research, Marketing research, scientific approach to research in physical and management science, Limitations of applying scientific methods in business research problems, Ethical issues in business research

Unit-2: Business Research-An Overview (06)

Research process, problem formulation, management problem v/s. research problem, Steps involved in preparing business research plan/proposal Business Research Design: Exploratory, Descriptive, & Causal research exploratory research: Meaning, suitability, collection, and hypothesis formulation

Unit 3 Research Design (05)

Meaning and need for research design, Features of good research design, Choice of research design, Scientific method and research design, Types of research design Validity and reliability in research

Unit-4: Data collection (06)

Primary and Secondary data – Sources – advantages/disadvantages, Data collection Methods –Observations, Survey, Interview and Questionnaire design, Qualitative Techniques of data collection. Measurement & Scaling Techniques: Nominal Scale, Ordinal Scale, Interval Scale, Rating Scale, Criteria for good measurement, attitude measurement – Likert's Scale, Semantic Differential Scale, Thurston-equal appearing interval scale, MDS – Multi Dimensional Scaling.

Unit-5: Hypothesis (06)

Meaning, Types, characteristics, sources, Formulation of Hypothesis, Errors in hypothesis testing, parametric and nonparametric test: T-test, Z-test, F-test, U-test, Rank-Sum test, K-W test. (Theory only)

Unit-6: Sampling (05)

Meaning, Steps in Sampling process, Types of Sampling - Probability and non probability Sampling Techniques, Errors in sampling. Sampling process

Unit-7: Introduction to statistical tools of Business Research (05)

Bivariate Analysis (Chi-square only), Multivariate Analysis - Factor Analysis, Discriminant Analysis, Cluster Analysis, Conjoint Analysis, **ANOVA** – One-way & Two-way classification (Theory only).

Unit 8: Report Preparation and Presentation (05)

Objective, Importance of the Report and presentation, Report preparation, Report format, Report writing, Guidelines for tables and graphs. Reading the research report

References books

1. Research Methodology (Methods & Techniques) – C.R.Kothari - Wiley Eastern Ltd
2. Business Research Methodology – Shrivastav- Tata McGraw Hill
3. Business Research Methodology – J.K. Sachdeva- Himalaya Publishing House
4. Marketing research-An applied orientation,5th edition-Naresh K. Malohtra,Satyabhushan Dash- pearson Publication
5. Research Methodology – A.B. Rao- Excel Books
6. Management Research Methodology – Krishnaswamy, Sivakumar, Mathirajan– PearsonEducation
7. Methodology and Techniques of Social Research- Wilkinson &Bhandarkar- Himalaya Publishing House
8. Business Research Methods- Murthy, Bhojanna- Excel Books

School of Management Studies,
P.G. Department of Management
North Maharashtra University, Jalgaon

(Grade 'B' (2.88) NAAC Re- Accredited)

FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: First Year M.B.A. (W.E.F. June -2013)

Paper: 207 Ethical Managerial Practices

(75 + 25 Pattern: External Marks 75+Internal Marks 25 = Maximum Total Marks: 100)

Required Lectures: 45+15 hours

Unit-1: Role of Indian Ethical values in Management **(07)**

1.1 Dharma as a strategic intervention tool
1.2 Doctrine of Karma as a management technique
1.3 Purushottama - A Model of leadership
1.4 Kautilya's Economic view
1.5 Vivekananda's socio-economic ethics
1.6 Moral Laws of Gandhi

Unit-2: Understanding Ethics **(07)**

2.1 Moral
2.2 Personal Ethics
2.3 Stages of moral development
2.4 Kohlberg's six stages system
2.5 Office ethics vs. Business ethics
2.6 Myths about business ethics
2.7 Myths busting about office ethics

Unit-3: Business Ethics: Conceptual Framework **(08)**

3.1 Determinants of Individual Ethics
3.2 Business ethics- Meaning, Need, Importance of ethics in business
3.3 Why business Ethics is vital for Managers?
3.4 Factors influencing Business ethics
3.5 Principle of Business Ethics
3.6 Attitude of Indian manager towards Business Ethics
3.7 Implication of ethical leadership
3.8 Ethical decision making in the organization
3.9 Ethical dilemmas- Features and approaches to resolving it
3.10 Ten Commandments of Managerial Conduct

Unit-3: Ethics in Business Disciplines **(06)**

3.1 Ethics in marketing
3.2 Ethical and social issues in Advertisements.
3.3 Ethics & HRM
3.4 Ethics in Accounting & Finance
3.5 Ethics in Information Technology

Unit-4: Social Responsibility and Organizations **(06)**

4.1 Definition, Arguments for and against Social Responsibility
4.2 Gandhian Philosophy of Wealth management

4.3 Responsibilities of organization towards-Shareholders-Employees-Consumers-Suppliers-Government-Society
4.4 Organizational approaches to social responsibility
4.5 Major social responsibilities of Business organization
4.6 Social Responsible Practices of different Corporate

Unit-5: Concept of Corporate Governance (06)
5.1 History and development, Objectives, Need
5.2 Importance of Corporate Governance
5.3 Principles of Corporate Governance
5.4 Corporate Governance in world-practices and perspectives

Unit-7: Ethical Paradoxes & Cases (05)

References book:

1. Business ethics & Professional Values by A.B.Rao, Excel Books
2. Business Ethics-Concept & Cases by Manuel G. Velasquez
3. Business Organization and Management by Neeru Vasisth, Namita Rajput, Kitab Mahal Publishing
4. Management by Ricky W.Griffin, AITBS Publishers
5. Corporate Governance by P. P. Arya, B.B. Tondon, A. K. Vashisht, Himalaya Publishing House
6. Ethical Management by Satish Modh, McMillan India Ltd.
7. Business Ethics by Dr. A.K. Gavai, Himalaya Publishing House
8. Corporate Governance & Business Ethics: Text & Cases by U.C. Mathur, McMillan India Ltd.
9. Business Ethics and Indian Value System: text and cases by Anand Singh, Himalaya Publishing House
10. Business ethics and managerial values by S. K. Bhatia, Deep & Deep Publications

SSBT's College of Engineering & Technology, Bambhori

Department of Applied Science

Teaching Work Sheet SEM: – I (July-November 2016)

Name of Faculty	FE/SE	Subject	Th	Pr/Tut	LOAD
1.Dr M Panigrahi	FE	EM-I	04	1	**11**
	SE	EM-III	04	2	
2.S S Patil	FE	EM-I	08	03	**183**
	SE	EM-III	04	03	
3.M V Deshpande	FE	EM-I	08	03	**18**
	SE	EM-III	04	03	
4.Parag V Patil	FE	EM-I	08	04	**18**
	SE	EM-III	04	02	
5.A.V.Khambayat	FE	EM-I	08	04	**18**
	SE	EM-III	04	02	
6.R.A.Kukkar	FE	EM-I	00	03	**13**
	SE	EM-III	08	02	
7.Dr K S Patil	FE	EP-I	09	09	**18**
8.C U Nikam	FE	EP-I	09	09	**18**
9.M B Patil	FE	EP-I	09	09	**18**
10.A R Mali	FE	EC-I	09	09	**18**
11.U T Patil	FE	EC-I	09	09	**18**
12.H A Wani	FE	EC-I	09	09	**18**
13.N B Bhoi	FE	SS-I	05	13	**18**
14.R A Adakmol	FE	SS-I	04	14	**18**
	TOTAL LOAD		127	112	**240**

HOD

Applied Science

SSBT's College of Engineering & Technology, Bambhori

Department of Applied Science

Teaching Work Sheet SEM: – II (Jan-April 2016)

