



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-II

January 2018





Shrama 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
Grade B ++ (2.91) NAAC Accredited

Website- www.ssoetjalgaon.ac.in

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Ref. No. COET/AICTE/MD/ / 18

Date:

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. to page no. 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	1011
02.	Hardware Specification	Core 2 Duo and Higher Specifications = 1011
03.	No of Terminals on LAN/WAN	1011
04.	Relevant Legal Software	<ul style="list-style-type: none">• 54 System software packages• 69 Application software packages
05.	Peripherals / Printers	<ul style="list-style-type: none">• Printers= 85• Scanners = 9
06.	Internet Accessibility (in kbps & hrs)	<ul style="list-style-type: none">• Leased Line = 48Mbps

College is having Wireless and OFC Connectivity through out the Campus

APP-07-MD-09

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	<ul style="list-style-type: none">Leased Line = 48 Mbps

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

01	Details	Available Area (sq.mtr.)
02	Play Ground	12,204
03	Basket ball Court	1,140
04	Gym and Sports Office	226
05	Bad Minton court	988
06	Total	14,558 sq.mtr

Students Performance: 2016-17

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	
2016-17	30	261	

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.
2016-17	107	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	15+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.
2016-17	107	16+04 (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	-
2016-17	Hockey	04	-

Annual Sports Inter Branch

Year	No. of Students participated	Participation in Events
2011-12	Boys – 486 Girls - 198	Football , Badminton, Table Tennis ,Chess, Basket Ball, Volley Ball Cricket, Kabaddi, Weight Lifting, Fencing' cross country
2012-13	Boys – 608 Girls - 226	Football , Badminton, Table Tennis ,Chess, Basket Ball, Volley Ball Cricket, Kabaddi, Weight Lifting, Fencing , cross country
2013-14	Boys - 618 Girls - 230	Football , Badminton, Table Tennis ,Chess, Basket Ball, Volley Ball Cricket, Kabaddi, Weight Lifting, Fencing , cross country
2014-15	Boys - 621 Girls - 228	Football , Badminton, Table Tennis ,Chess, Basket Ball, Volley Ball Cricket, Kabaddi, Weight Lifting, Fencing , cross country
2015-16	Boys - 569 Girls - 221	Badminton, Table Tennis, Chess, Basket Ball, Volley Ball Cricket, Kabaddi, Hand Ball, Archery, Snooker, 100mtr. Running.
2016-17	Boys - 576 Girls - 234	Badminton, Table Tennis, Chess, Basket Ball, Volley Ball Cricket, Kabaddi, Hand Ball, Archery, Snooker, 100mtr. Running.

Soft Skill Development Facilities

The soft skill development facilities are provided at the Department Level by each Department and at College level through Training and Placement cell which is headed by Training and Placement Officer.

The College signed MOU with Treezec E Solutions, Mumbai for personality development and aptitude test for success in professional & personal life.

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: - 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)	3 x 6	18	Administrative
		B15	3x3	9	210
		G 34A,B	3x7.5	22	
		G35 A,B	3x7.5	22	
		G37A,B	3x9	27	
		G38	3 x6	18	
		G39A,B	3x9	27	
		320A	3x7.5	22 – 165	
3	Class Room	130	9 x 9	81	Instructional
		131	9 x 9	81	999
		132	9 x 9	81	
		133	9 x 9	81	CR 8
		229	9 x 9	81	648
		230	9 x 9	81	
		232	9 x 9	81	
		233	9 x 9	81	
		114	12 x 9	108	Tran. to Civil

		321	12 x 9	108	Tran. to Civil
4	Drawing Hall/ class Room	G37	15x9	135	
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	2x3 x 3	18	Amenities
		306	2x3x6	18	
	Passage		54x3	162	Circulation
	Stair		3x4.5	13.5	& other 175
	Total				

Total Instructional area =1816

Total Administrative area = 210

Total Amenities area= 36

DEPARTMENT OF BIOTECHNOLOGY

Department wise area statement details of Biotechnology Department

Sr.No	Particulars	Room No.	Size (M X M)	Carpet area Sq.M	Remarks
1	Departmental office	236(A)	6 x 3	18	Administrative
2	HOD Cabin	234	6 x 3+6x2	30	
3	Staff Cabin	238A	3x4	12	
		239A	3 x 4	12	
4	Class Room	223	6x9	54	Instructional
		224	6x9	54	
		225	6x7.5	45	
5	Faculty Room	226	4x9	36	
6	Tutorial Room	111A	5.5x6	33	
7	Seminar Hall with Chemical Engg.	308	18x9	162	
8	Laboratories				Instructional
9	1. Microbiology	238	9 x 9- 3x 4	69	Developed
	2. Biochemistry	239	9 x 9- 3x 4	69	Developed
	3. Fermentation Biotechnology	242	4.8 x 9 +3 x 7.5	66	Developed
	4. Bioprocess Engineering	241	9 x 7.3	66	Developed
	5. Bioprocess Modeling & Simulation/ Computer Lab	243	4.8 x 9 + 3 x 7.5	66	Developed
	6. Immunology Lab/ Molecular Biology and Genetic Engineering	235	9 x 7.3	66	Developed
	7. Project Lab	234	3 x 7.5 _ 5 x 9	68	Developed
	8. Plant Tissue Culture Lab	245	7.5x9	68	Developed
	9. Bioinformatics	111	12x9	108	Developed
	10. Down Stream Processing Lab	M001A	8.8 x 7.5	66	Developed
	11. Research Lab	227	9 x 7.3	66	Developed
10	Toilet	240	3x3	9	Amenities
11	Passage	GF, FF, SF	66 x 3 1x3x4.5	198 13.5	Circulation and others 212 Sq.M
Total					1442 Sq.M

H.O.D. (MBA)

Sr.No	Particulars	Room No.	Size (M X M)	Carpet area Sq.M	Remarks
1	Departmental office	236(A)	6 x 3	18	Administrative
2	HOD Cabin	234	6 x 3+6x2	30	
3	Staff Cabin	237A	3x4	12	
		238A 239 227 ^a	3 x 4	12	
4	Class Room	224	6x9	54	

	Tutorial Room Tutorial Room	225	6x9	54	Instructional
		B12	6x7.5	45	
		226			
		11A			
5	Seminar Hall with Chemical Engg.	308	18x9	162	
6	Laboratories				Instructional
9	12. Microbiology	238	9 x 9- 3x 4	69	Developed
	13. Biochemistry	239	9 x 9- 3x 4	69	Developed
	14. Bioprocess Engineering	242	4.8 x 9 +3 x 7.5	66	Developed
	15. Fermentation Technology	241	9 x 7.3	66	Developed
	16. Bioinformatics Lab	244	4.8 x 9 + 3 x 7.5	66	Developed
	17. Plant Tissue Culture Lab	245	9 x 7.3	66	Developed
	18. Project Lab	235	3 x 7.5 _ 5 x 9	68	Developed
	19. Immunology MBGE	236	7.5x9	68	Developed
	20. Bioinformatics	111	12x9	108	Developed
	21. Down Stream Processing Lab	M001A	8.8 x 7.5	66	Developed
	22. Research Lab	227	9 x 7.3	66	Developed
10	Toilet	240	3x3	9	Amenities
11	Passage	GF, FF, SF	66 x 3 1x3x4.5	198 13.5	Circulation and others 212 Sq.M
Total					1442 Sq.M

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 m²	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 Vacuum 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/-)

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 314	2x3x4 2x3x4 4.5 x 4.5 6 x 3 3 x 3 7.5x3 6x3	24 24 20 18 09 22 18	Administrative 180
4	Class Room Class Room Class Room Class Room Class Room Class Room Tutorial UG Tutorial P G Tutorial UG	203 205 212 305 114 321 G13A 104B G10A	12 x 9 15 x9 12x9 12x9 12x9 12x9 4.5 x 7.5 6 x 5.5 6x5.65	108 135 108 108 108 108 34 33 PG 34	Instructional 473
5					Instructional
	Seminar Hall	G14	18x9	162	
6	Laboratories				UG 388
	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 1101
	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	99	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 =2029

Total Administrative area = 180

Total Amenities area= 54

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 Veronmake 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

Building wise/Department wise space allocation 31.07.13 SAR

Sr.	Particulars/Details	Room	Size Max.	Carpet Area	Remarks
No.		No.	m x m	in Sq m.	
1	Departmental Office	202A	4.5x6	27	Administrative
2	HOD Cabin	202	4.5 x 6	27	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 Civil
4	Class Room Tutorial Room P G Tutorial Room U G Tutorial Room P G	301 302 312 313 322 325 119B 220A 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	108 108 108 108 108 108 35 PG 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

S.S.B.T.'s College of Engineering and Technology, Bambhori, Jalgaon
Electrical Engineering Department

Investment in Laboratories

Sr. No.	Name of the Laboratory	Area (Sq. m.)	Cost in Rs.
1	Measurement/Network Analysis Lab	68	688780
2	Industrial Drives & Control Lab	82	698493
3	Electrical Machine Lab I	75	388187
4	Electrical Machine Lab II	81	584428
5	Power System Lab	67	615821
6	Switch Gear & Protection Lab	68	292670
7	High Voltage Engineering Lab	67	364829
8	Electronic Lab	68	510959
9	Control system Lab	68	119800
10	Computer Lab	83	968218
11	PG Lab	68	505984
12	PG Research Lab	68	1187288
	TOTAL	863	6925457

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

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	E211- 213	3x3x3.65	33	Administrative 206
	Proposed cabins	E 203 A E 204 A E 205 A E 303A*	4x3 7.6 x 3.8 9.1 x 3.5 3.5x3.8	12 20 32 13	UD
4	Class Rooms	E 305 E 311 E 312	10.80x7.60 11.40x7.60 11.40x7.60	82 87 87	Instructional 256
	Tutorial Room	E308A	7.8x5.2	40	
5	Seminar Hall	310	18.30x7.60	139	139
6	Laboratories				Instructional
	1)Programming lab / lab3	E201	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	E206	7.30 x9.50	69	
	7) Data Structure / lab2	E207	7.30 x 9.20	67	
	8) Multimedia / lab 4	E208	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	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

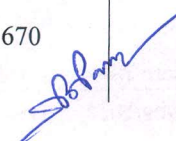
Total Amenities area= 58

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.Department: -4) **Mechanical Engineering**

Building wise/Department wise space allocation

(7)

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 2,3,6,7 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 (B) TE (A) TE (B) BE (A) BE (B) SE (A) Tutorial Room P G* Tutorial Room P G*	M301 M302 M303 M304 M306 M309 M102 A M103 A	7.5x11 7.5x11.3 7.5x11.3 7.5x11.3 9.5x11.3 9.5 x 11.3 7.5 x 4.5 7.5 x 4.5	82 85 85 85 107 107 34 P G 34 P G	Instructional 619 Cr 551 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	M007	7.5x11.30	85	PG
	4) Lab	M007A	7.5x7.45 +2.25x7.5	73	
	5) Computer Lab	M102	7.5x14.5	109	
	6) CAD CAM Lab/ Research Lab	M103	7.5x14.25 7.5x18.75	107 141	Research Institute lab
	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	
	14) 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	GF	2.75x20 3x12.75 x3.75 3x42x2.75 3x4x10.5	55 143 346 126	Circulation & Other 670



DEPARTMENT OF BUSINESS ADMINISTRATION
Department wise area statement details of MBA Dept

Sr. No.	Particulars/Details	Room No.	Size Maximum mxm	Area Sqm.	Remarks
1	HOD Cabin	A209	3.00 x 6.65	20	Administrative
	Department Office/ Lib.	A208	6.00 x 6.65	20+20=40	Administrative
2	Staff Cabin	A203	3.0 x 4.00	12	Administrative
		A204A	3 x 3.0 x 3.0	27	91
		A212	3 x 4	12	
3	Class Room	A202	9.1 x 7.4	67	Instructional
	Class Room	A213	9.1 x 7.4	67	456
4	Seminar Hall"	A211	7.9 x 17.0	134	Instructional
5	Computer Lab	204	7.3x14.0	102	Instructional
	Tutorial room I	A206	4.5 x 7.4	33	
	Tutorial room II	A207	4.5 x 7.4	33	
6	Girl's Common Room	A306	7.4 x 9.1	67	Amenities
	Boy's Common / GD	A309	7.4 x 9.1	67	Amenities
	Toilets	A203,12A	2 x 1.2 x 1.8	4	157
		A205,10	2 x 2.9 x 3.3	19	
7	Passage	FF	19.5 x 2.4	47	Circulation
		SF	19.5 x 2.4	47	158
	Stair		3 x 3.2 x 6.7	64	
	Total			862	

Total Instructional Area: 456
Total Administrative Area: 91
Total Amenities Area: 157

H.O.D. (MBA)

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 5th and 6th 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 signed 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.

ShramaSadhana Bombay Trust's
COLLEGE OF ENGINEERING & TECHNOLOGY, BAMBHORI, JALGAON
TENTATIVE ACADEMIC CALENDAR (TERM-I) 2017-18

Sr.No.	Activity	Day	Date / From -To
1.	Opening of College for Students & their registration (S.E. to B.E.& ME - II)	Monday	03 July 2017
2.	Commencement of Classes (S.E. to B.E.)	Tuesday	04 July 2017
3.	Meeting of IQAC	Saturday	22 July 2017
4.	Opening of College & Commencement of Classes for F.E. Students	Monday	01 Aug. 2017
5.	Commencement of Classes (DSE and M.E.-I year)	Monday	01 Aug. 2017
6.	Induction Programme for F.E. Students	Sunday	06 Aug. 2017
7.	S.E., T.E. & B.E. : ISE-I	Friday Saturday Monday	11 Aug. 2017 12 Aug. 2017 14 Aug. 2017
8.	Independence Day Celebration	Tuesday	15 Aug. 2017
9.	Add-on Course	Wednesday to Saturday	16 to 19 Aug. 2017
10.	Display of ISE – I (S.E. to B.E.) Results	Saturday	19 Aug. 2017
11.	Feedback from Students	Tuesday to Thursday	22 to 24 Aug. 2017
12.	Seminar Presentation (B.E.) (Till Date)	Saturday	26 Aug. 2017
13.	Alumni Meet	Sunday	10 Sept. 2017
14.	Engineer's Day	Friday	15 Sept. 2017
15.	F.E. : ISE-I	Saturday Monday Tuesday	16 Sept. 2017 18 Sept. 2017 19 Sept. 2017
16.	S.E., T.E. & B.E. : ISE-II	Friday Saturday Monday	22 Sept. 2017 23 Sept. 2017 25 Sept. 2017
17.	Display of ISE – I (F.E.) Results	Tuesday	26 Sept. 2017
18.	Display of ISE – II (S.E. to B.E.) Results	Friday	29 Sept. 2017
19.	Project Presentation (B.E.) (Till Date)	Friday	29 Sept. 2017
20.	Makeup Week (S.E. to B.E.)	Tuesday to Saturday	3 to 7 Oct 2017
21.	S.E. To B.E. : ICA	Monday to Wednesday	09 to 11 Oct. 2017
22.	F.E. & DSE: ISE-II	Tuesday Wednesday Thursday	24 Oct. 2017 25 Oct. 2017 26 Oct. 2017
23.	Makeup Week (F.E. and DSE)	Friday to Wednesday	27 Oct. to 1 Nov. 2017
24.	Display of ISE – II (F.E and DSE) Results	Monday	30 Oct. 2017
25.	F.E. and M.E. - I: ICA	Thursday to Friday	2 to 3 Nov. 2017
26.	PR/OR Exam. (T.E & B.E.) (Tentatively)	Tuesday to Sunday	7 Nov. to 12 Nov. 2017
27.	University Theory Examination (Tentatively)	Tuesday to Wednesday	14 Nov. to 13 Dec. 2017
28.	PR/OR Exam. (F.E. , S.E. & M.E.) (Tentatively)	Friday to Thursday	15 Dec. to 21 Dec. 2017
29.	International Conference on Global Trends in Engg., Tech., & Management	Friday to Sunday	22 Dec. to 24 Dec. 2017

Ref. No. COET/Aca.Cal./24/01/18

03 JAN 2018

Shrama Sadhana Bombay Trust's
COLLEGE OF ENGINEERING & TECHNOLOGY, BAMBHORI, JALGAON.
TENTATIVE ACADEMIC CALENDAR (TERM-II) 2017-18

Sr. No.	Activity	Day	Date / From -To
1.	Start of II Term: Registration of students (F.E. to B.E. and M.E. – I)	Tuesday	02 Jan. 2018
2.	Commencement of Classes (F.E. to B.E. and M.E. – I)	Wednesday	03 Jan. 2018
3.	FEAST (Festival of Engineers, Administrators, Scientists, and Technocrats)	Thursday to Saturday	11, 12, 13 Jan. 2018
4.	Republic Day Celebration	Friday	26 Jan. 2018
5.	F.E. to B.E. : ISE-I	Monday, Wednesday, Thursday	12, 14, 15 Feb. 2018
6.	Student Level Technical Paper Presentation (Milestone 2K18)	Saturday	17 Feb. 2018
7.	Entrepreneurship Awareness Camp. for T.E. & B.E. Students	Friday to Saturday	16 to 17 Feb. 2018
8.	Sports & Annual Gathering (Vasant Utsav)	Sunday to Saturday	18 Feb. to 24 Feb. 2018
9.	Display of ISE – I (F.E. to B.E.) Results	Tuesday	20 Feb. 2018
10.	Parents Meet	Sunday	25 Feb. 2018
11.	Science Exhibition for FE (By Applied Science Dept.)	Wednesday	28 Feb. 2018
12.	Add-on Course	Wednesday to Friday	28 Feb. to 2 Mar. 2018
13.	Feedback from Students	Wednesday to Saturday	07 Mar. to 10 Mar. 2018
14.	Seminar Presentation (T.E.) (Till Date)	Saturday	10 Mar. 2018
15.	Project Demo (T.E.) (Till Date)	Friday	23 Mar. 2018
16.	Shod Prakalpa Pratiyogita 2018 (Project Demo - B.E.)	Saturday	24 Mar. 2018
17.	F.E. to B.E.: ISE-II	Wednesday, Saturday, Monday	28, 31 Mar. and 2 April, 2018
18.	Display of ISE – II (F.E. to B.E.) Results	Friday	6 Apr. 2018
19.	Makeup Week (F.E. to B.E.)	Tuesday to Friday	3 Apr. to 6 Apr. 2018
20.	F.E. to B.E. and M.E. – I: ICA	Tuesday to Thursday	3, 4, 5 Apr. 2018
21.	End of Term	Saturday	7 Apr. 2018
22.	PR/Oral Exam., SE to BE (Tentatively)	Tuesday to Friday	10 Apr. to 20 Apr. 2018
23.	Theory Exam., FE to BE & ME (Tentatively)	Tuesday to Thursday	24 Apr. to 24 May 2018
24.	Project Oral (BE) & F.E. (PR/Oral), M.E. (OR) (Tentatively)	Saturday to Thursday	26 May to 31 May 2018
25.	Commencement of Next Academic Year	Monday	02 July. 2018

K
3-4-18

(Dr. K.S.Wani)

Principal
PRINCIPAL

SSBT's College of Engg. & Technology
Bambhori, Jalgaon-425001(M.S.)