Name of Faculty	FE/SE	Subject	Th	Pr/Tut	LOAD
1. Dr M Panigrahi	FE	EM-II (2-Sec)	08	04	**12**
2. S S Patil	FE	EM-II(2-Sec)	08	05	**18**
	SE	Biostatics (**Bio-Tech)**	04	01	
3. M V Deshpande	FE	EM-II (1-Sec)	04	03	**18**
	SE	EM-III (**E&Tc-A,B)**	08	03	
4.Parag V Patil	FE	EM-I (2-Sec)	08	03	**18**
	SE	EM-III (**Mech-A)**	04	03	
5.A.V.Khambayat	FE	EM-II (2-Sec)	08	03	**18**
	SE	EM-III (**Mech-B)**	04	03	
6.Dr K S Patil	FE	EP-II (3-Sec)	09	07	**16**
7.C U Nikam	FE	EP-II (3-Sec)	09	10	**19**
8.M B Patil	FE	EP-II (3-Sec)	09	10	**19**
9.D I Desai	FE	EC-II (2-Sec)	06	08	**14**
10.A R Mali	FE	EC-II (2-Sec)	06	06	**12**
12.U T Patil	FE	EC-II (3-Sec)	09	05	**14**
13.H A Wani	FE	EC-II (2-Sec)	06	08	**14**
14.N B Bhoi	FE	Soft Skill II	05	13	**18**
15.R A Adakmol	FE	Soft Skill II	04	14	**18**
	TOTAL LOAD		119	109	**228**

HOD

Applied Science

DEPARTMENT OF BIOTECHNOLOGY, SSBT's, COET, BAMBHORI, JALGAON

TEACHING LOAD DISTRIBUTION

ACADEMIC YEAR: 2015-2016 (SEMESTER I)

Date: 30-04-2015

SR.NO.	NAME	DESIGNATION	YEAR	SUBJECT	TH (Hrs)	PR BATCH X (Hrs)	TOTAL
1.	**Dr.I.D.Patil**	Prof. & HOD	SE	BPCAL	04	01(T)	09
			BE	Project & Seminar	--	04	
2.	**Mr. Jayant P.P.**	Assistant Prof.	TE	ENZ	03	--	18
			TE	Mol Bio	04	04	
			BE	DSP	03	02	
			BE	Int.D. Elective	03	--	
			BE	Project -I	--	02	
3.	**Mrs. S.S.Pawar**	Assistant Prof.	SE	UO I	04	02	16
			TE	CRE	04	02	
			TE	BIA		02	
			BE	PROJECT-I	--	02	
4.	**Mr. Gaurav Khodape**	Assistant Prof.	TE	Tissue Culture	01	02	17
			TE	BIEM	04	--	
			TE	Bioinfo	03	02	
			BE	BED	03	--	
5.	**Mr. Vikas Dongardive**	Assistant Prof.	SE	MB	04		17
			TE	ENZY	04		
			BE	Elective-I	03	02	
			BE	Project-I & Seminar		04	
6.	**Ms. Aaisha Sayyad**	Assistant Prof.	SE	CB	04	02	17
			SE	SOFT SKILLS	01	02	
			TE	BIA	04		
			TE	MB		04	
						TOTAL :	**94**

Dr.I.D.Patil
HOD Biotech

DEPARTMENT OF BIOTECHNOLOGY
SSBT'S COLLEGE OF ENGINEERING & TECHNOLOGY, BAMBHORI.
TEACHING LOAD DISTRIBUTION
ACADEMIC YEAR: 2015-2016 (SEMESTER II)

Date: 15-01-2016

SR.NO.	NAME	DESIGNATION	CLASS	SUBJECT	TH (Hrs)	PR BATCH X (Hrs)	TOTAL
1	Dr.I.D.Patil	Prof. & HOD	TE	IPR &E	04	--	12
			TE	Seminar-I	--	02	
			TE	Mini project	--	02	
			BE	PROJECT-II	--	04	
2	Mr. Jayant P. Parpalliwar	Assistant Prof.	BE	BPI	03	02	20
			TE	GENE	04	02	
			BE	Ele-II	03	02	
			BE	Project-II		04	
3	Mrs. S. S. Pawar	Assistant Prof.	SE	UO II	04	02	21
			SE	PHT	04	02	
			TE	MT	03	02	
			BE	PROJECT-II	--	04	
4	Mr. Gaurav Khodape	Assistant Prof.	TE	BPE	04		20
			BE	BPMS	03	02	
			TE	BP&FT	--	04	
			SE	CA	01	02	
			BE	PROJECT-II	--	04	
5	MS. Aaisha Sayyad	Assistant Prof.	SE	BCH	04	02	16
			SE	IMMU	--	02	
			TE	Minor Project	--	02	
			TE	Seminar-I	--	02	
			TE	FT	04		
6	Ms. Shraddha Ujjainwal	Contributory Lecturer	SE	IMMU	04	01	08
			BE	Ele-III	03	--	
TOTAL							**97**

Dr.I.D.Patil

(HOD, BIOTECH DEPT)

SSBT'S COLLEGE OF ENGINEERING & TECHNOLOGY, BAMBHORI.

DEPARTMENT OF CHEMICAL ENGINEERING

TEACHING LOAD DISTRIBUTION FOR TERM II,

SEM : IV, VI, & VIII

YEAR 2015-2016

SR. NO.	NAME	YEAR	SUBJECT	TH(Hrs)	(Hrs) x PR BATCH	TOTAL
1	Dr. K.S.WANI	T.E.	CRE-I	4	--	4
2	Dr. V.R.DIWARE	B.E.	CPDPE	3	2X2=4	19
		T.E.	PED-II	4	--	
			PROJECT(BE) , Minor Project, Seminar-I (TE)	--	8	
3	Dr.A.R.LOKHANDE	B.E.	CAPEDMS	3	2X2=4	20
		S.E.	MO	3	--	
			LAB CA	--	2X1=2	
			PROJECT(BE) , Minor Project, Seminar-I (TE)	--	8	
4	Dr. S.A.THAKUR	B.E.	Elective II	3	--	15
		T.E.	PEEC	4	--	
			PROJECT(BE) , Minor Project, Seminar-I (TE)	--	8	
5	V.P.SANGORE	T.E.	Entrepreneurship	--	1X2=2	22
		S.E.	APC	4	2X2=4	
			CEP I	4	--	
			LAB CP	--	2X2=4	
			Minor Project, Seminar-I (TE)	--	4	

6	N.Y.GHARE	T.E.	MT-II	4	4X1=4	21
		S.E.	PCAL	3	--	
			MO(TU)	--	1X2=2	
			PROJECT(BE) , Minor Project, Seminar-I (TE)	--	8	
7	Y.D.THAKARE	B.E.	IPC Elective II	3	2X2=4	21
		T.E.	CET	4	--	
			Entrepreneurship	--	1X2=2	
		S.E.	LAB MO	--	1X4=4	
			LAB CA	1	--	
			PCAL(TU)	--	1X1=1	
			Seminar-I (TE)	--	2	
8	Miss.P.N.BHAUTIK	T.E.	CRE - I	--	2X2=4	21
			MT-II	--	4X1=4	
		S.E.	CEP - II	4	--	
			PCAL(TU)	--	1X1=1	
			LAB MO	--	1X4=4	
			LAB CA	--	1X2=2	
			Seminar-I (TE)	--	2	
TOTAL LOAD						143

HOD (CHEMICAL ENGG)

SSBT'S COLLEGE OF ENGINEERING & TECHNOLOGY, BAMBHORI.

DEPARTMENT OF CHEMICAL ENGINEERING

TEACHING LOAD DISTRIBUTION FOR TERM I
SEM: III, V & VII
YEAR 2015-2016

SR. NO.	NAME	YEAR	SUBJECT	TH (Hrs)	PR BATCH x (Hrs)	TOTAL
1	DR.K.S.WANI	B.E.	BCE(ELE-I)	3	0	03
2	DR. V.R.DIWARE	B.E.	CRE-II	3	2X2=4	
			Lab (Ele-I)	0	2x2-4	
			PROJECT	0	2	
			SEMINAR	0	2	
		T.E.	PEDD-I	4	0	19
3	DR.S.A.THAKUR	B.E.	PDC	3	0	
			PROJECT	0	2	
			SEMINAR	0	2	
		T.E.	MT-I	4	0	
			IEM	2	0	13
4	V.P.SANGORE	T.E.	IIA	0	2X2=4	
		S.E.	AIOC	4	2X2=4	
			AOC	4	2X2=4	20
5	N.Y.GHARE	B.E.	TP	3	0	
			PROJECT	0	2	
			SEMINAR	0	2	
			PDC	0	1X2=2	
		T.E.	DA&I	1	1X2=2	
			MT-I	0	1X4=4	
		S.E.	CEM	4	0	20

6	DR. A.R.LOKHANDE	B.E.	EE(Int. Disci)	3	0	
			PROJECT	0	2	
			SEMINAR	0	2	
		T.E.	PHT	4	2X2=4	
			IEM	2	0	
			MT-I	0	1x4=4	21
7	Y.D.THAKARE	B.E.	PDC	0	1X2=2	
		T.E.	IIA	4	0	
		S.E.	FFO	4	2X2=4	
			SS-III	1	2X2=4	21
			DA&I	1	1X2=2	
					TOTAL	117

HOD (CHEMICAL ENGG)

COMPUTER DEPARTMENT

TEACHING LOAD DISTRIBUTION **TERM-I 2015-16**

Sr No.	Name of Staff	Year	Subject	TH	PR	Total
1	G. K. Patnaik	BE(A)	ACN	3	--	10
		BE(B)	ACN	3	--	
		BE	PROJECT	--	4	
2	K.P. Adhiya	SE(A)	MPMC	4		19
		SE(A)	MPMC LAB	-	4*2	
		BE	PROJECT	-	4	
		ME	DS	3		
3	M. E. Patil	TE(B)	CN	4	-	19
		TE(B)	CN LAB	-	4*2	
		ME	SPM	3	2*2	
4	Sandip S. Patil	TE(A)	CN	4	-	19
		TE(A)	CN LAB	-	4*2	
		ME	ASE	3	2*2	
5	Ashish T. Bhole	TE(B)	SE	4	-	21
		TE(B)	SE LAB	-	3*2	
		ME	NCC	3	2*2	
		BE(B)	A C N LAB	-	2*2	
6	S.S. Gharde	TE(A)	SP	4	-	21
		TE(A)	SP	-	6*2	
		ME	AA	3		
		BE	PROJECT	-	2	
7	Nilima Patil	SE(A)	OOT	4	-	20
		SE	OOT LAB	-	7*2	
		BE	PROJECT	-	2	

8	D. D. Puri	SE(B)	DSGT	4	2	20
		SE(B)	DSGT LAB	-	2*2	
		FE(A)	CP	4	-	
		FE(A)	CP LAB		2*2	
		BE	PROJECT	-	2	
9	Shital A. Patil	FE(I)	CP	4	-	20
		FE(I)	CP LAB	-	3*2	
		TE(B)	SP	4	-	
		TE(B)	SP	-	2*2	
		BE	PROJECT	-	2	
10	Akash Waghmare	SE(A)	DSGT	4	2	20
		SE(A)	DSGT LAB	-	6*2	
		BE	PROJECT	-	2	
11	N. Y. Suryavanshi	SE(B)	SS-II	1	-	21
		SE(B)	SS-II LAB	-	2*2	
		TE(A)	FLAT	4	--	
		BE(A)	ACN LAB	-	4*2	
		BE	PROJECT	-	4	
12	Priti R. Sharma	FE(D)	CP	4		21
		FE(D)	CP LAB	-	3*2	
		BE(A)	ES	3	-	
		BE(A)	ES LAB	-	3*2	
		BE	PROJECT	-	2	

13	Dipak D. Bage	FE(B)	CP	4		21
		FE(B)	CP LAB	-	1*2	
		BE(B)	ES	3	-	
		BE	ES	-	5*2	
		BE	PROJECT	-	2	
14	Y. Borse	FE(C,F)	CP	8	-	20
		FE(C,F2)	CP LAB	-	5*2	
		BE	PROJECT	-	2	
15	Atul V. Dusane	SE (B)	MPMC	4	-	16
		SE (B)	MPMC LAB	-	4*2	
		BE	PROJECT	-	4	
16	Satpal Rajput	TE(A)	SE	4	-	21
		TE	SE LAB	-	5*2	
		BE(A)	INTER-DICIPLINARY	3	-	
		BE	PROJECT	--	4	
17	Manojkumar Mahajan	TE(B)	POM	4	-	21
		TE	JAVA LAB	1	6*2	
		BE	PROJECT	-	4	
18	Vijay Ingle	TE(A)	POM	4	-	21
		TE(A)	JAVA LAB	1	2*2	
		BE(A)	ACNLAB		4*2	
		BE	PROJECT	-	4	
19	Jitendra Patil	SE(A)	OOT	4	-	14
		SE(A)	OOT LAB	-	4*2	
		BE	PROJECT	-	2	

20	Sushant Bahekar	FE(E)	CP	4	-	17
		FE(E,A1)	CP LAB	-	4*2	
		BE(A)	AIES	3	-	
		BE	PROJECT	-	2	
21	Vinaya Sawdekar	SE(A)	SS-II	1	-	19
		SE(A)	SS-IILAB	-	6*2	
		TE(B)	FLAT	4	-	
		BE	PROJECT	-	2	
22	Prachi Chaudhari	FE(H)	CP	4	-	19
		FE(H,F1)	CP LAB	-	4*2	
		BE(B)	AIES	3	-	
		BE	PROJECT	-	4	
23	Dhanashree Tayade	BE(B)	AUP	3	-	21
		BE(B)	AUP LAB	-	4*2	
		TE(B)	LINUXLAB		4*2	
		BE	PROJECT	-	2	
25	Chetana T. Baviskar	BE(A)	AUP	3	-	21
		BE(A)	AUP LAB	-	4*2	
		TE(A)	LINUXLAB		4*2	
		BE	PROJECT	-	2	
26	Shweta Pandey	FE(G)	CP	4	-	17
		FE (G,B2)	CP LAB	-	5*2	
		BE(B)	INTER-DICIPLINARY	3	-	

COMPUTER DEPARTMENT
TEACHING LOAD DISTRIBUTION TERM-II 2015-16

Sr No.	Name of Staff	Year	Subject	TH	PR	Total
1	G. K. Patnaik	BE(A)	CD	4	--	14
		BE(B)	CD	4	--	
		BE	PROJECT	--	6	
2	K.P. Adhiya	SE(A)	CO	4		15
		SE(B)	CO	4		
		BE	PROJECT	-	4	
		ME	PC	3		
3	M. E. Patil	BE(B)	SMQA	4	-	18
		BE(B)	SMQA LAB	-	2*2	
		BE(A)	MC	3		
		ME	STQA	3	2*2	
4	Sandip S. Patil	SE(A)	DS	4+2	-	19
		SE(A)	DSLAB	-	2*2	
		ME	SC	3	2*2	
		BE	PROJECT	-	2	
5	Ashish T. Bhole	TE(B)	OOMD	3	-	17
		TE(B)	OOMD LAB	-	2*2	
		BE(B)	MC	3		
		ME	WE	3		
		TE(A)	OOMD LAB	-	1*2	
		BE	PROJECT	-	2	

6	S.S. Gharde	TE(A)	OOMD	4	-	20
		TE(A)	OOMD LAB	-	6*2	
		BE	PROJECT	-	4	
7	Nilima Patil	SE(A)	CG	4	-	20
		SE(A)	CG LAB	-	4*2	
		SE(B)	CG LAB	-	3*2	
		BE	PROJECT	-	2	
8	D. D. Puri	SE(B)	CG	4	-	20
		SE(B)	CG LAB	-	4*2	
		SE(A)	CG LAB	-	3*2	
		BE	PROJECT	-	2	
9	Shital A. Patil	TE(B)	DBMS	4	-	20
		TE(B)	DBMS LAB	-	4*2	
		TE(A)	DBMS LAB	-	3*2	
		BE	PROJECT	-	2	
10	Akash Waghmare	TE(A)	DBMS	4	-	21
		TE(A)	DBMS LAB	-	2*2	
		ME	ADBMS	3	2*2	
		TE(B)	DBMS LAB	-	1*2	
		SE(B)	DS LAB	-	1*2	
		BE	PROJECT	-	2	
11	N. Y. Suryavanshi	TE(A)	ADA	3	-	21
		BE(A)	CD LAB	-	4*2	
		BE(B)	CD LAB	-	3*2	
		BE	PROJECT	-	4	