Copy to:

- 1) Chairman, G.B. & C.D.C.
- 2) All H.O.Ds, 3) DOAD, 4) DOA, 5) Director, R&D, 6) Director, Technical Development, 7) TPO,
- 8) D.R. 9) A.R. 10) O.S., 11) Exam. Office, 12) Chairman, Alumni Meet, 13) Store, 14) Library,
- 15) Chairman, Cultural Activities 16) Physical Director 17) Admission Office, 18) PRO & Coordinator- Parents Meet, 19) Student Welfare Officer, 20) Rector (Boys Hostel), 21) Rector (Girls Hostel), 22) Coordinator, ISTE & IE (I), 23) Vehicle Incharge, 24) Principal office

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

First Year Engineering
(Common to all Branches)

Faculty of Science and Technology



‘A’ Grade
NAAC Re-Accredited
(3rd Cycle)

Course Outline

Semester – I & II

w.e.f. 2017 – 18

Subject Group Code and Subject Groups

A – Core Engineering Course/ Program specific course

B – Basic Sciences/ Humanities / Social Sciences course

C – Discipline Specific Course / Elective Course

D – Ability Enhancement Course/ Skill development course

E – Interdisciplinary/ Generic Elective course

Syllabus Structure for First Year Engineering (Semester – I)

Course Code	Name of the course	Group	Teaching Scheme				Theory (Marks)		Practical (Marks)		Total (Marks)	Credits
			Teaching Hrs./week	Tut. Hrs./week	PR Hrs./week	Total Hrs./week	ISE	ESE	ICA	ESE		
FEN 101	Applied Physics -I	B	03	--	--	03	40	60	--	--	100	03
FEN 102	Applied Chemistry -I	B	03	--	--	03	40	60	--	--	100	03
FEN 103	Applied Mathematics -I	B	03	01	--	04	40	60	--	--	100	04
FEN 104	Communicative English	D	03	--	--	03	40	60	--	--	100	03
FEN 105	Introduction to Civil Engineering & Engineering Mechanics	A	03	--	--	03	40	60	--	--	100	03
FEN 106	Introduction to Electrical Engineering	A	03	--	--	03	40	60	--	--	100	03
FEN 107	Workshop Practice –I	A	-	--	02	02	--	--	25	--	25	01
FEN 108	Applied Sciences Lab -I	B	--	--	*02	02	--	--	25	--	25	01
FEN 109	Introduction to Civil Engineering & Engineering Mechanics Lab	A	--	--	02	02	--	--	25	25 (OR)	50	01
FEN 110	Introduction to Electrical Engineering Lab	A	--	--	02	02	--	--	25	25(OR)	50	01
FEN 111	Communicative English Lab	D	--	--	02	02	--	--	25	25(OR)	50	01
Total			18	01	10	29	240	360	125	75	800	24

ISE: Internal Sessional Examination, ESE: End Semester Examination, ICA: Internal Continuous Assessment, *Alternate week.

Syllabus Structure for First Year Engineering (Semester – II)

Course Code	Name of the course	Group	Teaching Scheme				Theory (Marks)		Practical (Marks)		Total (Marks)	Credits
			Teaching Hrs./week	Tut. Hrs./week	PR Hrs./week	Total Hrs./week	ISE	ESE	ICA	ESE		
FEN 112	Applied Physics -II	B	03	--	--	03	40	60	--	--	100	03
FEN 113	Applied Chemistry -II	B	03	--	--	03	40	60	--	--	100	03
FEN 114	Applied Mathematics -II	B	03	01	--	04	40	60	--	--	100	04
FEN 115	Introduction to “C” Programming	A	03	--	--	03	40	60	--	--	100	03
FEN 116	Introduction to Mechanical Engineering & Engineering Drawing	A	03	--	--	03	40	60	--	--	100	03
FEN 117	Introduction to Electronics Engineering	A	03	--	--	03	40	60	--	--	100	03
FEN 118	Workshop Practice –II	A	-	--	02	02	--	--	25	--	25	01
FEN 119	Applied Sciences Lab -II	B	--	--	*02	02	--	--	25	--	25	01
FEN 120	Introduction to Mechanical Engineering & Engineering Drawing Lab	A	--	--	02	02	--	--	25	25 (OR)	50	01
FEN 121	Introduction to “C” Programming Lab	A	--	--	02	02	--	--	25	25(OR)	50	01
FEN 122	Introduction to Electronics Engineering Lab	A			02	02	--	--	25	25(OR)	50	01
Total			18	01	10	29	240	360	125	75	800	24

ISE: Internal Sessional Examination, ESE: End Semester Examination, ICA: Internal Continuous Assessment, *Alternate week

Applied Physics - I

COURSE OUTLINE

Applied Physics - I

AP-I

FEN101

Course Title

Short Title

Course Code

Course description:

This course is aimed at introducing the fundamentals of basic sciences (Applied 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 (Applied Physics -I) and their applications in different areas

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	03	14	42	03

Prerequisite course (s): 11th& 12th Physics

Course Objectives

1. To impart knowledge of basic concepts in applied physics and implementation to various engineering fields.
2. To provide the knowledge and methodology necessary for solving problems in the field of engineering.

Course outcomes:

Learner will be able to...

1. Apply the concepts of use of non-conventional energy for betterment of society.
2. Apply the concepts of Laser and Fiber Optic communication and Illustrate the principle, construction and working of various LASERs and its applications.
3. Apply the concepts of crystallography and to use XRD techniques for analysis of crystal structure.
4. Basic understanding of Semiconductor theory with use of Hall effect in science and technology as a Hall probe sensor
5. Comprehend principles of interference and diffraction.

COURSE CONTENT

Applied Physics - I

Teaching Scheme

Lectures: 3 hours/week

Semester I

Examination scheme

End semester exam (ESE): 60 marks

Duration of ESE: 03 hours

Internal Sessional Exams (ISE): 40 marks

Unit-I: Environmental Science

No. of Lectures: 08 Hours, Marks: 12

a) Energy Sources (Non-conventional): Introduction to non-conventional energy sources, Solar cell (Principle, Construction, Working and Characteristics), Wind energy - Wind Mill, Biogas and Biomass (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 and Fiber Optics

No. of Lectures: 08 Hours, Marks: 12

a) Laser: Introduction, Laser beam characteristics – Coherence, Directionality, Intensity, Monochromaticity, 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 3D images using hologram, Reconstruction of 3D images, Comparison with ordinary photography.

b) Fiber Optics: Structure of optical fibre. Principle of optical fibre. Propagation mechanism in optical fibre – Angle of acceptance, Numerical aperture, Critical angle, Optical fibre communication system (only diagram), Advantages of optical fibre, Applications of optical fibre.

Unit-III: Crystallography and X-rays

No. of Lectures: 08 Hours, Marks: 12

a) Crystallography: Introduction, Space lattice – Translation vectors, the basis and crystal structure, Unit cell and Lattice parameters, Bravais lattices, the cubic crystal – The Simple Cube (SC), Body Centered Cube (BCC), Important parameters of cubic lattice – Number of atoms per unit cell, Co-ordination 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 cubic crystal, Numericals.

b) X-rays: Production of X-rays (Coolidge tube), Continuous and characteristic X-rays. Bragg's law, Properties and Applications of X-rays, Numericals.

Unit-IV: Physics of Semiconductor

No. of Lectures: 08 Hours, Marks: 12

Classification of solids on the basis of band theory, Fermi level and position of Fermi level in intrinsic [With derivation i.e. $E_f = (E_c + E_v)/2$] and extrinsic semiconductors, Conductivity in semiconductors, Formation of P-N junction, Diode under forward and reverse bias, Hall effect, Determination of Hall coefficient.

Unit-V: Optics

No. of Lectures: 08 Hours, Marks: 12

a) Interference: Interference, Michelson's Interferometer, Applications of Michelson's interferometer – Wavelength determination, Refractive index of thin film, Thickness of transparent material.

b) Diffraction: Diffraction, Theory of plane transmission diffraction grating, Determination of wavelength by grating, Rayleigh's criteria of resolution, Resolving power of grating.

c) Polarization: Polarization, Polarization by reflection, Brewster's law, law of Malus, Dichroism, Polaroids. Engineering applications of polarization.

Text Books:

1. R K Gaur, S L Gupta, "Engineering Physics", Dhanpat Rai Publications.
2. M N Avadhanulu, P G Kshirsagar, "Text book of Engineering Physics", S. Chand.

Reference Books:

1. P S Aithal, H J Ravindra, "Engineering Physics", Acme Learning.
2. G Vijayakumari, "Engineering Physics", Vikas Publications.
3. M R Srinivasan, "Physics for Engineers", New Age International Publishers.
4. C S Solanki, "Solar Photovoltaic", PHI Learning Private Limited.
5. S O Pillai, "Solid state Physics", New Age International Publishers.
6. Ajay Ghatak, "Optics", TMH.
7. Hugh D Young, Roger A Freedman, "University Physics (With Modern Physics)", Pearson.
8. Hintendra K Malik, A K Singh, "Engineering Physics", Mc Graw Hill.
9. K Rajgopal, "Engineering Physics", PHI Learning Private Limited.
10. Uma Mukharji, "Engineering Physics", Narosa Publishing House
11. S Deswal, A Deswal, "Basic Course of Environmental Pollution", Dhanpath Rai Publications.
12. N Subrahmanyam, Brijal, M N Avadhanulu, "Optics", S. Chand.

13. Sanjay Jain, “Engineering Physics”, Universities Press (India) Pvt Ltd.

Applied Chemistry - I

COURSE OUTLINE

Applied Chemistry - I

AC-I

FEN102

Course Title

Short Title

Course Code

Course description:

This course is aimed at introducing the fundamentals of basic sciences (Applied 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 Applied Chemistry –I and their applications in different branches of engineering.

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	03	14	42	03

Prerequisite course (s): 11th & 12th Chemistry

Course 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.

Course outcomes:

After successful completion of this course the student will be able to:

- Design and conduct experiments, analyze and interpret data.
- Design a component, system or process to meet desired needs within realistic constraints.
- An ability to function on multidisciplinary terms.
- Identify, formulate and solve problems.
- Understand the impact of engineering solutions in global, economic, environmental and societal context.
- Ability to appreciate contemporary issues and engages in life-long learning.
- Use the latest techniques, skills and modern tools necessary for engineering practices.
- Understanding of the necessity to quantitatively balance the built environment with the natural world.
- 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 classification, preparation, properties and applications of different alloys.
- m) Understand the Water, Air Noise and Radioactive Pollution along with its control measures.

COURSE CONTENT

Applied Chemistry - I

Teaching Scheme

Lectures: 3 hours/week

Semester I

Examination scheme

End semester exam (ESE): 60 marks

Duration of ESE: 03 hours

Internal Sessional Exams (ISE): 40 marks

Unit-I: Water

No. of Lectures: 08 Hours, Marks: 12

- 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

Unit-II: Polymer

No. of Lectures: 08 Hours, Marks: 12

- a) Introduction, Definition
- b) Classification: on the basis of chemical composition, synthesis, intramolecular forces.
- c) Types of polymerization – addition & condensation polymerization with examples.
- d) Plastic – Types of plastic – Thermoplastic & thermosetting plastic.
- e) Explanation & different types with their properties & applications (i) PVC (ii) Teflon (iii) Polycarbonate (iv) Polystyrene
- f) Rubber - Types of rubber- natural & synthetic
- g) 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

Unit-III: Cement

No. of Lectures: 08 Hours, Marks: 12

- a) Definition, Classification and properties - Natural, Pozzolana & Portland
- 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 Alloys

No. of Lectures: 08 Hours, Marks: 12

- 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) Duralumin (iv) Nichrome (v) Steel – Mild, Medium & High.

Unit–V: Environmental Pollution & its control. No. of Lectures: 08 Hours, Marks: 12

- a) Introduction
- b) Water Pollution: Causes, Effects and Control measures of water pollution,
- c) Air Pollution: Acid Rain, Green house effects, Depletion of Ozone
- d) Causes, Effect and Control measures of air pollution.
- e) Noise Pollution: Causes, effects & Control of noise pollution
- f) Radioactive pollution: Causes, effects & Control of Radioactive pollution.
- g) Green Chemistry -Definition & its application.

Text Books:

1. Jain & Jain, “Engineering Chemistry”, Dhanpat Rai Publishing Co.
2. S. S. Dara, “A Text Book of Engineering Chemistry”, S Chand & Co. Ltd.

Reference Books:

1. B K Sharma, Krishna, “Engineering Chemistry”, Prakashan Media (P) Ltd.
2. Suba Ramesh, “Engineering Chemistry”, Wiley India Pvt. Ltd.
3. R Gopalan, “A Text book of Engineering Chemistry”, Vikas Publishing House Pvt. Ltd. Third Edition
4. B S Chauhan, “Engineering Chemistry”, University Science Press, Third Edition.
5. Shashi Chawla, “A Text book of Engineering Chemistry”, Dhanpat Rai Publishing Co.
6. V R Gowariker, “Polymer Science”. New Age International.
7. Abhijit Mallick, “Engineering Chemistry”, Viva books.

8. Sunita Ratan, "Engineering Chemistry", S K Kataria & Sons.
9. Das R K, "Industrial Chemistry", Asia Pub. House, New York, 1966

Applied Mathematics - I

COURSE OUTLINE

Applied Mathematics - I

AM-I

FEN - 103

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	14	42	04

Prerequisite course (s): 11th & 12th mathematics

Course objectives:

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.

Course 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

Applied Mathematics - I

Teaching Scheme

Lectures: 3 hours/week

Tutorial: 1 hour

Semester I

Examination scheme

End semester exam (ESE): 60 marks

Duration of ESE: 03 hours

Internal Sessional Exams (ISE): 40 marks

UNIT 1: Matrices and its Applications**No. of Lectures: 08, Marks 12**

(Introduction to Definition of Elementary Transformations, Canonical Form & Rank of Matrix.)

1. System of Linear Equations. (By using rank of matrix) for both Homogeneous & non-Homogeneous systems.
2. Eigen values & Eigen vectors, Cayley Hamilton Theorem (only statement).
3. Orthogonal Transformation and Matrix.
4. Application of Matrices to the Engineering Field.

UNIT 2: Differential Calculus and its Applications**No. of Lectures: 08, Marks 12**

(Introduction to Successive Differentiation with standard formulae)

1. Leibnitz's theorem (without proof).
2. Taylor's & Maclaurin's theorems (without proof).
3. Expansion of Functions using Taylor's theorem, Maclaurin's theorem & Leibnitz's theorem.
4. Applications of Taylor's theorem.

UNIT 3: Complex Number and Its Applications**No. of Lectures: 08, Marks 12**

(Introduction of Complex Number- Definition and Properties, De-Moivre's Theorem and Argand diagrams. Roots of Complex Number)

1. Hyperbolic and Inverse Hyperbolic functions
2. Logarithm of Complex numbers,
3. Separation into Real and Imaginary parts.
4. Application to Engineering Field.

UNIT 4: Partial Differentiation**No. of Lectures: 08, Marks 12**

(Introduction to Partial Derivatives of First and Higher Order)

1. Euler's theorem on Homogeneous functions
2. Change of independent variable/ Composite Function
3. Total derivatives and Total Differential Theorem
4. Differentiation of Implicit functions.