12	Priti R. Sharma	BE(B)	DWM	4	-	21
		BE(B)	DWM LAB	-	2*2	
		BE(A)	SMQA LAB	-	3*2	
		SE(A)	MPMCI	3+2	--	
		BE	PROJECT	-	2	
13	Dipak D. Bage	TE(A)	OS	4		21
		TE(A)	OS LAB	-	4*2	
		TE(B)	OS LAB	-	3*2	
		SE(A)	MPMCI	3+2	--	
		BE	PROJECT	-	2	
14	Y. Borse	BE(A)	SMQA	4	-	20
		BE(A)	SMQA LAB	-	4*2	
		BE(B)	SMQA LAB	-	3*2	
		BE	PROJECT	-	2	
		SE (B)	MPMCI LAB	-	2*2	
		SE (A,B)	MPMCI LAB	-	2*2	
		BE	PROJECT	-	2	
15	Satpal Rajput	SE(A)	DC	4	-	20
		SE(A)	DC LAB	-	4*2	
		TE(A)	DBMS LAB		2*2-	
		SE(B)	DC LAB	-	1*2	
		BE	PROJECT		2	
16	Manojkumar Mahajan	SE(A)	ADL	1	-	22
		SE(B)	ADL	1	-	
		SE(A)	ADL LAB		4*2	
		SE(B)	ADL LAB		4*2	
		SE(B)	DS LAB	-	1*2	

		BE	PROJECT		2	
17	Vijay Ingle	TE(A)	MIS	3	-	19
		TE(A)	WPL LAB		4*2	
		TE(B)	DBMS LAB	-	2*2	
		BE	PROJECT	-	4	
18	Jitendra Patil	SE(B)	DC	4	-	20
		SE(B)	DC LAB	-	4*2	
		SE(A)	DC LAB	-	3*2	
		BE	PROJECT	-	2	
19	Sushant Bahekar	TE(B)	OS	3		17
		TE(B)	OS LAB	-	4*2	
		TE(A)	OS LAB	-	2*2	
		BE	PROJECT	-	2	
20	Vinaya Sawdekar	TE(B)	ADA	4	-	20
		BE(B)	CD LAB	-	4*2	
		BE(A)	CD LAB	-	3*2	
		BE	PROJECT	-	2	
21	Prachi Chaudhari	TE(A)	WPL LAB		4*2	18
		SE (A,B)	MPMCI LAB	-	4*2	
		BE	PROJECT	-	2	
22	Dhanashree Tayade	BE(A)	DWM	4	-	20
		BE(A)	DWM LAB	-	4*2	
		BE(B)	DWM LAB	-	2*2	
		SE(B)	DS LAB	-	1*2	
		BE	PROJECT	-	2	

23	Chetana T. Baviskar	TE(A)	MIS	3	-	19
		SE (A)	MPMCI LAB	-	4*2	
		SE(B)	MPMCI LAB	-	3*2	
		BE	PROJECT	-	2	
24	Shweta Pandey	SE(B)	DS	4+2	-	20
		SE(B)	DSLAB	-	4*2	
		SE(A)	DSLAB	-	3*2	

Electrical Engineering Department
Load Distribution 2015-16 Semester-I
Teaching load (UG)

S.N.	Name of the Staff	Year	Subject	Th.	Pr.	Tu.	Total Load (Hrs)
1	Dr. P. J. Shah	TE	PE	04	02		10
		BE	Seminar		02		
		BE	Project-I		02		
2	Dr. P. V. Thakre	BE	IDC	03	06		16
		BE	RES*	03			
		BE	Seminar		02		
		BE	Project-I		02		
3	Mr. V. S. Pawar	TE	EME	04			15
		BE	IEE (Elect.-I)	03	04		
		BE	Project-I		02		
		BE	Seminar-II		02		
4	Mr. M. M. Ansari	TE	EM/C-II	04	06		17
		BE	EAC*	03			
		BE	Project-I		02		
		BE	Seminar-II		02		
5	Mr. S. M. Shembekar	TE	PS-II	04	08		19
		BE	PSOC	03			
		BE	Project-I		02		
		BE	Seminar-II		02		
6	Mr. D. S. Patil	SE	EEM	04	08		21
		BE	HVE	03	02		
		BE	Project-I		02		
		BE	Seminar-II		02		
7	Mr. N.S. Mahajan	SE	PS-I	04			20
		SE E&TC	ECM	04	08		
		BE	Project-I		02		
		BE	Seminar-II		02		
8	Mr. S. S. Bhuskute	SE E&TC	ECM		08		18
		TE	EEW		08		
		BE	IDC		02		
9	Ms. S.S. Chhabra	SE	EM-I	04	08	02	20
		TE	PE		06		
10	Ms. N. D. Sapkar	TE	IOM	04			20
		BE	HVE		06		
		SE	EW		08		
		TE	EM/C-II		02		
11	Mr. A.R. Khan	SE	SS - III	01	08		22
		TE	SA-I	01	08		
		BE	IEE		04		
Total Load							**198**

* Interdisciplinary subject

Electrical Engineering Department
Teaching Load Distribution 2015-16 Semester-II (UG)

S.N.	Name of the Staff	Year	Subject	Th.	Pr.	Tu.	Total Load (Hrs)
1	Dr. P. J. Shah	SE	ADE	04	06	-	16
		BE	Project-II		04		
		TE	Seminar-I		02		
2	Dr. P. V. Thakre	SE	NA	03	04	02	19
		FE	EEEE	04			
		BE	Project-II		04		
		TE	Seminar-I		02		
3	Mr. V. S. Pawar	TE	CS-I	03	08		21
		BE	FACTS & PQ	04			
		BE	Project-II		04		
		TE	Seminar-I		02		
4	Mr. M. M. Ansari	SE	EM/C-I	04	08	02	24
		BE	PSS	04			
		BE	Project-II		04		
		TE	Seminar-I		02		
5	Mr. S. M. Shembekar	SE	EIED	04	08		25
		BE	SGP	03	04		
		BE	Project-II		04		
		TE	Seminar-I		02		
6	Mr. D. S. Patil	SE	NT	04			23
		TE	EM-II	03	08		
		SE	CP/MATLAB		02		
		BE	Project-II		04		
		TE	Seminar-I		02		
7	Mr. N.S. Mahajan	BE	CAPSA	04	04		25
		BE	SGP		04		
		SE	CP/MATLAB	01	06		
		BE	Project-II		04		
		TE	Seminar-I		02		
8	Mr. S. S. Bhuskute	TE	EMD	04			23
		SE Mech.(A)	BEDC	03	06		
		SE	NA		04		
		TE	Minor Project		02		
		TE	Seminar-I		02		
		FE	WP-II		02		
9	Ms. N. D. Sapkar	SE Mech.(B)	BEDC	03	06		23
		TE	SA-II		08		
		SE	ADE		02		
		TE	Minor Project		02		
		TE	Seminar-I		02		
10	Mr. A. R. Khan	TE	MPMC	04	08		24
		BE	PSDP	04	04		
		TE	Minor Project		02		
		TE	Seminar-I		02		
11	Miss N.R. Bhole	TE	ED	03			23
		BE	PSS		08		
		FE	WP-II		08		
		TE	Minor Project		02		
		TE	Seminar-I		02		
Load				**66**	**176**	**04**	**246**
Industrial Lecture/week by Industrial person							01
Total Load							**247**

Academic year 2015-16 (Semester –I)
Teaching load (PG)

S. N.	Name of the Staff	Year/ Sem.	Subject						No. of Batches	Total Load (Hrs)
				Th.	Pr.	Tu./ D	Project	Seminar		
1	Dr. P.J.Shah	ME-(FY)/I	MPMC	3	-	-	-	-	-	09
		ME-(FY)/I	Seminar-I	-	-	-	-	2		
		ME-(SY)/I	Project Stage-I	-	-	-	4	-		
2	Dr. P.V. Thakre	ME-(FY)/I	Lab. Pract.	-	2	-	-	-	1	02
3	V. S. Pawar	ME-(FY)/I	PSOT	3	-	-	-	-	-	11
		ME-(FY)/I	Seminar-I	-		-		2	-	
		ME-(SY)/I	Project Stage-I	-	-	-	4	-	-	
4	M.M.Ansari	ME-(FY)/I	PSD	3	-	-		-	-	07
		ME-(SY)/I	Project Stage-I	-	-	-	4	-	-	
5	S. M. Shembekar	ME-(FY)/I	FACTS & PQ	3	-	-	-	-	-	09
		ME-(SY)/I	Project Stage-I	-	-	-	4	-	-	
		ME-(SY)/I	Seminar-III	-	-	-	-	2	-	
6	N.S. Mahajan	ME-(FY)/I	PSPR	3	-	-	-	-	-	09
		ME-(FY)/I	Lab. Pract.	-	4	-	-	-	2	
		ME-(SY)/I	Project Stage-I	-	-	-	2	-	-	
		ME-(SY)/I	Seminar-III	-	-	-	-	2	-	
	Total Load			15	06		18	08		**47**

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Academic year 2015-16 (Semester –II)
Teaching load (PG)

S.N.	Staff Name	Year/ Sem.	Subject					Total Load (Hrs)
				Th	Pr.	Tu./D	Project and Sem.	
1	Dr. P.J.Shah	ME/II (FY)	DSP	03				11
		ME/II (FY)	Lab. Practice		02			
		ME/IV (SY)	Project Stage-II				06	
		ME/II (FY)	Seminar-II					
2	V.S. Pawar	ME/II (FY)	Elective-II	03				11
		ME/II (FY)	Lab. Practice		02			
		ME/IV (SY)	Project Stage-II				06	
		ME/II (FY)	Seminar-II					
3	M.M. Ansari	ME/II (FY)	HVPT	03				09
		ME/IV (SY)	Project Stage-II				06	
		ME/II (FY)	Seminar-II					
4	S.M. Shembekar	ME/II (FY)	PSMC	03				09
		ME/IV (SY)	Project Stage-II				06	
		ME/II (FY)	Seminar-II					
5	N. S. Mahajan	ME/II (FY)	CMPSA	03				11
		ME/II (FY)	Lab. Practice		02			
		ME/IV (SY)	Project Stage-II				06	
		ME/II (FY)	Seminar-II					
	Total load			15	06		30	51

COLLEGE OF ENGINEERING & TECHNOLOGY, BAMBHORI.

ELECTRONICS & TELECOMMUNICATION DEPARTMENT

TENTATIVE TEACHING LOAD SHEET
M.E. (DIGITAL ELECTRONICS) for Term- I
Year 2015-2016

Sr. No.	Name	Year and Term	Subject	Theory	Practical	Total load for each staff
01	Dr. S. R. Suralkar	ME FY Term I	AIS Seminar-I	03 --	-- 02*01=02	05
02	Prof. D. U. Adokar	ME FY Term I	DSD DSD Lab-I	03	-- 02*01=02	05
03	Dr. P. H. Zope	ME FY Term I	VLSI-D Seminar-I	03 --	-- 02*01=02	05
04	Prof.A.H.Karode	ME FY Term I	PC AIS Lab-I	02 --	-- 02*01= 02	04
05	Prof.N. M. KAZI	ME FY Term I	PC	01	--	01
06	Prof.S. U. NYATI	ME FY Term I	ADSP ADSP LAB-I	03 --	-- 02*01= 02	05
			Subtotal	15	10	
					Total	**25**

COLLEGE OF ENGINEERING & TECHNOLOGY, BAMBHORI.

ELECTRONICS & TELECOMMUNICATION DEPARTMENT

TEACHING LOAD SHEET

Second Year Term- III & IV

Year 2015-2016

Sr. No.	Name	Year and Term	Subject	Theory	Practical	Total
1	Dr S. R. Suralkar	ME SY Term I	Project Stage-I	--	18*01=18	18
2	Dr. P. H. Zope	ME SY Term I	Project Stage-I	--	18*01=18	18
3	Dr. M. P. Deshmukh	ME SY Term I	Project Stage-I	--	18*01=18	18
4	Prof. D U. Adokar	ME SY Term I	Project Stage-I	--	18*01=18	18
5	Prof. N. M. Kazi	ME SY Term I	Project Stage-I	--	18*01=18	18
6	Prof. A. C. Wani	ME SY Term I	Project Stage-I	--	18*01=18	18
7	Prof. A. H. Karode	ME SY Term I	Project Stage-I	--	18*01=18	18
8	Prof. S. U. NYATI	ME SY Term I	Project Stage-I	--	18*01=18	18
9	Prof S. P Ramteke	ME SY Term I	Project Stage-I	--	18*01=18	18
10	Prof V. M. Deshmukh	ME SY Term I	Project Stage-I	--	18*01=18	18
					TOTAL	180

Total Teaching Load = 180 Hrs.

COLLEGE OF ENGINEERING & TECHNOLOGY, BAMBHORI.

ELECTRONICS & TELECOMMUNICATION DEPARTMENT

TEACHING LOAD SHEET
M.E. (DIGITAL ELECTRONICS) for Term- II
Year 2015-2016

Sr. No.	Name	Year and Term	Subject	Theory	Practical	Total
1	Dr. S. R. Suralkar	ME FY Term II	IP&PR Seminar-II	03 --	-- 02*01=02	05
2	Dr. P. H. Zope	ME FY Term II	ESD Seminar-II	03	02*01=02 02*01=02	07
3	Prof. N. M. Kazi	ME FY Term II	ACN Seminar-II	03	---	03
4	Prof.A.H.Karode	ME FY Term II	ADC IP&PR	03	-- 02*01= 02	05
5	Prof. A. C Wani	ME FY Term II	MCD	03	--	03
6	Prof. S P Ramteke	ME FY Term II	ADC	--	02*01= 02	02
7						
8			Subtotal	15	10	
9					**Total**	**25**

COLLEGE OF ENGINEERING & TECHNOLOGY, BAMBHORI.

ELECTRONICS & TELECOMMUNICATION DEPARTMENT

TEACHING LOAD SHEET
M.E. (DIGITAL ELECTRONICS)
Year 2014-2015

Second Year Term- IV

Sr. No.	Name	Year and Term	Subject	Theory	Practical	Total
01	Dr U. S. Bhadade	ME SY Term I	Project Stage-II	--	18*01=18	18
02	Prof. S. R. Suralkar	ME SY Term I	Project Stage-II	--	18*01=18	18
03	Dr. P. H. Zope	ME SY Term I	Project Stage-II	--	18*01=18	18
04	Prof. A. H. Karode	ME SY Term I	Project Stage-II	--	18*01=18	18
05	Dr. M. P. Deshmukh	ME SY Term I	Project Stage-II	--	18*01=18	18
06	Prof. N. M. Kazi	ME SY Term I	Project Stage-II	--	18*01=18	18
07	Prof. A. C. Wani	ME SY Term I	Project Stage-II	--	18*01=18	18
08	Prof. S. U. NYATI	ME SY Term I	Project Stage-II	--	18*01=18	18
09	Prof S. P Ramteke	ME SY Term I	Project Stage-II	--	18*01=18	18
10	Prof D. U. Adokar	ME SY Term I	Project Stage-II	--	18*01=18	18
11	Prof V. M. Deshmukh	ME SY Term I	Project Stage-II	--	18*01=18	18
12	Prof. P. V. Thakre	ME SY Term I	Project Stage-II	--	18*01=18	18
					TOTAL	216

Total Teaching Load = 216 Hrs.

S.S.B.T'S College of Engineering & Technology, Bambhori, Jalgaon

Department of Information Technology

Load Distribution (SEM-I) 2015-16

Sr. No.	Staff Name	Designation	Class	Subject	Theory	Practical	Total Load
1	Dr. U. S. Bhadade	Professor	SEIT	OOT	4	2*1=2	10
			BE.IT	Project	--	2	
			BE IT	Seminar	--	2	
2	Mrs. A. K. Bhavsar	Asso. Prof	TE IT	SE	4	2*4=8	20
			BE.IT	IT	4	--	
			BE.IT	Project	--	2	
			BE IT	Seminar	--	2	
3	Mr. S. J. Patil	Asst. Prof	TE IT	CN	4	2*4=8	19
			TE IT	JPL	1	2*2=2	
			BE.IT	Project	--	2	
			BE IT	Seminar	--	2	
4	Mr. N. P. Jagtap	Asst. Prof	BE IT	ES	3	2*4=8	20
			SE IT	DSGT	4+1(T)	--	
			BE IT	Project	--	2	
			BE IT	Seminar	--	2	
5	Mr. S. H. Rajput	Asst. Prof	BE IT	AI	3	2*4=8	21
			TE IT	FLAT	4	--	
			TE IT	JPL	--	2*1=2	
			BE IT	Project	--	2	
			BE IT	Seminar	--	2	