UNIT 5: Integral Calculus**No. of Lectures: 08, Marks 12**

1. Gamma Function.

2. Beta Function.
3. Differentiation under Integral Sign. (No Verification of Rule).
4. Error Function

Text Books:

1. B S Grewal, "Higher Engineering Mathematics", Khanna Publication.

Reference Books:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley Eastern Ltd, 7th Edition.
2. H K Das, "Advanced Engineering Mathematics", S. Chand & Company.
3. B V Ramana, "Engineering Mathematics", TMH, 2nd Edition.
4. N P Bali, "A Text Book of Engineering Mathematics", Laxmi Publication, New Delhi.
5. Kandasamy, "Numerical Methods", S. Chand & Company.

Communicative English

COURSE OUTLINE

Communicative English

CE

FEN104

Course Title

Short Title

Course Code

Course description:

This course has been designed paying special attention to the contemporary industrial needs and current society demands for Communicative Language skills.

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	03	14	42	03

Prerequisite course (s): 11th & 12th English

Course objectives:

1. To help students become more fluent in the use of English and thus develop the ability to communicate easily and naturally.
2. To introduce different social situations to learners for developing their conversational skills.
3. To enhance learners English language proficiency in social and work situations, particularly in spoken interaction.
4. To develop communication skills in a professional context which will enable students to compete for an engineering or technical career and also perform effectively in their chosen profession.
5. To help students correct their pronunciation, word stress and intonation.
6. To develop the skills of technical writing and enable them to carry out their official and professional duties efficiently.
7. To help students use grammar for communication and relate grammatical structures to meaning, use and situation.
8. To inculcate student's competence in academic, commercial, and professional writing.

Course outcomes:

Upon Successful Completion of this course the students will be able to:

1. Students will be “accomplished technical communicators”;
2. Enhance learners’ English language proficiency in spoken interaction
3. They will be more fluent in the use of English and communicate naturally.
4. Augment the ability of the students to create, compose& render presentation with or without the help of media
5. Develop a logical framework for the critical analysis of spoken, written, visual and mediated messages in a diverse marketplace.
6. Become adept in their use of the spoken words in interpersonal communication, small group interactions and public speaking.
7. Students will be experts in professional writing.
8. Students will demonstrate proficiency in the use of written English, including proper spelling, grammar, and punctuation

COURSE CONTENT

Communicative English

Teaching Scheme

Lectures: 3 hours/week

Semester I

Examination scheme

End semester exam (ESE): 60 marks

Duration of ESE: 03 hours

Internal Sessional Exams (ISE): 40 marks

UNIT 1: Spoken English

No. of Lectures: 08, Marks 12

- a) Pronunciation & Spelling
- b) Organs of Speech-(diagram)
- c) Vowels
- d) Consonants
- e) Diphthongs
- f) Phoneme & phonemic Transcription
- g) Intonation
- h) Word & Sentence Stress

UNIT 2: Oral Communication (Functions)**No. of Lectures: 08, Marks 12****Drills, Dialogues & Dialogue Comprehension, Role plays**

- a) Introducing oneself
- b) Asking questions and giving polite replies
- c) Complaining and apologizing
- d) Persuading people to do something
- e) Taking the initiative
- f) Seeking permission
- g) Inviting friends and colleagues
- h) Praising and complimenting people
- i) Expressing sympathy
- j) Using the telephone

UNIT 3: Professional Communication**No. of Lectures: 08, Marks 12**

- a) Interview Skills (campus recruitment): Why an Interview? Interview Questions, Types of Interview, how to Answer the Questions, Reasons for selecting & rejecting a candidate, how to present well in the Interview?
- b) Group Discussion: Why Group discussion? Skills required in Group discussion, Areas to be concentrated while preparing for Group discussion, Techniques to initiate a Group discussion
- c) Difference between Group Discussion & Debate
- d) Successful Leadership Qualities
- e) Effective Presentation strategies: Preparation, structuring the Presentation, Visual Aids, Positive & Negative traits
- f) Public speaking
- g) Effective Listening Strategies: Difference between hearing & Listening

UNIT 4: Commercial and professional writing**No. of Lectures: 08, Marks 12**

- a) Job Application
- b) Preparing CV/Résumé
- c) Difference among Bio-data, CV & Résumé
- d) Business correspondence: Layout of Business letter, (complaint & adjustment, Invitation, order, inquiry, reply letters)

- e) Meeting, Notice, Agenda and minutes of a meeting, Memo, Fax, E-mail
- f) Paragraph writing
- e) Précis writing
- f) Academic writing: Research article
- g) Report writing

UNIT 5: Grammar Usage & Vocabulary Enhancement No. of Lectures: 08, Marks 12

- a) Agreement of Subject and Verb
- b) Static and Dynamic Verbs
- c) The auxiliary system: finite and non-finite verbs
- d) Modal Verbs
- e) Parts of Speech
- f) Sequence of Tenses
- g) Interrogation
- h) Reported Speech
- i) Conditionals
- j) Comprehension of Unseen Passages
- k) Punctuation and Capitalization

Text Books:

Effective Technical Communication by M Ashraf Rizvi, The McGraw-Hill companies.

Reference Books:

1. A Text Book of English Phonetics for Indian Students by T. Balasubramaniam. (Macmillan India Limited)
2. A Course in Phonetics and Spoken English by J. Sethi and P.V. Dhamija (PrenticeHall of India.)
3. Spoken English by R.K. Bansal and J.B. Harrison (Orient Longman)
4. Cambridge English Pronouncing Dictionary, Cambridge University Press, India, 2012
5. Better English Pronunciation by J.D.O'Connor.
6. The Functional Aspects of Communication Skills- Prasad, P., Delhi.
7. Communicative Grammar of English by Geoffrey Leech and Ian Svartik.

8. English Vocabulary in Use- McCarthy, Michael., Cambridge University Press.
9. English Grammar and Composition- Rajinder Pal and Prem Lata., Sultan Chand Publication.
10. Business Correspondence and Report Writing- R C Sharma Krishna Mohan - 2002
11. An introduction to Professional English and Soft Skills by B. K. Das et al., Cambridge University Press (Facilitated by BPUT)
12. Entrepreneurial Development by C. B. Gupta& Srinivasan. (S. Chand & Sons)

Introduction to Civil Engineering and Engineering Mechanics

COURSE OUTLINE

Introduction to Civil Engineering and Engineering Mechanics

ICEEM

FEN-105

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

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	03	14	42	03

Prerequisite course (s): 11th & 12th Mathematics & Physics

Course objectives:

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.

Course outcomes:

Upon successful completion of this course the student will be able to:

- 1. Know basic areas of civil engineering
- 2. Know principle of planning and building byelaws.
- 3. Understand use of the compass for angular measurement and calculation of included angles in a traverse
- 4. Compute the rectangular components of a force.
- 5. Identify and/or list the different types of force systems.
- 6. Define and calculate the resultant of coplanar force systems.

7. Define and calculate the moment of forces about any given point.
8. Draw free body diagrams of coplanar force systems.
9. Understand condition of equilibrium for coplanar forces
10. Solve for the forces and reactions in statically determinate coplanar force systems
11. Calculate the centroid of composite plane and curved figures.
12. Compute the tensile and compressive values of forces in truss members.
13. Define friction, friction force, static friction, kinetic friction, normal force, coefficient of static friction, angle of friction, and angle of repose.
14. Find position, displacement, speed, velocity, acceleration, distance, and time of moving particle along the straight line and curved path.
15. Solve particle motion involving equation in 2D using rectangular and tangential/normal Coordinate systems.
16. Understand Newton's second law and D'Alembert's principle, understand principle of linear impulse and momentum, Understand the principle of work and energy for particles.

COURSE CONTENT

Introduction to Civil Engineering & Engineering Mechanics

Teaching Scheme

**Lectures: 3 hours/week
marks**

hours

Marks

Semester I

Examination scheme

End semester exam (ESE): 60

Duration of ESE: 03

Internal Sessional Exams (ISE): 40

UNIT 1: Introduction to Civil Engineering

No. of Lectures: 08, Marks 12

- a) Basic Civil engineering: Introduction to various branches of civil engineering
- b) Building Construction: Introduction to principles of planning, introduction to various parts of buildings. Load bearing & frames structure
- c) Surveying: Principles of surveying, introduction to compass, bearing, Whole Circle Bearing & reduced Bearing System and measurement of included angles.

UNIT 2: Statics - I**No. of Lectures: 08, Marks 12**

- a) Resultant of coplanar forces: Introduction, basic concepts, principals 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 diagrams, conditions of equilibriums, equilibriums of forces in a plane, Lami's theorem, reactions of determinate beams

UNIT 3: Statics – II**No. of Lectures: 08, Marks 12**

- a) Centre of Gravity, Centre of mass and Centroid: Introduction, centre of gravity, centre of mass, centroid of composite plane figures, Derivation for centroid of rectangle, triangle and semicircle. Numerical on centroid of composite plane figures.
- b) Plane Truss: Types of Plane trusses (perfect and imperfect), Analysis of plane truss by method of joints and method of sections.
- c) Friction: - Introduction, laws of friction, simple contact friction, ladder friction, application of friction on horizontal and inclined planes.

UNIT 4: Dynamics - Kinematics**No. of Lectures: 08, Marks 12**

- 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 5: Dynamics - Kinetics**No. of Lectures: 08, Marks 12**

Kinetics of rectilinear motion of particle:

- a) D'Alembert's Principle, Newton's second law of motion,
- b) Conservation of energy and work energy principle for motion of particles.
- c) Impulse, momentum, direct central impact and coefficient of restitution. Conservation of momentum & impulse momentum principle of particle.

Text Books:

1. Sanju Unadkat, Engineering Mechanics, Techmax Prakashan
2. S C Gupta, Engineering Mechanics, Nirali Prakashan

Reference Books:

1. Bhavikatti S. S. & K. G. Rajashekarappa, "Engineering Mechanics", New Age International (P) Ltd., Publishers.
2. Kanitkar T. P. and Kulkarni, "Surveying and Levelling, Part I", Pune Vidyarthi Gruha Prakashan, 24th Edition
3. Bindra and Arora, "Building Construction", Dhanpat rai and Sons, Delhi.
4. N Kumara Swamy and A Ksmeswara Rao, "Building Planning and Drawing", Charotar Publishing House Pvt. Ltd.
5. Satish Gopi, "Basic Civil Engineering", Pearson Education, Delhi, 2008.
6. F P Beer and E R Johnson, "Mechanics for Engineers - Statics", McGraw-Hill Publication, 5th Edition
7. F P Beer and E R Johnson, "Mechanics for Engineers - Dynamics", McGraw-Hill Publication, 8th Edition.
8. S P Timoshenko and D H Young, "Engineering Mechanics", McGraw- Hill Publications, 4th Edition
9. 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.

Introduction to Electrical Engineering

COURSE OUTLINE

Introduction to Electrical Engineering

IEE

FEN-106

Course Title

Short Title

Course Code

Course description:

This course provides an introduction to electrical engineering which includes over view of electric power generation, single and three phase AC circuit, magnetic circuit and fundamentals of electrical installation

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	03	14	42	03

Prerequisite course (s): 11th & 12th Physics

Course objectives:

1. To explain basic laws and theorems of electrical networks
2. To explain fundamentals of magnetic circuits and alternating current circuits
3. To study and significance of magnetic circuits
4. To illustrate electrical wiring fundamentals and safety measures

Course outcomes:

1. Students will be able to demonstrate knowledge of circuit analysis using various basic laws and theorems of electrical circuits
2. Students will be able to demonstrate knowledge of magnetic circuits
3. Students will be able to demonstrate and understand definition and relationship of various AC circuits
4. Students will be able to demonstrate and understand the operation of transformer
5. Students will be able to demonstrate and understand the electrical wiring installations

COURSE CONTENT

Introduction to Electrical Engineering

Teaching Scheme

Lectures: 3 hours/week

Semester I

Examination scheme

End semester exam (ESE): 60 marks

Duration of ESE: 03 hours

Internal Sessional Exams (ISE): 40 marks

UNIT 1: DC Circuit

No. of Lectures: 09, Marks 12

DC Circuit: Kirchhoff's laws, Source conversion, series and parallel circuit, current and voltage division rule, Delta-star and star-delta conversion, Node voltage and Mesh current methods, Superposition theorem, Thevenin's theorem, Maximum power transfer theorem, Charging and discharging of capacitor, Time constant for RC circuit

UNIT 2: Single Phase AC Circuit

No. of Lectures: 08, Marks 12

Single phase AC Circuits: Concept of single phase supply, Terms related with A.C. quantities, pure resistive, inductive and capacitive circuits, complex and phasor representation of AC quantities, series and parallel circuits. Resonance in series and parallel circuits, Q-factor of coil.

UNIT 3: Three Phase AC Circuit

No. of Lectures: 08, Marks 12

Three phase AC Circuits: Concept of Three phase supply, star and delta connections, line and phase values, solution of balanced three phase circuits, phasor diagram. Measurement of power in three phase circuit.

UNIT 4: Magnetic Circuit

No. of Lectures: 09, Marks 12

Electromagnetic Induction: Faraday's laws, statically and dynamically induced emf, self and mutual inductance, coefficients of coupling, Terms related with magnetic circuits, Magnetization curve, Magnetic leakage and fringing, Leakage coefficient, Calculation of mmf, reluctance and flux Series and parallel magnetic circuits, Magnetic hysteresis, Hysteresis and eddy current loss.

UNIT 5: Electrical Installation

No. of Lectures: 08, Marks 12

Electric Wiring installations: Types of insulated wires & wiring systems, concept of fuses, MCBs, RCCB, ELCBs, etc. in wiring installations, concept of earthing, energy bill calculations, study of different lamps.

Principle of operation, constructional details, types and applications of single phase Transformer.

Text Books:

1. B. L. Theraja and A. K. Theraja, “A Text book of Electrical Technology - Vol-I and Vol-II”, S. Chand, 1st Edition, 2001.
2. J. B. Gupta, “A Course in electrical Power”, S. K. Kataria and Sons, 12th Edition, 2002.

Reference Books:

1. V. N. Mittal, Arvind Mittal, “Basic Electrical Engineering”, Tata McGraw Hill publishing co. Ltd, New Delhi
2. D. P. Kothari, I.J Nagrath , “Basic Electrical Engineering”, Tata McGraw Hill
3. M. S. Naidu, S. Kamakshaiah , “Introduction to Electrical Engineering”, Tata McGraw Hill.
4. P. Tiwari, “Basic Electrical Engineering”, New Age Publication.
5. Josep Administer, “Schaum’s outline of Electric circuits”, Tata McGraw Hill
6. Leonard Bobrow “Fundamentals of Electrical Engineering”, Oxford University press.
7. Vincent Del Toro, “Electrical Engineering Fundamentals”, Pearson.

Workshop Practice - I

LAB COURSE OUTLINE

Workshop Practice - I

WP-I

FEN 107

Course Title

Short Title

Course Code

Course Description:

Workshop Practice - I cover the basic knowledge and practices on measuring instrument, fitting shop, welding shop, Tin smithy, Black smithy and foundry shop in order to improve the practical skill of students in different workshops.

Laboratory	Hours/Week	No. of weeks	Total Hour	Semester Credits
	02	14	28	01

ESE Pattern: ICA

Prerequisite Course(s): 11th Physics, 12th Physics

Course 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, equipment's, job holding devices, job drawing, job material, job manufacturing operations and processes in different workshops.

Course Outcomes:

Upon successful completion of these practical's the student will be able to hand

1. Measuring Instruments and fitting shop
2. Welding Shop
3. Tin smithy shop
4. Black smithy shop
5. Foundry shop

LAB COURSE CONTENT

Workshop Practice - I

Teaching Scheme

Practical: 2 hours/week

Semester I

Examination scheme

End Semester Exams (ESE): ---

Internal Continuous Assessment (ICA): 25

1. Measuring Instruments:

a. Demonstration of handling measuring instruments like steel rule, measuring tape, try-square, Vernier calliper, micrometre, Vernier height gauges, bevel protector etc.

b. Fitting shop:

One job on finishing two sides and make right angles of square job by filing operation, one drilling and tapping operations.

2. Welding Shop:

a. Demonstration or 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 Shop:

One job including soldering, Riveting etc. For example- letter box, Waste paper basket, tray, Funnel etc.

4. Black Smithy Shop:

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 moulding, casting of any simple pattern.

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.

Applied Science - I Lab

LAB COURSE OUTLINE

Applied Science -I Lab

AS-II LAB

FEN 108

Course Title

Short Title

Course Code

Course Description:

In this laboratory, course emphasis is on the understanding of basic principles, working of pH-meter, Bomb calorimeter, Ostwald's Viscometer, various properties of lubricating oils, proximate analysis of fuels etc. The learner can use this knowledge and apply in various branches of engineering as required.

Laboratory	Hours/Week	No. of weeks	Total Hour	Semester Credits
	02	14	28	01

Prerequisite Course(s): 12th Chemistry, Different laws, basic principles and theories.

Course Objective:

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.

1. To impart knowledge of basic concepts in applied physics and implementation to various engineering fields.
2. To provide the knowledge and methodology necessary for solving problems in the field of engineering.