6	Mr. R. B. Sangore	Asst. Prof	BE IT	ERP & SAP	3		20
			BE IT	ERP	3	--	
			SE IT	IT		2*4=8	
			TE IT	JPL	--	2*1=2	
			BE IT	Project	--	2	
			BE IT	Seminar	--	2	
7	Mr. P. C. Harne	Asst. Prof	TE IT	SP	4	2*4=8	20
			SE IT	DSGT	--	2*2=4	
			BE IT	Project	--	2	
			BE IT	Seminar	--	2	
8	Mr. H. R. Kotwal	Asst. Prof	SE IT	OOT	--	2*3=6	14
			TE IT	POM	4	--	
			BE IT	Project	--	2	
			BE IT	Seminar	--	2	
9	Mr. S. K. Singh	Asst. Prof	BE IT	AUP	4	2*4=8	22
			TE IT	JPL	--	2*1=2	
			SE IT	DSGT	--	2*2=4	
			BE IT	Project	--	2	
			BE IT	Seminar	--	2	
10	Mr. P. K. Patil	Asst. Prof	SE IT	DSMP	4	2*4=8	20
			TE IT	LL	--	2*4=8	
11	Mr. M. S. Patil	Asst. Prof	SE IT	SS-III	1	2*4=8	14
			SE IT	DSGT	1(T)	--	
			BE IT	Project	--	2	
			BE IT	Seminar	--	2	
						Total	**200**

Department of Information Technology
Load Distribution (SEM-II) 2015-16

Sr. No.	Staff Name	Designation	Class	Subject	Theory	Practical	Project/ Seminar/ Mini Project	Total Load
1	Dr. U. S. Bhadade	Professor	SE IT	DS	4+1(T)	--	4	9
2	Mrs. A. K. Bhavsar	Asso. Prof	TE IT	OOMD	4	4*2=8	4	20
			SE IT	DC	4	--		
3	Mr. S. J. Patil	Asst. Prof	BE IT	C & NS	3	--	4	18
			BE IT	IS	3	4*2=8		
4	Mr. N. P. Jagtap	Asst. Prof	BE IT	CC	3	--	4	19
			TE IT	DBMS	4	4*2=8		
5	Mr. S. H. Rajput	Asst. Prof	SE IT	MPMCI	4+1(T)	3*2=6	4	18
			BE IT	SMQA	3	--		
6	Mr. R. B. Sangore	Asst. Prof	TE IT	OS	4	4*2=8	4	19
			BE IT	MC	3	--		
7	Mr. H. R. Kotwal	Asst. Prof	SE IT	CGM	4	3*2=6	4	22
			TE IT	WPL	--	4*2=8		
8	Mr. P. C. Harne	Lecturer	TE IT	MIS	4	--	4	15
			SE IT	DS	1(T)	3*2=6		
9	Mr. S. K. Singh	Lecturer	BE IT	DWM	3	2*4=8	4	16
			SE IT	MPMCI	1(T)	--		
10	Mr. P. K. Patil	Lecturer	SE IT	CO	4	--	4	21
			SE IT	ADL	1	3*2=6		
			BE IT	C & NS	--	3*2=6		
11	Mr. M. S. Patil	Lecturer	TE IT	E COM	4	--	4	16
			BE IT	SMQA	--	1*2=2		
			SE IT	DC	--	3*2=6		
Total								**193**

Item No.17(A)
DEPARTMENT-Civil Engineering
Teaching work load of all classes in current year 2014-15(Term wise)

Year Course Semester	Subject	Load pattern per week				No.of batches	Total equivalent load per week			Total work load
		Th	Pr	Drg.	Tut.		Th	Pr	Drg.	
SemI FE(Civil)	ECE&EM	3	2	-	1	Pr 3x10=30	40	60	-	100
SemI SE (Civil)	SOM	3x2	2	-	2	6	8	12	-	82
	BCTM	3x2	-	2		6	6	-	12	
	CT	3x2	2	-		6	3	12	-	
	SUR-I	3x2	2	-		6	3	12	-	
	Soft Skill -III	2	2	-		6	2	12	-	
SemII SE (Civil)	FM-I	3	2		1	6	4	12		91
	TOS-I	3	-	-	1	6	4	12	-	
	BDD	3	-	-		6	3		-	
	EG	3	2	2		6	3	12	12	
	SUR-II	3	2	-		6	3	12	-	
	CG	2	2			6	2	12		
SemI TE (Civil)	SD-I	3	-			3	4	-		50
	IE-I	3	2	2		3	4	6	6	
	FM-II	3	2	-		3	4	6	-	
	EE-I	3	2	-		3	4	6	-	
	CM-I	3		-		3	4		-	
	TOM-I	1	2	-		3	4	6	-	

SemII TE (Civil)	SD-II TOS-II GTE-I IE-II CM-II TOM II Seminar-I Minor Project	3 3 3 3 3 -	- 2 2 2 2 2	2 - - - - -		3 3 3 3 3 13 13	3 3 3 3 - -	- - 6 6 - 6 2 2	6 - - -	43
SemI BE (Civil)	QSV WRE-I CM-I EE-II ELEctive-I Project-I Seminar	4 4 4 4 4 - -	2 - 2 2 2 2 2	- - - - - - -		4 4 4 4 4 13	4 4 4 4 4 - -	8 - 8 8 8 26 2	- - - - - - -	80
SemII BE (Civil)	WRE-II SDD-III CM-II ELECTIVE-II PROJECT-II	4 4 4 4 -	2 - 2 2 4	- 4 - - -		4 4 4 4 12	4 4 4 4 -	8 - 8 8 48	- 16 - - -	108
Sem I ME (civil)	EEM EEC DOM AP Elective I Lab Practice I Seminar I	3 3 3 3 3	- - - - - 6 4	- - - - - - -		- - - - - 1 -	3 3 3 3 3 - -	- - - - - 6 4	- - - - - - -	25

Sem II M E (Civil)	AWTT		-	-		-	3	-	-	29
	AWWTT	3	-	-		-	3	-	-	
	IWWM	3	-	-		-	3	-	-	
	WSM	3	-	-		-	3	-	-	
	Elective II	3	-	-		-	3	6	-	
	Lab Practice II	3	6	-		1	-	4	-	
	Seminar II		4	-		-	-	4	-	

LOAD DESTRIBUTION FOR MECHANICAL ENGG. DEPARTMENT 2015-2016 SEM-I

Sr. No.	NAME	CLASS	SUBJECT	Theory (Hr)	Tutorial (Batch X Hr)	Practical (Batch X Hr)	Total Load
1	Dr. D.S. Deshmukh	BE (B)	RAC	03	-----	01*02=02	09
		BE	PROJ.SEM	-----	-----	04	
2	Dr. S. P. Shekhawat	SE(A+B)	ET	04+04=08	-----	--	12
		BE	PROJ.SEM	--	-----	04	
3	Mr. N. K. Patil	FE (H)	ECME	03	01*01=01	------	15
		BE (A)	OR	03	-----	-----	
		TE	MD-I	------	------	02*02=04	
		BE	PROJ.SEM	-----	-----	04	
4	Mr. K. Shrivastava	FE (I)	ECME	03	01*01=01	-----	16
		TE (A)	HT	04	------	02*02=04	
		BE	PROJ.SEM	-----	-----	04	
5	Mr. M.V. Rawlani	BE (B)	OR	03	-----	-----	16
		BE (I.Elec-1)	ORT	03	-----	-----	
		SE	MSM	-----	-----	02*02=04	
		SE	SS	-----	-----	01*02=02	
		BE	PROJ.SEM	-----	-----	04	
6	Mr. P. G. Damle	TE(A+B)	MD-I	04+04=08	-----	02*02=04	16
		BE	PROJ.SEM	-----	-----	04	
7	Mr. D. B. Sadaphale	SE (A)	MSM	04	-----	02*02=04	20
		SE (B)	FM	04	02X01=02	01*02=02	
		BE	PROJ.SEM	-----	-----	04	
8	Mr. P. N. Ulhe	SE(A+B)	SOM	04+04=08	02x01=02	-----	20
		BE	CAD/CAM	-----	-----	03*02=06	
		BE	PROJ.SEM	-----	-----	04	
9	Mr. P. M. Solanki	BE (A)	MTX	03	-----	-----	19
		TE (A+B)	CG	01+01=02	-----	-----	
		BE	CAD/CAM	-----	-----	05*02=10	
		BE	PROJ.SEM	-----	-----	04	
10	Mr. P. D. Patil	SE (A+B)	SS	01+01=02	-----	06*02=12	21
		BE (A)	CAD/CAM	03	-----	-----	
		BE	PROJ.SEM	-----	-----	04	
11	Mr. M. V. Kulkarni	TE (B)	HT	04	-----	03*02=06	21
		BE (A)	RAC	03	-----	01*02=02	
		SE	ET	-----	-----	01*02=02	
		BE	PROJ.SEM	-----	-----	04	
12	Mr. A. R. Bhardwaj	SE (B)	ME-I	04	-----	-----	16
		TE	MD-I	-----	-----	04*02=08	
		BE	PROJ.SEM	-----	-----	04	