Course Outcomes:

Upon successful completion of lab Course, student will be able to:

- a) Analyse the partition Coefficient of Iodine between water & CCl₄.
- b) Analyse the saponification value of given oil sample.
- c) Analyse the viscosity of given liquid by Ostwald's Viscometer.
- d) Analyse the Calorific value of fuel sample by using Bomb calorimeter.
- e) Identify the Moisture content, Volatile matter, Ash content and Fixed carbon in coal sample by proximate analysis.
- f) Identify the acidic and basic solution by using pH-meter.
- g) Analyse the acid value of Vegetable Oil sample.

- h) Analyse the strength of NaHCO_3 and Na_2CO_3 in alkali mixture.
- i) Analyse the Aniline point of lubricating oil.
- j) Analyse the Iodine value of an Oil sample by Wij's method.

Learner will be able to:

1. Apply the concepts of use of non-conventional energy for betterment of society.
2. Apply the concepts of Laser and Fiber Optic communication and Illustrate the principle, construction and working of various LASERs and its applications.
3. Apply the concepts of crystallography and to use XRD techniques for analysis of crystal structure.
4. Basic understanding of Semiconductor theory with use of Hall effect in science and technology as a Hall probe sensor
5. Comprehend principles of interference and diffraction.

LAB COURSE CONTENT

Applied Science - I Lab

Teaching Scheme

Practical: 2 hours/week

(Alternate)

Semester I

Examination scheme

End Semester Exams (ESE): ---

Internal Continuous Assessment (ICA): 25

Applied Chemistry – I Lab

Practical -2 Hrs/Alternate weeks (Alternate with Applied Physics- I)

(Note: Minimum FIVE Experiments out of 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. $\text{K}_2\text{Cr}_2\text{O}_7$ 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 $\text{K}_4[\text{Fe}(\text{CN})_6]$ 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.

Text Books:

1. Jain & Jain, "Engineering Chemistry", Dhanpat Rai Publishing Co.
2. S. S. Dara, "A Text Book of Engineering Chemistry", S Chand & Co. Ltd.

Reference Books:

1. B K Sharma, Krishna, "Engineering Chemistry", Prakashan Media (P) Ltd.
2. Suba Ramesh, "Engineering Chemistry", Wiley India Pvt.Ltd.
3. R Gopalan, "A Text book of Engineering Chemistry", Vikas Publishing House Pvt. Ltd. Third Edition
4. B S Chauhan, "Engineering Chemistry", University Science Press, Third Edition.
5. Shashi Chawla, "A Text book of Engineering Chemistry", Dhanpat Rai Publishing Co.

Applied Physics – I

Practical -2 Hrs/Alternate weeks (Alternate with Applied Chemistry- I)

(Note: Minimum FIVE Experiments from the following)

1. Semiconductor diode characteristics.
2. Band gap in semiconductor material.
3. To determine the resistivity of the given semiconductor by using four probe method.
4. To determine the wavelength of laser source.
5. Fiber Optics Communications.

6. Hall Effect & determination of Hall coefficient.
7. Solar cell Characteristics
8. Spectrometer Grating
9. Michelson's Interferometer
10. Determination of polarizing angle for glass and to determine refractive index of glass using Brewster's law.
11. Experimental verification of law of Malus
12. Crystal structure

Text Books:

1. R K Gaur, S L Gupta, "Engineering Physics" , Dhanpat Rai Publications.
2. M N Avadhanulu, P G Kshirsagar, "Text book of Engineering Physics" , S. Chand.

Reference Books:

1. P S Aithal, H J Ravindra, Engineering Physics", Acme Learning.
2. G Vijayakumari, "Engineering Physics", Vikas Publications.
3. M R Srinivasan, "Physics for Engineers", New Age International Publishers.
4. C S Solanki, "Solar Photovoltaic", PHI Learning Private Limited.

Introduction to Civil Engineering & Engineering Mechanics Lab

LAB COURSE OUTLINE

Introduction to Civil Engineering & Engineering Mechanics Lab

ICEEM LAB

FEN109

Course Title

Short Title

Course Code

Course Description:

These laboratories cover experiments related to basic principles of Statics, Dynamics, Topographic Surveying, building planning.

Laboratory	Hours/Week	No. of weeks	Total Hour	Semester Credits
	02	13	26	01

ESE Pattern: Oral (OR)

Prerequisite Course(s): 12th Physics.

Course 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 Measurements with Compass.

Course Outcomes:

Upon successful completion of these practical the student will be able to

- a) To understand basic laws of engineering mechanics & apply the same to solve problems.
- b) To learn the use of prismatic compass for angular measurements.
- c) Understand & apply triangle laws of forces for solving problems.
- d) Understand the conditions of equilibrium of forces.
- e) Describe efficiency, load, efforts, velocity ratio, frictional effort verify law of machines.

- f) Describe frictional forces, limiting friction, coefficient of friction and verify law of friction.
- g) Apply graphical methods to solve problems.
- h) Measure bearings of lines with prismatic compass and calculate included angles.

LAB COURSE CONTENT

Introduction to Civil Engineering

& Engineering Mechanics Lab

Teaching Scheme

Practical: 2 hours/week

Semester I

Examination scheme

End Semester Exams (ESE): 25 marks

Internal Continuous Assessment (ICA): 25 marks

Group A

1. Study of vectors

- a) To calculate the resultant of coplanar and non-coplanar (space) forces.
- b) To calculate unknown forces (reaction).

2. Verification of law of polygon of forces.

- a) To verify the 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 ratio 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. Reaction 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 frictions 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 \propto reaction.

7. Study the 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 machines from graph.

8. Graphical work (Statics)- (minimum three problems on graphical solutions of Static's problems).

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 three problems on graphical solutions of Dynamic's problems).

a) To draw the motion curve and understand the significance of same.

b) To calculate the displacement and distance travelled from V-T diagram.

Note: The lab journal should consist of six experiments/assignments from group A. Assignment no. 8 & 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 of first unit. Any one of the following.

a) Write notes on following: Various branches of civil engineering such as Structural Engineering, Water Resource Engineering, Geotechnical engineering, Transportation engineering, Environmental Engineering, Building science and Construction Management.

b) i) Explain principles of planning.

ii) Differentiate between load bearing and framed structures with neat sketches.

Note: The lab journal should consist of above two experiments/assignments from group B.

Text Books:

1. Sanju Unadkat, Engineering Mechanics, Techmax Prakashan
2. S C Gupta, Engineering Mechanics, Nirali Prakashan

Reference Books:

1. Bhavikatti S. S. & K. G. Rajashekarappa, "Engineering Mechanics", New Age International (P) Ltd., Publishers.
2. Kanitkar T. P. and Kulkarni, "Surveying and Levelling, Part I", Pune Vidyarthi Gruha Prakashan, 24th Edition
3. Bindra and Arora, "Building Construction", Dhanpat rai and Sons, Delhi.
4. N Kumara Swamy and A Kameswara Rao, "Building Planning and Drawing", Charotar Publishing House Pvt. Ltd.
5. Satish Gopi, "Basic Civil Engineering", Pearson Education, Delhi, 2008.
6. F P Beer and E R Johnson, "Mechanics for Engineers - Statics", McGraw-Hill Publication, 5th Edition
7. F P Beer and E R Johnson, "Mechanics for Engineers - Dynamics", McGraw-Hill Publication, 8th Edition.
8. S P Timoshenko and D H Young, "Engineering Mechanics", McGraw- Hill Publications, 4th Edition
9. 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.

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 journal submitted by the students.

Introduction to Electrical Engineering Lab.

LAB COURSE OUTLINE

Introduction to Electrical Engineering Lab

IEE LAB

FEN110

Course Title

Short Title

Course Code

Course Description:

In this laboratory course emphasis is on the understanding of the characteristics of basic circuits that use resistors, inductors and capacitors; magnetic circuits, AC/DC circuits and electrical installation. The students can use this knowledge to analyze more complex circuits such as electrical networks, single and three phase circuits, magnetic circuits etc.

Laboratory	Hours/week	No. of weeks	Total Hour	Semester Credits
	02	14	28	01

ESE Pattern: Oral [OR]

Prerequisite Course(s): Course on Physics at HSC level.

Course Objectives:

The objective of this lab is to impart the fundamental knowledge of electrical engineering to the students and to develop the students' ability to apply the specific procedures to analyze the electrical engineering Systems.

In this lab, students will be familiar with use of different theorems to analyze electrical networks. Students will also become familiar with R, L and C circuit, transformation ratio of transformer, power measurement, energy bill calculations etc.

Course Outcomes:

Upon successful completion of the lab student will be able to

- Identify electrical components / equipment's.
- Simplify D.C. network using Superposition Theorem.
- Simplify D.C. network using Thevenin's Theorem.
- Analyze RL and RLC series circuit.

- e. Perform measurement of power in a single phase circuit.
- f. Determine transformation ratio of a single phase transformer.
- g. Analyze the measurement of power consumption of lamp.
- h. Analyze light output in lumens of different lamps.
- i. Analyze energy bill calculation of different lamps.
- j. Describe operating principle of MCB, RCCB and ELCB.

LAB COURSE CONTENT

Introduction to Electrical Engineering

Semester I

Teaching Scheme

Examination scheme

Practical: 2 hours/week

End Semester Exams (ESE): 25 marks

Internal Continuous Assessment (ICA): 25 marks

(Minimum FOUR practical's in each group)

Group A

1. Study and representation of electrical components / equipment's
2. Verification of Thevenin's theorems.
3. Verification of Superposition theorems.
4. Verification of Maximum power transfer theorems.
5. Measurement of current, voltage and power in R-L series excited by single phase AC supply.
6. Measurement of current, voltage and power in R-L-C series excited by single phase AC supply.

Group B

7. Measurement of power in single-phase circuit.
8. Measurement of power in three-phase circuit.
9. Determination of transformation ratio of a single-phase transformer.
10. Measurements of light output in lumens and energy bill calculation for different lamps.
11. Study of MCB, RCCB and ELCB.
12. Study of different earthing systems

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 journal submitted by the students.

Text Books:

1. B. L. Theraja and A. K. Theraja, "A Text book of Electrical Technology - Vol-I and Vol-II", S. Chand, 1st Edition, 2001.
2. J. B. Gupta, "A Course in electrical Power", S. K. Kataria and Sons, 12th Edition, 2002.

Reference Books:

1. V. N. Mittal, Arvind Mittal, "Basic Electrical Engineering", Tata McGraw Hill publishing co. ltd, New Delhi.
2. D. P. Kothari, I.J Nagrath, "Basic Electrical Engineering", Tata McGraw Hill
3. M. S. Naidu, S. Kamakshaiah, "Introduction to Electrical Engineering", Tata McGraw Hill.
4. P. Tiwari, "Basic Electrical Engineering", New Age Publication.
5. Josep Administer, "Schaum's outline of Electric circuits", Tata McGraw Hill
6. Leonard Bobrow "Fundamentals of Electrical Engineering", Oxford University press.
7. Vincent Del Toro, "Electrical Engineering Fundamentals", Pearson.

Communicative English Lab

COURSE OUTLINE

Communication English Lab

CE-I

FEN111

Course Title

Short Title

Course Code

Course description:

The Communicative English Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	02	14	28	01

Prerequisite course (s): 11th & 12th English

Course objectives:

1. To make students recognize the accents of English through Audio-Visual aids.
2. To help students build their confidence and help overcome their inhibitions and self-consciousness while speaking in English. The focus will be on fluency.
3. To familiarize the students with communicative English.

Course outcomes:

Upon Successful Completion of this course the students will be able to:

1. Students will be sensitized towards recognition of English sound pattern.
2. The fluency in speech will be enhanced.

LAB COURSE CONTENT

Communicative English Lab

Semester I

Teaching Scheme

Examination scheme

Practical: 2 hours/week

End Semester Exams (ESE): 25 marks

Internal Continuous Assessment (ICA): 25 marks

Laboratory Work:

Note: - The students will be required to submit practical assignments before Examination.

- Sounds of English

- Pronunciation & Spelling
- Stress and Intonation
- Errors in Spoken English
- Business Letter (Layout)
- Job application with Resume preparation
- Newspaper Reading

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 journal submitted by the students.

Reference Books:

1. English Pronouncing Dictionary, Cambridge University Press, India, 2012.
2. A Textbook of English Phonetics for Indian Students by T. Balasubramanian, Macmillan Publisher, 1981

Applied Physics - II

COURSE OUTLINE

Applied Physics - II

AP-II

FEN112

Course Title

Short Title

Course Code

Course description:

This course is aimed at introducing the fundamentals of basic sciences (Applied Physics-II) 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 (Applied Physics -II) and their applications in different areas

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	03	14	42	03

Prerequisite course (s):11th& 12thPhysics

Course Objectives

1. To impart knowledge of basic concepts in applied physics and implementation to various engineering fields.
2. To provide the knowledge and methodology necessary for solving problems in the field of engineering.

Course outcomes:

Learner will be able to...

1. Apply the concepts of use of non-conventional energy for betterment of society.
2. Apply the concepts of Laser and Fiber Optic communication and Illustrate the principle, construction and working of various LASERs and its applications.
3. Apply the concepts of crystallography and to use XRD techniques for analysis of crystal structure.
4. Basic understanding of Semiconductor theory with use of Hall effect in science and technology as a Hall probe sensor.
5. Comprehend principles of interference and diffraction.

COURSE CONTENT

Applied Physics - II

Teaching Scheme

Lectures: 3 hours/week

Semester II

Examination scheme

End semester exam (ESE): 60 marks

Duration of ESE: 03 hours

Internal Sessional Exams (ISE): 40 marks

Unit-I: Acoustics and Ultrasonic

No. of Lectures: 08 Hours, Marks: 12

a) Acoustics: Elementary acoustics, Echo, Reverberation, Reverberation time, Sabine's formula (without derivation). Coefficient of absorption, Intensity level, Loudness, decibel, Acoustic intensity, Limits of audibility, Acoustical planning of building, Factors affecting the architectural acoustics of building, Limits of audibility, Numericals.

b) Ultrasonic: Ultrasonic waves, Production of ultrasonic waves by – (1) Piezoelectric generators-its merits and demerits, (2) Magnetostriction oscillator - its merits and demerits. properties of ultrasonic. Engineering applications of ultrasonic. Numericals.

Unit-II: Magnetic Materials & Superconductivity No. of Lectures: 08 Hours, Marks: 12

a) Magnetic Materials: Origin of magnetism, Classification of magnetic materials into paramagnetism, Diamagnetism and Ferromagnetism. Hysteresis loop, Hard and Soft magnetic materials. Ferrites – Production, Properties and Applications. Numerical.

b) Superconductivity: Superconductors, Type-I and Type-II superconductors, Properties of superconductors, Effect of Impurity, Magnetic field, Pressure, Stress etc. on superconductors, Meissner's effect, Applications of superconductor. Numericals.

Unit-III: Modern Physics and Spectroscopy No. of Lectures: 08 Hours, Marks: 12

a) Modern Physics: Motion of a charged particle in electric field, Magnetic field and Combined field. Electron microscope (SEM), Positive rays. Block diagram, Principle and Working of cathode ray oscilloscope, Bainbridge Mass Spectrograph (Principle, Construction and Working). Numericals.

b) Spectroscopy: Zeeman effect (Normal and Anomalous), Experimental arrangement for Normal Zeeman effect, Nuclear magnetic resonance, Magnetic resonance imaging. Numericals.

Unit-IV: Quantum Physics**No. of Lectures: 08 Hours, Marks: 12**

Wave nature of matter, Wave-particle duality, De-Broglie's wave, Wavelength of matter wave, Concept of group velocity, Phase velocity and Wave packet. Heisenberg's uncertainty principle with illustrations, Physical significance of wave function, Schrodinger's time independent and time dependent wave equation, Application of Schrodinger's time independent wave equation to the problem of particle in rigid box.

Unit-V: Nanoscience and Nanotechnology**No. of Lectures: 08 Hours, Marks: 12**

Introduction to Nano particles, Properties of Nano particles (Optical, Electrical, Magnetic, Structural, Mechanical), Brief description of different methods of synthesis (Physical, Chemical, Biological, Mechanical), Classification of Nano materials, Fabrication process – Top-down approach, Bottom-up approach. Applications of nanotechnology. Advantages and Limitations of Nano-materials.

Text Books:

1. R K Gaur, S L Gupta, “Engineering Physics” , Dhanpat Rai Publications.
2. M N Avadhanulu, P G Kshirsagar, “Text book of Engineering Physics” , S. Chand.

Reference Books:

1. P S Aithal, H J Ravindra, Engineering Physics”, Acme Learning.
2. G Vijayakumari, “Engineering Physics”, Vikas Publications.
3. M R Srinivasan, “Physics for Engineers”, New Age International Publishers.
4. C S Solanki, “Solar Photovoltaic”, PHI Learning Private Limited.
5. S O Pillai, “Solid state Physics”, New Age International Publishers.
6. Ajay Ghatak, “Optics”, TMH.
7. Hugh D Young, Roger A Freedman, “University Physics (With Modern Physics)”, Pearson.
8. Hintendra K Malik, A K Singh, “Engineering Physics” , Mc Graw Hill.
9. K Rajgopal, “Engineering Physics”, PHI Learning Private Limited.
10. Uma Mukharji, “Engineering Physics”, Narosa Publishing House
11. S Deswal, A Deswal, “Basic Course of Environmental Pollution”, Dhanpath Rai Publications.
12. N Subrahmanyam, Brijal, M N Avadhanulu, “Optics”, S. Chand.
13. Sanjay Jain, “Engineering Physics”, Universities Press (India) Pvt Ltd.