13	Mr. D. C. Talele	TE(B)	TOM-II	04	-----	05*02=10	21
		BE (I.Elec-1)	ERT	03			
		BE	PROJ.SEM	-----	-----	04	
14	Dr. P.P. Bornare	BE (A)	ELE-I (AUTO.)	03	-----	01*02=02	21
		TE(B)	ICE	04	-----	04*02=08	
		BE	PROJ.SEM	-----	-----	04	
15.	Mrs. J. R. Surange	SE (A)	ME-I	04	-----	-----	21
		SE (B)	MSM	04	-----	04*02=08	
		SE(B)	SOM	-----	01x01=01	-----	
		BE	PROJ.SEM	-----	-----	04	
16.	Mr. C. K. Mukherjee	TE (A & B)	IE&S	04+04=08	-----	-----	22
		SE	ET	-----	-----	07*02=14	
17.	Mr. A. V. Rajput	BE (A)	ELE-I (AUTO.)	03	-----	01*02=02	22
		TE	CG	-----	-----	08*02=16	
		FE	ECME	-----	01x01=01	-----	
18.	Mr. S.A. Rajput	SE (ELEX.)	PPE	04	-----	04*02=08	21
		BE	RAC	-----	-----	04*02=08	
		FE	ECME	-----	01x01=01	-----	
19	Mr. N. B. Dhanore	TE (A)	TOM-II	04	-----	03*02=06	22
		TE	HT	-----	------	01*02=02	
		SE	SS	-----	-----	01*02=02	
		BE	RAC	-----	-----	02*02=04	
		BE	ELE-I (AUTO.)	-----	------	02*02=04	
20	Mr. P. T. Patil	TE (A)	ICE	04	-----	04*02=08	23
		BE	ELE-I (AUTO.)	-----	------	04*02=08	
		TE	HT	-----	------	01*02=02	
		FE	ECME	-----	01x01=01	-----	
21	Miss. T.A. Chaudhari	SE (A)	FM	04	02X01=02	07*02=14	24
		SE	SOM	-----	01X01=01	-----	
		TE	HT	-----	-----	01*02=02	
		FE	ECME	-----	01X01=01	-----	

TIME TABLE I/C
Mr. P. N. Ulhe

HOD
Dr. D. S. Deshmukh

LOAD DESTRIBUTION
MECHANICAL ENGINEERING DEPARTMENT
Academic Year: - 2015-2016 Semester-II[nd]

Sr. No.	Name of Faculty Member	Subject	Class	Theory		Practical (Batch X Hr)		B.E. Project (Hrs)	T.E. Minor Project (Hrs)	T.E. Seminar-I	Total
				Section	Hours	No. of Batches	Hours				
1	Dr. D.S. Dehmukh	EDEME	F.E.	A	04*01=04	------	------	04	02	02	16
		EME	F.E.	------	------	02	02*02=04				
2.	Dr. S. P. Shekhawat	TOM-I	S.E.	A	04*01=04	------	------	04	------	02	14
		TOM-I	S.E.	B	04*01=04	------	------				
3.	Mr. N. K. Patil	EDEME	F.E.	B	04*01=04	------	------	04	------	02	23
		MQC	T.E.	A	03*01=03	------	------				
		ED	F.E.	------	------	03	03*02=06				
		FEA	B.E.	------	------	02	02*02=04				
4.	Mr. K. Shrivastava	EDEME	F.E.	C	04*01=04	------	------	04	------	02	22
		Turbo M/C	T.E.	A	04*01=04	------	------				
		ED	F.E.	------	------	02	02*02=04				
		Turbo M/C	T.E.	------	------	02	02*02=04				
5	Mr. M.V. Rawlani	NACM	T.E.	A	03*01=03	------	------	04	------	02	22
		NACM	T.E.	B	03*01=03	------	------				
		ED	F.E.	------	------	02	02*02=04				
		EME	F.E.	------	------	03	03*02=06				
6.	Mr. P. G. Damle	MD-II	T.E.	A	04*01=04	------	------	04	------	02	22
		MD-II	T.E.	B	04*01=04	------	------				
		MD-II	T.E.	------	------	03	03*02=06				
		ED	F.E.	------	------	01	01*02=02				

7.	Mr. D. B. Sadaphale	AT	S.E.	A	04*01=04	------	------	04	------	02	24
		AT	S.E.	B	04*01=04	------	------				
		AT	S.E.	A & B	Tut 2*1=02	------	------				
		AT	S.E.	------	------	04	04*02=08				
8.	Mr. P. N. Ulhe	MV	B.E.	A	04*01=04	------	------	04	------	02	24
		MV	B.E.	B	04*01=04	------	------				
		MV	B.E.	------	------	05	05*02=10				
9.	Mr. P. M. Solanki	EDEME	F.E.	E	04*01=04	------	------	04	------	02	23
		FEA	B.E.	A	03*01=03	------	------				
		ED	F.E.	------	------	03	03*02=06				
		FEA	B.E.	------	------	02	02*02=04				
10.	Mr. P. D. Patil	EDEME	F.E.	F	04*01=04	------	------	04	------	02	24
		ED	F.E.	------	------	07	07*02=14				
11.	Mr. M. V. Kulkarni	EDEME	F.E.	I	04*01=04	------	------	04	------	02	24
		Turbo M/C	T.E.	B	04*01=04	------	------				
		Turbo M/C	T.E.	------	------	03	03*02=06				
		EME	F.E.	------	------	02	02*02=04				
12.	Mr. A. R. Bhardwaj	ME-II	S.E.	A	03*01=03	------	------	04	------	02	18
		ME-II	S.E.	B	03*01=03	------	------				
		MD-II	T.E.	------	------	02	03*02=06				
13	Mr. D. C. Talele	FEA	B.E.	A	03*01=03	------	------	04	------	02	24
		Tribology	B.E.	B	03*01=03	------	------				
		FEA	B.E	------	------	04	04*02=08				
		Tribology	B.E	------	------	02	02*02=04				

14.	Dr. P.P. Bornare	PBM	T.E.	A	03*01=03	------	------	04	------	02	24
		PBM	T.E.	B	03*01=03	------	------				
		EME	F.E.	------	------	03	03*02=06				
		Tribology	B.E	------	------	03	03*02=06				
15.	Miss. J. R. Surange	EDEME	F.E.	G	04*01=04	------	------	04	------	02	25
		MQC	T.E.	B	03*01=03	------	------				
		ED	F.E.	------	------	03	03*02=06				
		MQC	T.E.	------	------	03	03*02=06				
16.	Mr. C. K. Mukherjee	MD Lab	S.E.	A	01*01=01	------	------	------	02	02	26
		MD Lab	S.E.	B	01*01=01	------	------				
		MD Lab	S.E.	------	------	06	06*02=12				
		MQC	T.E.	------	------	03	03*02=06				
		EME	F.E.	------	------	01	01*02=02				
17.	Mr. A. V. Rajput	EDEME	F.E.	H	04*01=04	------	------	------	02	02	25
		Auto-II	B.E.	A	03*01=03	------	------				
		ED	F.E.	------	------	03	03*02=06				
		EME	F.E.	------	------	04	04*02=08				
18.	Mr. S.A. Rajput	Tribology	B.E.	A	03*01=03	------	------	------	02	02	25
		Tribology	B.E	------	------	03	03*02=06				
		AT	S.E.	----	------	02	02*02=04				
		AT	S.E.	----	Tut 2*1=02	------	------				
		EME	F.E.	------	------	03	03*02=06				
19.	Mr. N.B. Dhanore	Auto-II	B.E.	B	03*01=03	------	------	------	02	02	25
		ED	F.E.	------	------	02	02*02=04				
		EME	F.E.	------	------	03	03*02=06				
		MD-II	T.E.	------	------	02	02*02=04				
		MV	B.E.	------	------	02	02*02=04				