Applied Chemistry - II

COURSE OUTLINE

Applied Chemistry - II

AC-II

FEN113

Course Title

Short Title

Course Code

Course description:

This course is aimed at introducing the fundamentals of basic sciences (Applied 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 Applied Chemistry –I and their applications in different branches of engineering.

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	03	14	42	03

Prerequisite course (s): 11th & 12th Chemistry

Course objectives:

1. To apply the knowledge of science in engineering and technology.
2. To understand the basic concepts of chemistry and to analyse it from experiments.

Course outcomes:

After successful completion of this course the student will be able to:

- a) Design and conduct experiments, analyse 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 classification, preparation, properties and applications of different alloys.
- m) Understand the Water, Air Noise and Radioactive Pollution along with its control measures.

COURSE CONTENT

Applied Chemistry - II

Teaching Scheme

Lectures: 3 hours/week

Semester II

Examination scheme

End semester exam (ESE): 60 marks

Duration of ESE: 03 hours

Internal Sessional Exams (ISE): 40 marks

Unit-I: Chemical bonding

No. of Lectures: 08 Hours, Marks: 12

Introduction, Definition, Ionic bond, Covalent bond, coordinate or Dative bond, & Metallic bond

Metallic bond & Explanation of metallic Properties -

i) Electrical conductivity ii) Thermal conductivity iii) Metallic cluster iv) Malleability & Ductility v) Melting point

Hybridization: Types of Hybridization sp , sp^2 , sp^3

Unit-II: Fuels

No. of Lectures: 08 Hours, Marks: 12

a) Introduction – Definition, classification of Fuel, Calorific value & its units,

b) Characteristics of good fuel

c) Solid Fuel: Analysis of Coal-(i) Proximate analysis – Determination & its significance (ii) Ultimate analysis – Determination & its Significance

d) Determination of Calorific Value by Bomb calorimeter (Numerical based on it).

Liquid Fuel: Refining & fractional distillation of LPG, petroleum, gasoline, diesel, Kerosene. Biodiesel –preparation, properties & uses.

Gaseous Fuel: Preparation, properties & uses of (i) Water gas, (ii) Natural gas.

e) Determination of Calorific Value of gaseous Fuel/Volatile liquid by Boy's Gas Calorimeter (Numerical based on it).

Unit–III: Lubricant**No. of Lectures: 08 Hours, Marks: 12**

- a) Introduction: Classification, characteristics.
- b) Mechanism of lubrication – Fluid Film, boundary & extreme-pressure lubrication
- c) Properties of lubricant –
 - A. Physical properties with Experimental determination
 - i. Viscosity & Viscosity Index by Red wood viscometer.
 - ii. Flash & fire point by Pensky - Marten's apparatus
 - iii. Cloud & pour points
 - B. Chemical properties with determination
 - i. Saponification value
 - ii. Acid value
- d) General Criteria for selection of lubricants for delicate machine, IC engine, gears, cutting tools, transformer & refrigeration system.

Unit–IV: Refractories**No. of Lectures: 08 Hours, Marks: 12**

- a) Introduction,
- b) Types of Refractories, Characteristics of Refractories
- c) Preparation, Properties & application of acidic, basic & neutral Refractories
 - (i) Acidic - Alumina, Silica, Fireclay.
 - (ii) Basic - Magnesite, Dolomite.
 - (iii) Neutral - Carbon, graphite.

Unit–V: Corrosion and its control**No. of Lectures: 08 Hours, Marks: 12**

- a) Introduction – definition, causes, consequences of corrosion
- b) Dry & Wet Corrosion - explanation with mechanism.
- c) Types of corrosion – Pitting, waterline, soil.
- d) Corrosion Control - Design & material selection, anodic & cathodic protection, hot dipping, galvanizing, tinning, electroplating.

Text Books:

1. Jain & Jain, "Engineering Chemistry", Dhanpat Rai Publishing Co.
2. S. S. Dara, "A Text Book of Engineering Chemistry", S Chand & Co. Ltd.

Reference Books:

1. B K Sharma, Krishna, "Engineering Chemistry", Prakashan Media (P) Ltd.

2. Suba Ramesh, "Engineering Chemistry", Wiley India Pvt. Ltd.
3. R Gopalan, "A Text book of Engineering Chemistry", Vikas Publishing House Pvt. Ltd. Third Edition
4. B S Chauhan, "Engineering Chemistry", University Science Press, Third Edition.
5. Shashi Chawla, "A Text book of Engineering Chemistry", Dhanpat Rai Publishing Co.
6. V R Gowariker, "Polymer Science". New Age International.
7. Abhijit Mallick, "Engineering chemistry", Viva books.
8. Sunita Ratan, "Engineering chemistry", S K Kataria & Sons.
9. Das R K, "Industrial Chemistry", Asia Pub. House, New York, 1966

Applied Mathematics - II

COURSE OUTLINE

Applied Mathematics - II

AM-II

FEN114

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	14	42	04

Prerequisite course (s): 11th & 12th mathematics

Course objectives:

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.

Course 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.
4. Use partial derivative to find total derivative of implicit functions.
5. Use partial derivative to find Jacobians
6. Find error and approximate values of problems related to engineering field.
7. Draw the rough sketch of Cartesian and polar curves.
8. Evaluate multiple integrals using spherical polar and cylindrical polar coordinates.
9. Solve ordinary differential equations using numerical methods.

COURSE CONTENT

Applied Mathematics - II

Teaching Scheme

Lectures: 3 hours/week

Tutorial: 1hr.

Semester II

Examination scheme

End semester exam (ESE): 60 marks

Duration of ESE: 03 hours

Internal Sessional Exams (ISE): 40 marks

Unit-I: Application to Partial differentiation (No. of Lect. 08, Marks-12)

1. Jacobian and its applications. (Definition of Jacobian, chain Rule of Jacobian,
2. Jacobian of implicit function,
3. Functional dependence & independence
4. Errors & approximations. (Problems related to engineering field)
5. Lagrange's method of undetermined multipliers for single constraint.

Unit-II: Differential Equation & its Applications (First order & First degree) (No. of Lect. - 08, Marks-12)

1. Exact differential equation.
2. Reducible to exact differential equation.
3. Linear differential equation.
4. Reducible to linear differential equation.
5. Applications of differential equation to simple Electrical circuits & Conduction of heat

Unit-III: Curve Tracing and Fourier series (No. of Lect. - 08, Marks-12)

1. Curve Tracing: Cartesian & polar curves.
2. Fourier series:
 - a) Full range Fourier series on $c \leq x \leq c + 2L$
 - b) Half range Fourier series on $0 \leq x \leq L$
 - c) Applications to Harmonic analysis

Unit-IV: Multiple Integrals and its Applications (No. of Lect.-08, Marks- 12)

1. Introduction to three co-ordinate systems.
2. Double integration. (Cartesian form, polar form & change of order of integration).
3. Triple integration.
4. Application of multiple integrals to area & volume.

Unit-V: Numerical Solution of Ordinary Differential Equation (First order and First degree) (No. of Lect. - 08, Marks-12)

1. Numerical solution by Taylor's series method.
2. Runge -Kutta method (fourth order).
3. Picard's method.
4. Modified Euler's method.

5. Milne's method

Reference Books:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley Eastern Ltd, 7th Edition.
2. B S Grewal, "Higher Engineering Mathematics", Khanna Publication.
3. H K Das, "Advanced Engineering Mathematics", S. Chand & Company.
4. B V Ramana, "Engineering Mathematics", TMH, 2nd Edition.
5. N P Bali, "A Text Book of Engineering Mathematics", Laxmi Publication, New Delhi.
6. Kandasamy, "Numerical Methods", S. Chand & Company.

Introduction to “C” Programming

COURSE OUTLINE

Introduction to “C” Programming

ICP

FEN115

Course Title

Short Title

Course Code

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.

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	03	14	42	03

Prerequisite course (s): Physics

Course objectives:

To impart knowledge so that the student will:

1. Learn the fundamentals, structure and syntax of C Language.
2. Write simple programs in C Language.

Course outcomes:

Upon completing this course, the student will be able to:

1. Understand the fundamentals of C programming.
2. Choose the loops and decision making statements to solve the problem.
3. Use functions to solve the given problem.
4. Implement different Operations on arrays.
5. Understand strings and structures.
6. Understand the usage of pointers

COURSE CONTENT

Introduction to “C” Programming

Teaching Scheme

Lectures: 3 hours/week

Semester II

Examination scheme

End semester exam (ESE): 60 marks

Duration of ESE: 03 hours

Internal Sessional Exams (ISE): 40 marks

UNIT 1: Introduction**No. of Lectures: 08, Marks 12**

What is C, The C Character set, Constant, Variables & Keywords, Types of C Constants, Rules for constructing Integer Constants, Rules for constructing Real Constants, Rules for constructing Character Constants, Types of C Variables, Rules for constructing Variable Names, Comments in a C Program

Type Declaration Instruction, Type Conversion in Assignments

Data Types Revisited: Integers, long & short, signed & unsigned, Chars, signed & unsigned, Float & Doubles

Console Input/Output: Types of I/O, Console I/O Function, Formatted Console I/O Functions, Unformatted Console I/O Functions

Decision Control Instruction: The if statement, Multiple Statements within if, The if-else statement, Nested if-else, Forms of if

Use of Logical Operators, The else if Clause, The | Operator, The Conditional Operators

UNIT 2: Loop**No. of Lectures: 08, Marks 12**

Loop Control Instruction: Loops, the while Loop, Tips & Traps, More Operators, for Loop, Nesting of Loops, Multiple Initializations in the for Loop, the break Statement, the continue Statement, The do-while Loop, The Odd Loop

Case Control Instruction: Decisions using switch, The Tips & Traps, switch versus if-else Ladder, The goto Keyword

UNIT 3: Function & Pointers**No. of Lectures: 08, Marks 12**

Function: What is a Function? Why use Functions? Passing Values between Functions, Scope Rule of Functions, Order of Passing Arguments, Using Library Functions

Pointers: Call by Value and Call by Reference, An Introduction to Pointers, Pointer Notation, Back to Function Calls

UNIT 4: Arrays**No. of Lectures: 08, Marks 12**

Arrays: What are Arrays? A Simple Program using Array, more on Arrays, Array Initialization, Array Elements in Memory, Bounds Checking, Passing Array Elements to a Function, Pointers and Arrays, Passing an Entire Array to a Function, The Real Thing

Multidimensional Array: Two Dimensional Arrays, initializing a Two-Dimensional Array, Memory Map of a Two-Dimensional Array, Pointers and Two Dimensional Arrays, Pointer to an Array, Passing 2 D Array to a Function, Array of Pointers, Three-Dimensional Array

UNIT 5: Strings

No. of Lectures: 08, Marks 12

Strings: What are Strings? More about Strings, Pointers and Strings, Standard Library String

Functions: strlen(), strcpy(), strcat(), strcmp()

Handling Multiple Strings: Two-Dimensional Array of Characters, Array of Pointers to strings,

Limitations of Array of Pointers to Strings

Structures: Why use Structures? Declaring a Structure, Accessing Structure Elements, How Structure Elements are Stored? Array of Structure

Text Books:

1. Let Us C by Yashavant Kanetkar, 14th Edition, BPB Publication

Reference Books:

1. Programming in ANSIC C by E Balagurusamy, Tata McGraw Hill, 4/E, 2007
2. Mastering C by K. R. Venugopal and S. R. Prasad, Tata McGraw Hill, 2011
3. The C Programming Language by Brian W. Kernighan and Dennis M. Ritchie, PHI
4. C How to Program by Paul Deitel and Harvey Deitel, 8th Edition, Pearson

Introduction to Mechanical Engineering and Engineering Drawing

COURSE OUTLINE

Introduction to Mechanical Engineering and Engineering Drawing

IMEED

FEN116

Course Title

Short Title

Course Code

Course description:

This course provides the elementary level knowledge of Introduction to Mechanical Engineering and Engineering Drawing. Course includes introduction to Engineering Drawing, Orthographic Projection, Isometric view and Isometric Projection. The course also introduces students to concept of Energy and energy conservation, Energy management & Audit, Conventional Energy Sources and various mechanical devices.

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	03	14	42	03

Prerequisite course (s): Elementary Physics

Course objectives:

1. To describe some of the subfields of mechanical engineering
2. To develop imagination of physical objects to be represented on paper for engineering communication
3. To develop the manual drawing skill.
4. To develop drawing interpretation skill.
5. To develop the physical realization of the dimension of the objects.

Course outcomes:

1. Students will be able to understand the theory of projection.
2. Students will be able to know and understand the conventions and the methods of engineering drawing.
3. Students will be able to improve their visualization skills so that they can apply these skills in developing new products.
4. Students will be able to define mechanical engineering
5. Students will be able to distinguish mechanical engineering from other types of engineering
6. Students will be able to describe important components of engineering design

COURSE CONTENT

Introduction to Mechanical Engineering

& Engineering Drawing

Teaching Scheme

Lectures: 3 hours/week

Semester II

Examination scheme

End semester exam (ESE): 60 marks

Duration of ESE: 04 hours

Internal Sessional Exams (ISE): 40 marks

UNIT 1: Introduction to Mechanical Engineering No. of Lectures: 08, Marks 12

a) Introduction to Manufacturing: Definition and working of Turning, facing, knurling, Thread cutting, Drilling, Boring, Counter Sinking, Counter Boring, Plane milling, End milling, Slot milling. (No sketches of Machine tools and no analytical portion, sketches to be used only for explaining operations.).

b) Introduction to Machine Design: Basic procedure of machine design, requisite of design engineer, Introduction to steel and cast iron and its mechanical properties.

Mechanical elements: Basic functions and applications of shafts, keys, couplings, bearings.

c) Introduction to Thermal Engineering: Energy, different forms of energy, heat, work and its forms, sources of energy.

Difference between 2 stroke & 4 stroke engine, diesel & petrol engine, introduction to steam power plant layout.

d) Introduction to Industrial Engineering: Basic concepts of method study, time study, site selection, productivity. Definition, concepts, aims, objectives and scope of industrial psychology.

UNIT 2: Projections of Lines

No. of Lectures: 08, Marks 12

a) Line parallel to both the plane, Line parallel to one plane and perpendicular to the other. Line inclined to one plane and parallel to the other.

b) Line inclined to both the reference planes. (First Angle & Third angle method of projection),

c) Traces of lines.

UNIT 3: Projections of Planes**No. of Lectures: 08, Marks 12**

- a) Plane with surface parallel to one plane and perpendicular to other, Plane inclined to one plane and perpendicular to other (First Angle & Third Angle method of projection)
- b) Projections of planes inclined to both the plane (problems on AIP & AVP). (First Angle & Third Angle method of projection)

UNIT 4: Orthographic Projections**No. of Lectures: 08, Marks 12**

- a) Types of lines, methods of dimensioning and types of dimensioning,
- b) Orthographic projections (First angle orthographic projection methods) of different machine parts problem,
- c) Types of sections & Sectional Orthographic projections (First angle & Third angle orthographic projection methods)

UNIT 5: Isometric Projections**No. of Lectures: 08, Marks 12**

- a) Introduction, Isometric axes, lines and planes; true scale and isometric scale. Isometric projection and Isometric view
- b) Conversion of given orthographic view into isometric projection.

Text Books:

1. Arunoday Kumar, Engineering Drawing, Techmax
2. Venugopal, Engineering Drawing

Reference Books:

1. Bhatt N D, Panchal V M, “Engineering Drawing – Plane and Solid Geometry”, Charotar Publishing House.
2. T Jeyapoovan, “Engineering Drawing and Graphics Using Autocad”, Vikas Publication Noida, New Delhi.
3. H G Phakatkar, “Engineering Graphics”, Nirali Publication, Pune.
4. Kannaiah K L, Narayana, “Engineering Graphics”, Scitech Pub, Chennai
6. Khurmi, Machine Design, Dhanpat Rai Publication
7. P K Nag, Engineering Thermodynamics, Tata McGraw Hill

Introduction to Electronics Engineering

COURSE OUTLINE

Introduction to Electronics Engineering

IEXE

FEN117

Course Title

Short Title

Course Code

Course description:

This course provides an introduction to electronics engineering covering: semiconductor devices such as diodes, transistors FETs and Optoelectronic and Power Electronic devices, operational amplifiers and their application; logic gates and their applications

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	03	14	42	03

Prerequisite course (s): Physics

Course objectives:

1. To provide students with a firm grasp of the essential principles of basic electronics.
2. To understand the concepts and terminology that is used in electronics engineering.
3. It is not an in-depth Electronic course but, rather a course aimed at acquiring an understanding of basic principles that are used in electronic engineering.

Course outcomes:

1. Understand working principle of PN junction diode, Zener diode and their applications.
2. Describe different configuration of Bipolar Junction Transistor.
3. Understand CE amplifier and working of transistor as a switch.
4. Describe different configurations of FET
5. Understand operating principle of various Optoelectronics and Power Electronics Devices
6. Understand operational amplifier and its applications.
7. Describe use of the Basic gate and Universal gate

COURSE CONTENT

Introduction to Electronics Engineering

Semester II

Teaching Scheme

Examination scheme

Lectures: 3 hours/week

End semester exam (ESE): 60 marks

Duration of ESE: 03 hours

Internal Sessional Exams (ISE): 40 marks

UNIT 1: Diodes

No. of Lectures: 08, Marks 12

PN Junction Diode, V-I Characteristics, Junction break down, Diode current equation, Diode resistances, Temperature Dependence, Zener Diode and its V-I Characteristics, Applications: Rectifiers, basic clipping and clamping circuits, Voltage Multipliers

UNIT 2: Bipolar Junction Transistors

No. of Lectures: 08, Marks 12

Introduction to npn and pnp transistors, Alpha, Beta, Gamma and their relations, different regions of operations, CE & CB input output characteristics, BJT as a switch, BJT as an amplifier, DC load line and Q point. Applications of BJT as switch and amplifier.

Unit 3: Field Effect Transistors

No. of Lectures: 8, Marks 12

Classification, working and V-I Characteristics of JFET and MOSFET, Parameters of FET, Difference between FET and BJT, MOSFET resistors, MOSFET Capacitor, CMOS (NMOS & PMOS), Applications of FET as Switch.

Unit 4: Optoelectronics and Power Devices

No. of Lectures: 8, Marks 12

Luminance, Photoconductivity, Photodiode, LED, LCD, Laser Diode, Optocoupler, Power Diode, SCR, SCR as a switch, V-I Characteristics, DIAC and TRIAC, UJT and relaxation oscillator.

Unit 5: OPAMP, Number System and Logic Gates

No. of Lectures- 8, Marks- 12

OPAMP: IC 741 Pin diagram, Virtual ground concept, Inverting and Noninverting Amplifier, Adder, Subtractor, Integrator, Differentiator and Voltage follower.

Logic Gates: Number Systems, Basic and Universal Logic gates, truth table verification, Simplification and implementation of logic equations, De-Morgan's theorem, Half adder and Half Subtractor, Concept of Combinational & Sequential logic circuits

Text Books:

1. Applied Electronics: S. Chand Publication, R. S. Sedha
2. Principles of Electronics: S. Chand Publications, V.K. Mehta

Reference Books:

1. Modern Digital Electronics: TMH Publications, R. P. Jain
2. Applied Electronics: S. Chand Publication, B. L. Theraja
3. Electronics Principles: TMH Publications, A.P. Malvino
4. Linear Integrated Circuits: PHI Publications Ramakant Gaykwad

Workshop Practice- II

LAB COURSE OUTLINE

Workshop Practice II

WP-II

FEN 118

Course Title

Short Title

Course Code

Course Description:

Workshop Practice II covers the basic knowledge and practices on Carpentry shop, plumbing shop, Machine shop, and Electronics and Electrical workshop in order to improve the practical skill of students in different workshops.

Laboratory	Hours/Week	No. of weeks	Total Hour	Semester Credits
	02	14	28	01

Prerequisite Course(s): 11th, 12th Physics, Mathematics,

Course Objectives:

In workshop practice, students will get familiar with use of different workshop practices like carpentry shop, plumbing shop, machine shop, electronics and electrical workshop. Students will also get familiar with different tools, machines, equipment's, job holding devices, job drawing, job material, job manufacturing operations and processes in different workshops.

Objective to develop following Intellectual skills: -

- Identification and selection of manufacturing processes/operations according to job requirement in different workshops.
- Identification, selection and understanding of tools, equipment's, machines and job material according to job drawing for different workshops.
- Understanding working principle and construction of process planning sheet.
- Identification, repairing, maintenance and understanding of the working principle of electronic and electrical components/devices.

Objective to develop following Motor skills:

- Ability to handle measuring instruments.
- Ability to read the job drawing.
- Ability to understand the basic working principle of carpentry operations, tools and equipment's in carpentry shop. Ability to understand the basic working principle of Plumbing operations, tools and equipment's in Plumbing shop.

- d. Ability to understand the basic working principle of lathe machine operations, tools and equipment's in Machine shop.
- e. Ability to understand the basic working principle of Electronics components used in electronics workshop.
- f. Ability to understand the repair and maintenance of domestic appliances in electrical workshop.

Course Outcomes:

Upon successful completion of these practical's the student will be able to work in -

- a) Carpentry shop
- b) Plumbing shop
- c) Machine shop

LAB COURSE CONTENT

Workshop Practice- II

Teaching Scheme

Practical: 2 hours/week

Semester II

Examination scheme

End Semester Exams (ESE): --

Internal Continuous Assessment (ICA): 25 marks

A. Carpentry shop

1. Introduction to carpentry operations, equipment and tools.
2. One job involves lap joint, bridle joint.

B. Plumbing shop

1. Introduction to the tools and equipment's like pipe vice, pipe bending machine, pipe dies, cutting dies, pipe wrench etc. used for plumbing operations on G.I. pipe.
2. One Job having both side threading and like bending operations.

C. Machine shop

1. One job on lathe machine involving operations like Facing, plain turning, step turning, taper turning, chamfering and drilling.

Reference Books:

1. Hajra 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.

Applied Science-II Lab

LAB COURSE OUTLINE

Applied Science-II Lab

AS-II LAB

FEN 119

Course Title

Short Title

Course Code

Course Description:

In this laboratory, course emphasis is on the understanding of basic principles, working of pH-meter, Bomb calorimeter, Ostwald's Viscometer, various properties of lubricating oils, proximate analysis of fuels etc. The learner here can use this knowledge and apply in various branches of engineering as required.

Laboratory	Hours/Week	No. of weeks	Total Hour	Semester Credits
	02	14	28	01

Prerequisite Course(s): 12th Chemistry, Different laws, basic principles and theories.

Course Objectives:

1. To impart knowledge of basic concepts in applied physics and implementation to various engineering fields.
2. To provide the knowledge and methodology necessary for solving problems in the field of engineering.

Course Outcomes:

Upon successful completion of lab Course, student will be able to:

- a) Analyse the partition Coefficient of Iodine between water & CCl₄.
- b) Analyse the saponification value of given oil sample.
- c) Analyse the viscosity of given liquid by Ostwald's Viscometer.
- d) Analyse the Calorific value of fuel sample by using Bomb calorimeter.
- e) Identify the Moisture content, Volatile matter, Ash content and Fixed carbon in coal sample by proximate analysis.
- f) Identify the acidic and basic solution by using pH-meter.
- g) Analyse the acid value of Vegetable Oil sample.
- h) Analyse the strength of NaHCO₃ and Na₂CO₃ in alkali mixture.
- i) Analyse the Aniline point of lubricating oil.
- j) Analyse the Iodine value of an Oil sample by Wij's method.

LAB COURSE CONTENT

Applied Science - II Lab

Teaching Scheme

Practical: 2 hours/week

Semester II

Examination scheme

End Semester Exams (ESE): --

Internal Continuous Assessment (ICA): 25 marks

Applied Physics-II Lab

Practical: 2 hours/ week (Alternate with Applied Chemistry-II)

(Note: Minimum FIVE Experiments from the following)

1. Sound Level Meter
2. Ultrasonic Interferometer.
3. Ultrasonic Detectors
4. EMF by Thomson's method.
5. To Study B-H curve
6. Determination of Magnetic Susceptibility.
7. Uses of CRO
8. Synthesis and Characterization of Nano Composites

Applied Chemistry-II Lab

Practical: 2 hours/ week (Alternate with Engineering Physics-II)

(Note: Minimum FIVE Experiments from the following)

1. Determination of partition Coefficient of Iodine between water & CCl₄.

- a). Preparation of different composition of saturated Iodine solution in CCl₄.
- b). Separation of Aqueous and CCl₄ layer from each bottle.
- c). Titration of Aqueous layer against N/100 Sodium Thiosulphate solution.
- d). Titration of CCl₄ layer against N/20 Sodium Thiosulphate solution.
- e). Calculation of Iodine in both the layers.

2. Determination of saponification value of oil.

- a). Preparation of std. KOH solution.
- b). Standardization of Std. KOH solution against 0.5N HCL solution using Phenolphthalein indicator.
- c). Add KOH solution in 2 gm of Oil sample and reflux for 2 hours.
- d). Titrate the above solution against 0.5N HCL solution using Phenolphthalein indicator.

e). Using two titrate values calculate the saponification number.

3. Determination of Viscosity by Ostwald's Viscometer.

- a). Find out the density of given liquid by using specific gravity bottle.
- b). Measure the flow time required for liquid and water by using Ostwald's Viscometer.
- c). Calculate the relative viscosity from the above observed values.

4. Determination of Calorific value of fuel sample by using Bomb calorimeter.

- a). Burn the known mass of solid fuel in Bomb pot.
- b). Observe the temperature difference of water in bomb pot.
- c). Calculate the actual and corrected calorific value of solid fuel sample from above observations.

5. Determination of Moisture, Volatile matter & Ash in a given sample of Coal (Proximate analysis).

- a). Determine and calculate the moisture content from the given coal sample.
- b). Determine and calculate the Volatile matter from the given coal sample.
- c). Determine and calculate the Ash content from the given coal sample.
- d). Determine and calculate the Fixed Carbon from the given coal sample.

6. Use of pH meter.

- a). Calibrate the pH-meter using buffer solution at room temperature.
- b). Measure the pH-values of given solutions.
- c). From the measured pH-values of solution, conclude which are acidic or basic solutions.

7. Acid Value of vegetable Oil sample.

- a). Add neutral alcoholic solution in given Oil sample and heat in water bath for 30minutes.
- b). Titrate above solution against 0.1N KOH solution using phenolphthalein indicator.
- c). Calculate the acid value of given Vegetable Oil sample from above observations.

8. Determination of NaHCO_3 & Na_2CO_3 in given alkali mixture.

- a). Titration of alkali mixture solution against 0.1N HCl using methyl orange indicator.
- b). Titration of alkali mixture solution against 0.1N HCl using phenolphthalein indicator.
- c). Calculate the strength of NaHCO_3 and Na_2CO_3 from the above observed titrate values.

9. Determination of Aniline point of lubricating oil.

- a). Mixed Aniline and lubricating oil sample in Aniline point apparatus.
- b). Maintain the apparatus at constant temperature using water bath.
- c). Observe the temperature at which cloudiness and hazy appearance in the solution.

d). Report the observed values as Aniline point.

10. Determination of Iodine value of an Oil sample (Wij's method).

a). Back Titration: Dissolve the given oil sample in CCl_4 solution then add Wij's solution.

b). Titrate the above solution against std. 0.1N Sodium Thiosulphate solution.

c). Blank Titration: In Wij's solution add KI solution and titrate it against 0.1N sodium Thiosulphate solution.

d) Calculate the Iodine value of an oil sample from above observed titrate values.

Reference Books:

1. B K Sharma, "Engineering Chemistry", Krishna Prakashan Media (P) Ltd.
2. Subaramesh, "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 (Third Edition)", Vikas Publishing House Pvt. Ltd.
6. B S Chauhan, "Engineering Chemistry", University Science Press. Third Edition.
7. Shashi Chawla, "A Text book of Engineering Chemistry", Dhanpat Rai Publishing Co.
8. Abhijit Mallick, "Engineering chemistry", Viva books.
9. Sunita Ratan, "Engineering chemistry", S K Kataria & Sons.
10. R K Das, "Industrial Chemistry", Asia Publishing House.
11. S. Deswal, A. Deswal, "Basic Course in Environmental Pollution", Dhanpat Rai Publishing Co.

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.

Introduction to Mechanical Engineering & Engineering Drawing Lab

LAB COURSE OUTLINE

Introduction to Mechanical Engineering & Engineering Drawing Lab

IMEED LAB

FEN 120

Course Title

Short Title

Course Code

Course Description:

This lab includes drawing sheets related to Engineering Drawing and labs related to elementary level knowledge of Elements of Mechanical Engineering.

Laboratory	Hours/Week	No. of weeks	Total Hour	Semester Credits
	02	14	28	01

ESE Pattern: Oral (OR)

Prerequisite Course(s): 11th Physics, 12th Physics

Course Objective:

In this lab, students will imbibe essentials of Engineering Drawing through progressive practice of Orthographic Projection, Isometric view and Isometric Projection. Students will also get familiar with mechanical devices used to transmit power.

Objective to develop following Intellectual skills:

- Identify elements of given Engineering Drawing.
- Interpretation of given engineering drawing.
- Understand Orthographic projection.
- Understand Isometric projection and Isometric view.
- Understand principle and working of Boiler, its mountings & accessories.
- Understand principle and working of power transmission devices.
- Understand principles of energy audit of domestic devices.

Objective to develop following Motor skills:

- Ability to layout a drawing sheet and apply basic drawing concepts to it.
- Ability to draw Orthographic projection of given object.
- Ability to draw Orthographic projection with section view.
- Ability to draw Isometric projection and Isometric view of given object.
- Ability to perform energy audit of domestic devices.

Course Outcomes:

Upon successful completion of these practical the student will be able to

- a) Read the given engineering drawing sheet.
- b) Interpret different views of given engineering object.
- c) Construct an orthographic projection i.e. front view, top view, side views of an object.
- d) Prepare an orthographic projection with section of an object.
- e) Construct an isometric projection of an object.
- f) Prepare an isometric view of an object.
- g) Convert orthographic projections of given object into isometric drawing.
- h) Illustrate principle and working of fire tube and water tube boiler.
- i) Illustrate principle and working of boiler mountings and accessories.
- j) Explain principle and working of power transmission devices.
- k) Illustrate energy audit of simple domestic appliances.

LAB COURSE CONTENT

Introduction to Mechanical Engineering

& Engineering Drawing Lab

Teaching Scheme

Practical: 2 hours/week

Semester II

Examination scheme

End Semester Exams (ESE): 25 marks

Internal Continuous Assessment (ICA): 25 marks

1. Sheet No. 01 – Freehand sketches of Machine elements.

Free hand sketches of machine elements including screw threads, screwed fasteners, nuts, bolts, riveted and welded joints, Keys, shaft, couplings. (With constructional details.)

2. Sheet No. 02 – Projection of lines.

- a) Illustration of projection of straight line inclined to two planes. (Minimum 02 solved examples)
- b) Illustration of projection of straight line inclined to two planes (Traces of lines). (Minimum 02 solved examples)

3. Sheet No. 03 – Projection of Planes.

Illustration of projection of plane inclined to both planes. (Minimum 04 solved examples)

4. Sheet No. 04– Orthographic Projection.

- a) Illustration of simple orthographic projection using both 1st angle and 3rd angle method. (Minimum 02 solved examples)

b) Illustration of sectional orthographic projection using both 1stangle and 3rdangle method.
(Minimum 02 solved examples)

5. Sheet No. 05 – Isometric Projection

a. Illustration of Isometric projection with natural scale. (Minimum 02 solved examples)

b. Illustration of Isometric projection with isometric scale. (Minimum 02 solved examples)

Note: FIVE drawing sheets from ED Lab shall be conducted during 14 weeks available during semester.

Reference Books:

1. Bhatt N D, Panchal V M, “Engineering Drawing – Plane and Solid Geometry”, Charotar Publishing House.
2. Rajan T S, “Basic Mechanical Engineering”, New Age International Pvt. Ltd, New Delhi.
3. T Jeyapoovan, “Engineering Drawing and Graphics Using Autocad”, Vikas Publication Noida, New Delhi.
4. Kannaiah K L, Narayana, “Engineering Graphics”, Scitech Publications, Chennai, 2ndEdition
5. H G Phakatkar, “Engineering Graphics”, Nirali Publication, Pune.
6. R K Dhawan, “Machine Drawing”, S Chand & Co., 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.

Guidelines for ESE:

ESE will be based on journal submitted by the students.

Introduction to “C” Programming Lab

LAB COURSE OUTLINE

Introduction to “C” Programming Lab

ICP LAB

FEN121

Course Title

Short Title

Course Code

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.

Laboratory	Hours/Week	No. of weeks	Total Hour	Semester Credits
	02	14	28	01

ESE Pattern: Oral (OR)

Prerequisite Course(s): 11th Physics, 12th Physics

Course Objectives:

To impart knowledge so that the student will:

1. Learn the fundamentals, structure and syntax of C Language.
2. Write simple programs in C Language.

Course Outcomes:

Upon completing this course, the student will be able to:

1. Understand the fundamentals of C programming.
2. Choose the loops and decision making statements to solve the problem.
3. Use functions to solve the given problem.
4. Implement different Operations on arrays.
5. Understand strings and structures.
6. Understand the usage of pointers.

LAB COURSE CONTENT

Introduction to “C” programming Lab

Semester II

Teaching Scheme

Examination scheme

Practical: 2 hours/week

End Semester Exams (ESE): 25 marks

Internal Continuous Assessment (ICA): 25 marks

GROUP - A

Concerned faculty member will suitably frame FIVE assignments, ONE from each UNIT of the concerned theory subject, each assignment of 20 questions from unsolved exercises of Text Books as given below. The questions should be in the nature of multiple choices, TRUE / FALSE, output of a program, identify errors in a program etc. These assignments should be performed in the lab and for hands on experience.

GROUP – B

Minimum FIVE laboratory assignments from Group - B shall be performed using open source software. The suggested List is given below.