20.	Mr. P.T. Patil	EME	F.E.	------	------	03	03*02=06	------	02	02	26
		TOM-I	S.E.	------	------	03	03*02=06				
		Turbo M/c	T.E.	------	------	03	03*02=06				
		MQC	T.E.	------	------	02	02*02=04				
21.	Miss. T.A. Chaudhari	EDEME	F.E.	D	04*01=04	------	------	------	02	02	26
		ED	F.E.	------	------	03	03*02=06				
		EME	F.E.	------	------	03	03*02=06				
		TOM-I	S.E.	------	------	03	03*02=06				

TIME TABLE I/C
Mr. P. D. Patil

HOD
Dr. D. S. Deshmukh

DEPARTMENT OF MEANICAL ENGINEERING (POSTGRADUATE)

ME (Machine Design) Load distribution SEM – I (2015 – 16)

Sr. No.	Name	Class	Subject	Theory (Hr)	Practical (Batch X Hr)	Total
1	Dr. D.S Deshmukh	FE	Seminar- I	--	04	04
2	Dr. S. P. Shekhawat	FE	IACS	03	--	07
		FE	Seminar -I	--	04	
3	Er. N. K. Patil	FE	CMMD	01	02 x 02 = 04	09
		FE	Seminar- I	--	04	
4	Mr. P. G. Damle	FE	VE	03	02 x 02 = 04	11
		FE	Seminar -I	--	04	
5	Mr. D. B. Sadaphale	FE	AMED	03	--	07
		FE	Seminar -I	--	04	
6	Mr. P. N. Ulhe	FE	TRIBO	03	02 x 02 = 04	11
		FE	Seminar-I	--	04	
7	Mr. P. M. Solanki	FE	CMMD	02	--	06
		FE	Seminar -I	--	04	

Mr. P.N. Ulhe
PG Time Table In-charge
Dept. Mechanical Engg

H.O.D
Dept. Mechanical Engg

DEPARTMENT OF MEANICAL ENGINEERING (POSTGRADUATE)

ME (Machine Design) Load distribution SEM – II (2015 – 16)

Sr. No.	Name	Class	Subject	Theory (Hr)	Practical (Batch X Hr)	Total
1.	Dr. D.S Deshmukh	FE	Seminar- II	--	04	04
2.	Dr. S. P. Shekhawat	FE	MPD	03	--	07
		FE	Seminar -II	--	04	
3.	Er. N. K. Patil	FE	MTD	01	--	05
		FE	Seminar- II	--	04	
4	Mr. P. G. Damle	FE	DSM	03	02 x 02 = 04	11
		FE	Seminar -II	--	04	
5	Mr. D. B. Sadaphale	FE	MTD	02	--	10
		FE	Seminar -II	--	04	
		FE	MPD	--	02 x 02 = 04	
6	Mr. P. N. Ulhe	FE	OTD	03	02 x 02 = 04	11
		FE	Seminar-II	--	04	
7	Mr. P. M. Solanki	FE	PBT	03	--	07
		FE	Seminar -II	--	04	

Mr. P.N. Ulhe
PG Time Table In-charge
Dept. Mechanical Engg

H.O.D
Dept. Mechanical Engg

SSBT's College of Engineering & Technology, Bambhori, Jalgaon.
Department of Business Administration
Teaching Load Distribution
Semester II & IV (Academic Year: 2015 - 16)

SR. No.	NAME	SUB CODE	SUBJECT	MBA-I	MBA-II	TOTAL
				Theory	Theory	
1	Dr. Vishal S. Rana	206	Organizational Behavior – II	4		8
		407 B	Retail Mgt & Consumer Behavior		4	
3	Dr. Saroj Shekhawat	202	IT For Managers	4		8
		402	E-Comm. & Excellence Mgt		4	
4	Er. P.A.Anawade	208	Operations Management	4		8
		403	Indian Commercial Laws		4	
5	H.A.Salunkhe	207	Financial Management	4		12
		405 A	Family Business Mgt		4	
		406 A	International Financial Mgt		4	
6	R.A.Modiyani	205	Management Accounting	4		16
		401	International HRM		4	
		406 B	Retail Management & Digital Mktg		4	
		407 A	Case Studies in Financial Mgt		4	
7	Mukesh Ahirrao	203	Global Economics Scenario	4		16
		204	Marketing Management	4		
		404	Investment & Portfolio Mgt		4	
		405 B	Investment & Portfolio Mgt		4	
8	Faroza Kazi	201	Business Research Methods	4		16
		405 C	Performance & Compensation Mgt		4	
		406 C	Performance & Compensation Mgt		4	
		407 C	Case Studies in HR Mgt		4	
				32	**52**	**84**

Time Table I/C **HOD (MBA)**

SSBT's College of Engineering & Technology, Bambhori, Jalgaon.
Department of Business Administration
Teaching Load Distribution
Semester I & III (Academic Year: 2015 - 16)

SR. NO	NAME	SUB CODE	SUBJECT	MBA-I	MBA-II	TOTAL
				Theory	Theory	
1	Dr.V.S.Rana.	106	Organizational Behavior-I	4		**8**
		307-B	Global Marketing Management		4	
2	Mr.P.A.Anawade	108	Quantitative Techniques	4		**8**
		303	Legal Aspect of Business		4	
3	Dr. Saroj Shekhawat	102	Corporate Communication Skills	4		**12**
		104	Human Resource Management		4	
		306-C	Strategic Human Resource Management		4	
4	Mr.H.A.Salunkhe	107	Corporate Social Responsibility	4		**16**
		304-A	Banking & Investment Management		4	
		305-A	Tax Management		4	
		306-B	Sales & Distribution		4	
5	Ms.R.A.Modiyani	105	Business Accounting	4		**16**
		301	Strategic Management		4	
		305-B	Consumer Behavior and Service Marketing		4	
		306-A	Strategic Financial Management		4	
6	Mr. Mukesh Ahirrao	103	Managerial Economics		4	**16**
		304-B	Product and Brand Management		4	
		305-C	Human Capital Management and Development	4		
		307-A	Tally & Advance Excel	4		
7	Ms. Faroza Kazi	101	Management Science	4		**16**
		302	Management Information System & ERP		4	
		304-C	Industrial Relations & Labour Welfare		4	
		307-C	Labour Laws		4	
			Total =	**32**	**60**	**92**

Time Table I/C **HOD (MBA)**

Internal Continuous Evaluation System in place

The internal continuous evaluation system in place at this college level is done as per University guidelines currently enforce/ received before the start of term. The schedule for performance of practicals is notified on the departmental lab notice board. This schedule is batchwise and it also indicates the completion/ submission date of practical, drawing and assignment sheets. It is meant for those subjects for whom term work marks are to be sent to the University.

The attendance record of the students is maintained in ERP software and in the register meant for this purpose. This register also evaluates the performance of the students under the following headings:

a) Attendance in class/practical
b) Performance in class/practical
c) Class tests/ viva voce
d) Assignment/ Journal

The above are quantified and marks are awarded in the next week, displayed and consolidated at the end of term. At term end the term work assessment programme is displayed and the work is evaluated by two faculty members who are appointed by the Principal and the term work marks are forwarded to the University under the signature of both the examiners.

Students' assessment of Faculty, System in place.

During the 5th week of the term the feedback by the students is taken subject wise for the staff who teach them. A set of questionnaire is circulated them and feedback is obtained. This feedback is taken by academic monitoring committee comprising of three HOD's and Coordinator of Academic and Research and Development. The feedback is submitted to the Principal and he apprises the faculty member about their weak points and they are given the opportunity to improve upon their deficiencies and their weak points during the term itself.

Also during the term, students are free to pass on the difficulties through suggestion boxes kept at various location and if they are related to their academic difficulties, their difficulties are solved and the concerned faculty is advised by the Principal with sole aim of improvement in academics. Personal hearing is given by Coordinator of Academics and Research and Development and the Principal.