1. Write a C program to find area of circle, triangle, rectangle, square using switch statement.
2. Write a C program to find the sum of a series (looping).
3. Write a C program to accept a string and reverse it without using library functions. Display the original and reversed string. (String handling).
4. Write a C program that uses functions to perform the following string operations using function and pointers:
 - i) To insert a sub-string in to given main string from a given position.
 - ii) To delete n Characters from a given position in a given string.
5. Write a C program to read ‘N’ elements into an array and compute the sum of all the elements stored in an array using pointer. (Arrays and pointers).
6. Write a C program to read a matrix of order (M *N) and (P * Q) and compute the addition and multiplication of two matrices. (Passing matrix to functions).
7. Write a C program to read ‘N’ students information and display the information with appropriate headings, where each student information consists of roll number, Name, total marks scored etc. (Structure handling).

Note: Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Guidelines 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 journal submitted by the students.

Text Books:

1. Test Your C Skills by Yashavant Kanetkar, 5th Edition, BPB Publication
2. Let Us C by Yashavant Kanetkar, 14th Edition, BPB Publication

Reference Books:

1. Programming in ANSIC C by E Balagurusamy, Tata McGraw Hill, 4/E, 2007
2. Mastering C by K. R. Venugopal and S. R. Prasad, Tata McGraw Hill, 2011
3. The C Programming Language by Brian W. Kernighan and Dennis M. Ritchie, PHI
4. C How to Program by Paul Deitel and Harvey Deitel, 8th Edition, Pearson

Introduction to Electronics Engineering Lab

LAB COURSE OUTLINE

Introduction to Electronics Engineering Lab

IEXE LAB

FEN 122

Course Title

Short Title

Course Code

Course Description:

In this laboratory course emphasis is on the understanding of the characteristics of basic circuits that use resistors, capacitors, diodes, bipolar junction transistors, Op-Amp, logic gates, transducers etc. The students can use this knowledge to analyse more complex circuits such as complex electrical networks, rectifiers, amplifiers, digital circuits, circuits using transducer etc.

Laboratory	Hours/Week	No. of weeks	Total Hour	Semester Credits
	02	14	28	01

ESE Pattern: Oral (OR)

Prerequisite Course(s): Course on physics at HSC level

Course Objectives:

The objective of this lab is to impart the fundamental knowledge of electronics engineering to the students and to develop the students' ability to apply the specific procedures to analyse the electronics engineering Systems.

In this lab, students will become familiar with various basic analogue and digital electronic circuits.

Course Outcomes:

Upon successful completion of these practical the student will be able to

- Identify Electronic components
- Learn diode V-I Characteristic
- Understand BJJ as a switch
- Understand LED, JFET, SCR V-I characteristics
- Analyse and implementation of Op-amp and Digital circuits.
- To understand PCB and Various soldering techniques.

LAB COURSE CONTENT

Introduction to Electronics Engineering Lab

Semester II

Teaching Scheme

Examination scheme

Practical: 2 hours/week

End Semester Exams (ESE): 25 marks

Internal Continuous Assessment (ICA): 25 marks

Group A

1. To Plot the V-I Characteristics of P-N Junction diode.

- a) To plot forward characteristic of P-N Junction diode.
- b) To plot reverse characteristic of P-N Junction diode.
- c) To determine static resistances of diode.

2. Study of BJT as a Switch

- a) Determination of parameters in cut off region.
- b) Determination of parameters in saturation region.
- c) Understanding of Q-point.

3. To Plot the V-I Characteristics of JFET.

- a) To plot drain characteristic of JFET.
- b) To plot transfer characteristic of JFET.
- c) To determine JFET parameters.

4. A study of characteristics of Light Emitting Diode (LED)

- a) To plot forward characteristic of Light Emitting Diode (LED).
- b) To study difference of this characteristics with P-N junction diode characteristics.

5. To plot V-I characteristics of SCR

- a) To plot forward characteristic of SCR.
- b) To determine V_{BO} , I_L & I_H of SCR

Group B

6. Implementation of inverting and non-inverting amplifier using OPAMP

- a) To determine theoretical gain in both applications
- b) To compare these with practical values

7. Implementation of any Boolean expression using LOGIC GATES.

- a) Simplification of Boolean expression
- b) Implementation using Basic gates
- c) Implementation using Universal gates

8. Introduction to Printed Circuit Board (PCB) & Soldering Techniques.

- a) Study of types of PCB's.
- b) Study of Layout and artwork
- c) Study of different soldering techniques.

Note: Perform any Three (03) experiments from each group.

Reference Books:

- 1. S Salivahanan, N Sureshkumar and A Vallavaraj, "Electronics Devices and Circuits", TMH, 2 nd Edition, 2009
- 2. R S Sedha, "Applied Electronics", S Chand, 1 st Edition, 2005
- 3. R A Gaikwad, "Op-Amps and Linear Integrated Circuits", PHI, 4 th edition, 2001
- 4. R P Jain, "Modern Digital Electronics", TMH, 4th Edition, 2010
- 5. Printed Circuit Board Design and technology: Walter C. Bosshar

Guide lines for ESE:

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. Evaluation will be based on paper work.

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. (BIOTECHNOLOGY) 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

Course Title

EM-III

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.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	15	40	03

Prerequisite Course(s): 10th & 12th 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&MolegularBiology”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

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 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

Course title

UO-I

Short title

BTL-303

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.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	15	40	03

Prerequisite Course(s): 10th and 12th 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. Chattopadhyaya 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.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	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

Theory : 3 hours/ week

Practical : 4 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) (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 Dagainawala, 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., Ingraham J.L., Woollis 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): 10th and 12th 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

Course Title

BCH

Short Title

BTL-401

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

Lectures :3 Hrs/week

Practical : 2 Hrs/Week

Examination Scheme

End Semester Exams (ESE) : 80 Marks.

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: Triacylglycerols, 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. Freeman & 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.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	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

Lectures :3 Hrs/week

Practical : 2 Hrs/Week

Tutorial : 1Hr/Week

Examination Scheme

End Semester Exams (ESE) : 80 Marks.

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

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

Lectures :3 Hrs/week

Tutorial : 1Hr/Week

Examination Scheme

End Semester Exams (ESE) : 80 Marks.

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.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	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

Lectures :3 Hrs/week

Practical : 2 Hrs/Week

Examination Scheme

End Semester Exams (ESE) : 80 Marks.

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. Chattopadhyaya, 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 heat transfer rate.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	15	40	03

Prerequisite Course(s): 10th and 12th 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

Lectures :3 Hrs/week

Practical : 2 Hrs/Week

Examination Scheme

End Semester Exams (ESE) : 80 Marks.

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 INC 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
Course Title

Lab CA
Short Title

BTP-406
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.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	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 4th order method.
3. Students will also learn to solve Numerical Integrations by various methods like, by Picards method, Trapezoidal Rule, by Simpson's 1/3rd Rule, Simpson's 3/8th rule.

Learning Outcomes:

Students completing this course will be 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.

SE Biotechnology	Course Content Lab Computer Applications	Semester – IV
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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 4th 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 1/3rd Rule
10. To solve Numerical Integration by Simpson's 3/8th 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, 6th Edition, Tata McGraw Hill.
4. David M. Himmelblau, Basic Principles & Calculations in Chemical Engineering, 6th 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 .

**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
ICA: Internal Continuous Assessment

ESE: End Semester Examination

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

End Semester Examination (ESE) : 80 Marks

Tutorial: 01/week

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 vector 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.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	13	39	04
Tutorial	01	13	13	

Prerequisite Course(s): Engineering Mechanics

COURSE CONTENT

Strength of Materials

Semester-III

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks

Tutorial: 01/week

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 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 10th Edition.
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.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	13	39	03
Tutorial	-	-	-	

Prerequisite Course(s): Knowledge of Element of Surveying

COURSE CONTENT

Surveying- I

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: 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 10th Edition.
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 associations 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 I		16	2	10	28	100	400	175	75	750	23

ISE: Internal Sessional Examination
ICA: Internal Continuous Assessment

ESE: End Semester Examination

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, conformable 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.

- 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 Scheme

Lecture: 3 hours / week

Examination

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 submerged 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 irrotational 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-Poiseuille'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 as 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 deflection, 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:- Castiglino'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. Indeterminate 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

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	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.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	01	13	13	-

Prerequisite Course(s): Basic Knowledge of Computer.

Course Content

Computer Graphics
Teaching Scheme
Lecture: 1 hour/ week
Semester-IV

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
Computer Graphics

Short Title
CG LAB

Course Code

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 objects such as Circle, Arc, Rectangle, Ellipse, Polygon, Chamfer, Mirror etc.
 - d) Familiar with AutoCAD 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
Engineering Geology

Short Title
EG LAB

Course Code

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, Conglomerates, Breccias, Sand stones, Quartzites, 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

Building Design and Drawing

Short Title

BDD

Course Code

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.

Laboratory	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
	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 & disassembling 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.

Practical	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
	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 stereoscope

- 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

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

Course Title

EM-III

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.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	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.

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
Course Title

CEM
Short Title

CHL 301
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.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	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 be 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.

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.

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 CO₂ 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. Shackelford, Introduction to material science, McMillan publishing company, New York ISBN 1990.
- 5. D.Z. Jestrzebaski, 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

Course Title

FFO

Short Title

CHL 302

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.

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
Course Title

AIOC
Short Title

CHL 303
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.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	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 be able to differentiate between ionic and covalent interactions observed in molecules. They would also be 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.

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 , Vander 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 , $\text{K}_2\text{Cr}_2\text{O}_7$

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 (15th 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

Course Title

AOC

Short Title

CHL 304

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.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	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 be 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.

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. Friedel 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 compounds.
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 HNO₃-fortified spent acid, Preparation of p-Nitroacetanilide, Preparation of α -Nitronaphthalene

Sulphonation

Sulphonation , Mechanism of sulphonation of benzene

Technical industrial 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: Wiley 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

Course Title

Lab CEM

Short Title

CHP 305

Course Code

Course Description: This course intended to fulfill the need for comprehensive laboratory course in Chemical Engineering Materials

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	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 Bernoulli's 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

Course Title

Lab AIOC

Short Title

CHP 307

Course Code

Course Description: This course dealing with the fundamentals of quantitative chemical analysis both on volumetric and gravimetric basis.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	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

Course Title

Lab AOC

Short Title

CHP 308

Course Code

Course Description: This course intended to fulfill the need for comprehensive laboratory course in organic chemistry.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	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 be 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 $-\text{NH}_2$ / $-\text{OH}$ group.
9. Preparation of benzoyl derivative of $-\text{NH}_2$ / $-\text{OH}$ group.
10. Preparation of 2:4 dinitro-phenyl hydrazone (2,4 DNP) derivative of $-\text{CHO}$ / $-\text{CO}$ 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

Course Title

CEP -I

Short Title

CHL 401

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.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	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.

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 & Finnsch 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 West Press. 1973
- 3) G.N. Pandey, A textbook of chemical technology, Vol. I, Vikas publishing house pvt. ltd.

Course Outline

Process Calculation

Course Title

PCAL

Short Title

CHL 402

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.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	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.

Process Calculations**(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**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

Course Title

MO

Short Title

CHL 403

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.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	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.

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. McCabe W. L. & Smith J. C. " Unit Operation for Chemical Engg." 5th Edt. McGraw Hill Kogakusha Ltd.
2. Coulson J. M. & Richardson 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 & Bhattacharya " Mechanical Operation In Chemical Engg." NCBA Calcutta
5. P. Chattopadhyaya " 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

Course Title

APC

Short Title

CHL 404

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.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	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.

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 1st, 2nd, 3rd, & 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 like 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

Course Title

CEP -II

Short Title

CHL 405

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.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	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.

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 West Press. 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

Course Title

Lab CA

Short Title

CHP 406

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.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	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 4th order method.
3. Students will also learn to solve Numerical Integrations by various methods like, by Picards method, Trapezoidal Rule, by Simpson's 1/3rd Rule, Simpson's 3/8th rule.

Learning Outcomes:

Students completing this course will be 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.

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 4th 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 1/3rd Rule
10. To solve Numerical Integration by Simpson's 3/8th 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, 6th Edition, Tata McGraw Hill.
4. David M. Himmelblau, Basic Principles & Calculations in Chemical Engineering, 6th Edn., Pearson Education Pvt.Ltd., New Delhi.
5. S.S.Sastry, Introductory methods of Numerical Analysis, Prentice Hall

Course Outline

Lab Chemical Processes

Course Title

Lab CP

Short Title

CHP 407

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.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	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.

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

Course Title

Lab MO

Short Title

CHP 408

Course Code

Course Description: This course intended to fulfill the need for comprehensive laboratory course in unit operations.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	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

Course Title

Lab APC

Short Title

CHP 409

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.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	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 experimentally 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) Determination 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 persulphate 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

**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.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	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
Analog & Digital Electronics

Short Title Course Code
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, Subtractor. Multiplexer, Demultiplexer 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

Tutorial: 1 hour / week

End Semester Examination (ESE) : 80 Marks

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 subtractor, full subtractor.

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
Discrete Structure and Graph Theory

Short Title Course Code
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

Lecture: 3 hours / week

Tutorial: 1 hour / week

Examination Scheme

End Semester Examination (ESE) : 80 Marks

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
Microprocessor and Microcontroller

Short Title Course Code
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
Object Oriented Technology

Short Title Course Code
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)

- Introduction to procedural, modular and object-oriented programming techniques.
- Limitations of procedural programming.
- Need of object-oriented programming. Advantages, disadvantages and applications of OOP.
- Class, objects, abstraction, encapsulation, data hiding, inheritance, polymorphism and message passing.
- The basics of C++
- 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 Bhawe, 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

- Divisibility Rules
- Speed Maths
- Remainder Theorem
- Different Types of Numbers
- Applications

b. HCF, LCM and Linear Equations

- HCF – Successive Division and Prime Factorization Methods
- LCM – Successive Division and Prime Factorization Methods
- 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
Analog & Digital Electronics

Short Title Course Code
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 subtractor & full subtractor 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
Discrete Structure and Graph Theory

Short Title Course Code
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
Microprocessor and Microcontroller

Short Title Course Code
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 8087 only) 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
Object Oriented Technology

Short Title Course Code
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,

- Addition,
- Subtraction,
- Multiplication,
- 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 Bhawe, 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
Data Communication

Short Title Course Code
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

Microprocessor & Microcontroller Interfacing

Short Title

MPMCI

Course Code

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

Tutorial: 1 hour / week

End Semester Examination (ESE) : 80 Marks

Paper Duration (ESE) : 03 Hours

Internal Sessional Exam (ISE) : 20 Marks

1. Basic I/O Interface

(08 Hours, 16 marks)

- MSDOS FAT
- MS DOS Device Drivers Types, Structure of device drivers.
- 8255 PPI : Internal block diagram, control word and status word, modes of operation, numericals on control word design.

2.

(08 Hours, 16 marks)

- 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
Data Structures

Short Title Course Code
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.

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

Data Structures

Semester - IV

Teaching Scheme

Examination Scheme

Lecture: 3 hours / week

Tutorial: 1 hour / week

End Semester Examination (ESE) : 80 Marks

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 operations 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 operations w.r.t. binary search tree.
- b Concept of threaded binary tree, tree traversals (recursive & non-recursive).
- 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', ' Θ ', ' Ω ' notations.
- e Best, Worst, and Average 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 problems with C++", Pearson Publications.

Computer Organization

COURSE OUTLINE

Course Title
Computer Organization

Short Title Course Code
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

Computer Graphics

Short Title

CG

Course Code

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

Tutorial: 1 hour / week

End Semester Examination (ESE) : 80 Marks

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 Harrington, "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

Application Development Lab

Short Title Course Code

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
Data Communication Lab

Short Title Course Code
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

Data Structures Lab

Short Title Course Code

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, Yedidiah 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 problems 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

Computer Graphics

Short Title

CG

Course Code

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

Create 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 Harrington, "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.)**

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	Total	
	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
Engineering Mathematics-III

Short Title
EM-III

Course Code

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 Linear 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	
Tutorial	01	14	14	04

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

Teaching Scheme:

Lectures : 3 Hrs/Week

Tutorials : 1 Hr/Week

Examination Scheme:

(ESE) End Semester Examination: 80 Marks

(ISE) Internal Sessional Examination: 20 Marks

(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
Power Plant Engineering

Short Title
PPE

Course Code

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 be 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

Teaching Scheme:

Lectures : 3 Hrs/Week

Examination Scheme:

(ESE) End Semester Examination: 80 Marks

(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
Electrical Measurement-I

Short Title
EM-I

Course Code

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.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	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

Teaching Scheme:

Lectures : 3 Hrs/Week

Tutorial : 1 Hrs/Week

Examination Scheme:

(ESE) End Semester Examination: 80 Marks

(ISE) Internal Sessional Examination: 20 Marks

(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 electro-dynamics 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
Power System-I

Short Title
PS-I

Course Code

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

Teaching Scheme:

Lectures : 3 Hrs/Week

Examination Scheme:

(ESE) End Semester Examination: 80 Marks

(ISE) Internal Sessional Examination: 20 Marks

(ESE) End Semester Exam duration: 03 Hours

UNIT-I: Generation

09 Hours, 16 Marks

- 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.
- Schematic block diagram and role played by each block for Hydro Electric power plant
- Basic requirements, site selection and principle of working of Thermal Electric power plant.
- Main components and auxiliary components of Thermal Electric power plant.
- Schematic block diagram and role played by each block for Thermal Electric power plant
- Basic requirements, site selection and principle of working of Nuclear Electric power plant.
- Main components and auxiliary components of Nuclear Electric power plant.
- 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

- Principle of working, main components and auxiliary components and of solar power plant
- Schematic block diagram and role played by each block of solar power plant
- Principle of working, main components and auxiliary components, schematic block diagram and role played by each block of tidal power plant
- Principle of working, main components and auxiliary components and of MHD power plant
- Schematic block diagram and role played by each block of MHD power plant
- Principle of working, main components and auxiliary components of fuel cells
- Schematic block diagram and role played by each block of fuel cells
- 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

- Classification of power plants as Base load Peak load & Intermediate load plants.
- Hydrograph
- 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

Electrical Engineering Materials

Short Title

EEM

Course Code

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

Teaching Scheme:

Lectures : 3 Hrs/Week

Examination Scheme:

(ESE) End Semester Examination: 80 Marks

(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.Chhahotra 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
Soft Skills – III

Short Title
SK-III

Course Code

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

Teaching Scheme:

Lectures : 1 Hrs/Week

Practical : 2 Hrs/Week

Examination Scheme:

(ICA) Internal Continuous Assessment: 50 Marks

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
Power Plant Engineering Lab

Short Title
PPE Lab

Course Code

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

Practical: 2Hr/Week

Examination Scheme:

(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, Domkundawar, "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
Electrical Workshop

Short Title
EW Lab

Course Code

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

Electrical Measurement- I Lab

Short Title

EM- I Lab

Course Code

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	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 be 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 ratio error of current Transformer
8. Measurements of phase angle error and ratio 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
Electrical Engineering Materials

Short Title
EEM Lab

Course Code

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.

Practical	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	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.Chhahotra 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
Analog & Digital Electronics

Short Title
ADE

Course Code

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.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	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

Teaching Scheme:

Lectures : 3 Hrs/Week

Examination Scheme:

(ESE) End Semester Examination: 80 Marks

(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 subtractor .
- 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- edge 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
Network Analysis

Short Title
NA

Course Code

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

Lectures	Hours/Week	No. of Weeks	Total Hours	Credits
	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

Teaching Scheme:

Lectures: 3 Hrs/Week

Tutorials : 1 Hr/Week

Examination Scheme:

(ESE) End Semester Examination: 80 Marks

(ISE) Internal Sessional Examination: 20 Marks

(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.I
5. M.E. Valkenburg, "Network Analysis", Pearson Education .
6. D. Chattopadhyay & 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
Electrical Machines – I

Short Title
EM/C – I

Course Code

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

Teaching Scheme:

Lectures : 3 Hrs/Week

Tutorial : 1 Hrs/Week

Examination Scheme:

(ESE) End Semester Examination: 80 Marks

(ISE) Internal Sessional Examination: 20 Marks

(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 equation.
- 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 Publication
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

Teaching Scheme:

Lectures: 3 Hrs/Week

Examination Scheme:

(ESE) End Semester Examination: 80 Marks

(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
Numerical Techniques

Short Title
NT

Course Code

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

Teaching Scheme:

Lectures : 3 Hrs/Week

Examination Scheme:

(ESE) End Semester Examination: 80 Marks

(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
C – Programming / MATLAB

Short Title
CP/MATLAB

Course Code

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
Analog & Digital Electronics Lab

Short Title
ADE Lab

Course Code

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

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	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

Teaching Scheme:

Practical : 2 Hrs/Week

Examination Scheme:

(ICA) Internal Continuous Assessment: 50 Marks

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
Network Analysis Lab

Short Title
NA Lab

Course Code

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

Teaching Scheme:

Practical : 2 Hrs/Week

Examination Scheme:

(ICA) Internal Continuous Assessment: 25 Marks

(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
Electrical Machines – I Lab

Short Title
EMC – I Lab

Course Code

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.)**

**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.

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

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

- Intrinsic and Extrinsic Semiconductor - Concept of Doping, N type Semiconductor, P type semiconductor.
- Conduction Mechanism - Drift and Diffusion Current, Carrier Concentration after doping (N and P type material).
- Law of mass action.
- 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

- Concept of DC and AC Load line.
- 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 A_v , A_i , R_i , & R_o 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

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: 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, subtractor, 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 register 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.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	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

Tutorial: 1 hour / week

End Semester Examination (ESE) : 80 Marks

Paper Duration (ESE) : 03 Hours

Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Codes and Boolean algebra

No of Lect. – 9, Marks: 16

- Introduction to Number Systems.
- Representation of signed numbers.
- Classification of Binary codes. BCD codes, Excess -3 codes, Gray codes, ASCII codes, Hamming code and pulsed operation of logic gates.
- Boolean algebra, reducing Boolean expressions, SOP form, POS form, Minterm, Maxterm.
- 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/ Subtractor 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

- Definition of different term: Accuracy, precision, sensitivity, resolution, Significant figures.
- Errors: gross error, systematic error, random error, limiting errors.
- Statistical Analysis.
- Permanent magnet moving coil mechanism (PMMC).
- DC ammeter and DC volt meter.
- Series and shunt type of ohmmeter.

Unit-II: Electronic instruments

No of Lect. – 8, Marks: 16

- Digital multi-meter.
- Types of DVM: Linear Ramp type, Integration, Dual slope integration and successive approximation.
- 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.

Lecture	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
	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, 3rd 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.

Laboratory	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
	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.

- Measure the line Voltage for star / delta inductive load.
- Measure the line current for star / delta inductive load.
- Measure the power of watt-meters.
- Draw the phasor diagram for the star / delta inductive load.
- Calculate total power.

2. Speed control of D.C. shunt motor by armature voltage and flux control method.

- Measure armature voltages of D.C. shunt motor.
- Measure the field current of D.C. shunt motor.
- Plot graph for measure values voltages and field current.
- Verification of characteristics of motor.

3. Load test on three phase induction motor.

- Measure input Voltage and current of motor.
- Measure output speed of motor.
- Measure output torque of motor.
- 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 & disassembling.

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 & disassembling.

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 & disassembling.

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 & disassembling.

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.

Laboratory	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
	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 I_{CQ} , V_{CEQ} i.e. Q point)
- b. Calculation of I_{CQ} , V_{CEQ} 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 R_i , R_o .

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 I_{DQ} , V_{DSQ} i.e. Q point)
- b. Calculation of I_{DQ} , V_{DSQ} 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 R_i , R_o .

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 R_i , R_o

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.

- Sketch and recognize the resulting waveforms for a sinusoidal carrier being amplitude modulated by a single frequency audio signal.
- 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 ;
- 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.

- Generate AM modulated wave form.
- Apply Modulated AM signal to demodulator.
- Observe clipping effect.
- 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, 3rd 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.

Laboratory	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
	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.

- Apply different combinations of inputs and observe the outputs.
- Compare the outputs with the truth tables.

2. Design of 4 bit Gray to binary Code Converter.

- Prepare the truth table of Gray to binary code.
- All the 16 combinations of inputs are given at respective pins
- Verify the truth tables of Gray to binary code.

3. Realization of IC7483 as parallel adder and subtractor.

- Apply the inputs to A3 to A0 and B0 to B3.
- Check the output sum S3 to S0 and also C4.
- For Subtraction, Apply B input through NOT gate, which gives complement of B.
- Verify the truth table of adder/subtractor.

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/subtractor.

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 Q₃, Q₂, Q₁, and Q₀.

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:

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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

Tutorial: 1 hour / week

End Semester Examination (ESE): 80 Marks

Paper Duration (ESE) : 03 Hours

Internal Sessional Exam (ISE) : 20 Marks

UNIT-I: Linear Differential Equations:

No of Lect. – 8, Marks: 16

- 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.
- Applications of Linear differential equations to electrical circuits.

UNIT-II: Function of Complex Variable

No of Lect. – 8, Marks: 16

- Analytic functions, Cauchy-Riemann equations.
- Cauchy's Residue theorem (Without proof)
- Cauchy's Integral theorem and Cauchy's Integral formula (without proof).
- 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

- Different Types of Waveshaping circuit- Astable multivibrator, Bistable multivibrator and monostable multivibrator.
- Analysis of different Time Base circuits – Miller integrator, Bootstraps sweep circuit.
- Introduction of Differential amplifier, Different modes of Differential amplifier.
- DC Analysis of Differential amplifier with Re, AC analysis of Differential amplifier.
- Calculation of CMRR for Balanced & Unbalanced operation, Techniques to improve CMRR of Differential amplifier.
- 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 F_α , F_β & 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 R_i and R_o .
- e) Analysis of Voltage shunt and Current shunt Negative feedback amplifier with derivations of R_i and R_o .

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.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	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

- Block diagram and operation of microcomputer system.
- 8085 Microprocessor architecture & operation.
- Program Counter and Stack pointer and Pin diagram of 8085 microprocessor.
- De-multiplexing of lower order address bus and generation of control signals.
- Memory classification, Basic of memory interfacing and Address decoding techniques.
- 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

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: Operational amplifier:

No of Lect. – 9, Marks: 16

- Ideal op-amp characteristics; schematic development stages of op-amp.
- Current sources and active loads.
- Difference, intermediate and output stages including Miller capacitors for frequency computation.
- Internal circuit of op-amp IC $\mu A741$, operational amplifier parameters, offset null techniques of op-amp features.
- Data sheet interpretation and data sheet study of op-amp IC 741.
- Measurement of op-amp parameters, effects of real operational amplifier parameters on circuit performance.
- 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 μ A725, 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 μ A723 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 MC1723 and 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

- Definition and types of network function with their Numerical.
- Concept of complex frequency and characteristics of standard signals.
- Concept of Laplace transform and Laplace transform of basic R, L, and C Component.
- Network Analysis using Laplace transform with initial condition, Numericals.
- 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.

Laboratory	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
	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.

Laboratory	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
	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).

- 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.

- Apply different I/P signals & observe the O/P waveform.
- Plot the frequency response.

3. Study the operation of half wave and full wave precision rectifier

- Observe the I/P & O/P waveforms for both the circuits.

4. Design and test positive and negative clamper.

- 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.**
 - Calculate A_{vd} in differential mode operation.
 - Calculate A_{vc} in Common mode operation.
 - Compare CMRR in above two methods.
- 2. Observe the response of Miller integrator for given i/p.**
 - Draw input and output waveform of miller integrator.
- 3. Measure response of Schmitt trigger circuit for sine wave input.**
 - Calculation of UTP and LTP.
 - Observe Hysteresis characteristics.
 - 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 P_{ac} .
- b. Calculate D.C. i/p Power P_{dc} .
- c. Calculate efficiency.

6. Class B Complementary Symmetry efficiency calculation and elimination of crossover distortion.

- a. Calculate A.C. output power P_{ac} .
- b. Calculate D.C. I/P Power P_{dc} .
- 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 A_v , input impedance R_i , and output impedance R_o for current series/ voltage series negative feedback amplifier

- a. Compare Voltage gain A_v , input impedance R_i , and output impedance R_o 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, "Electronics 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.

- Measure electrical quantity such as Voltages and currents at different ports of the two ports the network.
- Find the Driving point impedance or transfer impedance of given network.
- Compare analytical and the practical values.

2. Determine Pole-Zero plot of given one port reactive network.

- Measure the output current of the one port reactive network with frequency variation.
- Calculate impedance by taking ratio of input voltage and measured currents for each frequency value.
- Draw the graph of impedance and frequency and find practical values of poles and zeros
- Compare analytical and practical values of poles and zeros.

3. Study of Series and parallel resonance, find BW and Q- factor.

- 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 ' V_s ' & 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.)**

**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.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	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

Tutorial: 1 hour / week

End Semester Examination (ESE) : 80 Marks

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
Information Theory

Short Title Course Code
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 Schneier, "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
Discrete Structure and Graph Theory

Short Title Course Code
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

Tutorial: 1 hour / week

End Semester Examination (ESE) : 80 Marks

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
Digital system and Microprocessor

Short Title Course Code
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)

- Logic Gates
- Implementation of logic gates using universal gates
- Digital Signal: Positive & Negative logic
- Boolean Algebra
- Kmap representation (2, 3 and 4 variable)
- Grouping in the Kmap
- Don't Care condition in Kmap

2. Combination logic design

(08 Hours, 16 marks)

- Kmap representation (5 and 6 variable)
- 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
Object Oriented Technology

Short Title Course Code
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)

- Introduction to procedural, modular and object-oriented programming techniques.
- Limitations of procedural programming.
- Need of object-oriented programming. Advantages, disadvantages and applications of OOP.
- Class, objects, abstraction, encapsulation, data hiding, inheritance, polymorphism and message passing.
- The basics of C++
- 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, void 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 Bhawe, 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

- Divisibility Rules
- Speed Maths
- Remainder Theorem
- Different Types of Numbers
- Applications

b. HCF, LCM and Linear Equations

- HCF – Successive Division and Prime Factorization Methods
- LCM – Successive Division and Prime Factorization Methods
- 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
Information Theory

Short Title Course Code
IT

Course Description:

This laboratory provides students with a comprehensive study of the basic concepts of cryptography and data compression. It will help 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 exhibit 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 exhibit 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 consist 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 work on bit-by-bit basis
- It should consist 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 Schneier, "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
Discrete Structure and Graph Theory

Short Title Course Code
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
Digital System and Microprocessor

Short Title Course Code
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

- Draw the logical symbol and truth table
- Implement the connection on bread board and verify the truth table

2. Implement any logic gates by using universal gates

- Construct logic gates using universal gates
- 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 Multiplexer and Demultiplexer

- a. Construct Multiplexer 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
Object Oriented Technology

Short Title Course Code
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,

- Addition,
- Subtraction,
- Multiplication,
- 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 Bhawe, 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

Data Communication

Short Title

DC

Course Code

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

Microprocessor & Microcontroller Interfacing

Short Title

MPMCI

Course Code

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

Tutorial: 1 hour / week

End Semester Examination (ESE) : 80 Marks

Paper Duration (ESE) : 03 Hours

Internal Sessional Exam (ISE) : 20 Marks

1. Basic I/O Interface

(08 Hours, 16 marks)

- MSDOS FAT
- MS DOS Device Drivers Types, Structure of device drivers.
- 8255 PPI : Internal block diagram, control word and status word, modes of operation, numericals on control word design.

2.

(08 Hours, 16 marks)

- 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
Data Structures

Short Title Course Code
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.

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

Data Structures

Semester - IV

Teaching Scheme

Examination Scheme

Lecture: 3 hours / week

Tutorial: 1 hour / week

End Semester Examination (ESE) : 80 Marks

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 operations 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 operations w.r.t. binary search tree.
 - b Concept of threaded binary tree, tree traversals (recursive & non-recursive).
 - 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', ' Θ ', ' Ω ' notations.
 - e Best, Worst, and Average 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 problems with C++", Pearson Publications.

Computer Organization

COURSE OUTLINE

Course Title
Computer Organization

Short Title Course Code
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
Computer Graphics & Multimedia

Short Title Course Code
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 Harrington, "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 Principles & Practice", Pearson Second edition.

Application Development Lab

LAB COURSE OUTLINE

Course Title

Application Development Lab

Short Title Course Code

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
Data Communication Lab

Short Title Course Code
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

Data Structures Lab

Short Title Course Code

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, Yedidiah 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++", Wiley India Publication.
8. Larry Nyhoff, "ADTs' Data Structures and Problems 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

Computer Graphics & Multimedia

Short Title

CGM LAB

Course Code

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 Harrington, "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.)**

**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 Mathematics -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

Course Title

ET

Short Title

Course Code

Mechanical / Automobile Engineering

Branch

Second Year

Year

Second

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, C_v and C_p .
	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 $-\int v dp$, relation between $\int P dv$ and $-\int v dp$,
	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 C_p , C_v 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 ratio, 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, 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 strain 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) Ramamrutham, Strengths of Materials, Dhanpat Rai Publication.
- 3) Junnarkar & Advani, Mechanics of Structure, Charotar Publication House, ANAND.
- 4) Beer & 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.
Cold working- recovery, recrystallisation, grain growth and hot working.
 - f
 - 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 .
Effects of various parameters on structure and properties of C.I.
- g 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

- Introduction and principles of heat treatment of steels, processing heat treatments for steels like full annealing, normalizing, process and stress relief anneal, spheroidization.
- a 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, Wiley 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, processes and 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. Shackelford & 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

Course Title

ME-I

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 McGraw 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

Course Title

ET Lab

Short Title & Course Code

Mechanical / Automobile Engineering

Branch

Second Year

Year

Second

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 1 st 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 2 nd law of thermodynamics using house hold refrigerator. Demonstrate of application of 2 nd 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 aluminium 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 any four experiments from group A and group B 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 Turning 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
Course Title

EM-III
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 vector 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

Course Title

Branch - Mechanical / Automobile Engineering

TOM-I

Short Title Course Code

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 Centroids	
	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 Duggipati 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, Phasor 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, 1 ST Edition, 2001
2	B L Theraja and A K Theraja, "A Text book of Electrical Technology- Vol-II", S. Chand, 1 ST 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 Chandigarh
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

Course Title

ME-II

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.
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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

Course Title

Branch - Mechanical Engineering

MD LAB

Short Title & Course Code

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 of 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):

11th standard Physics, 12th 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:
Code

Short Title Course

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, (<i>No numerical treatment on view factor</i>), 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

Course Title

ICE

Short Title

Course Code

Branch- Mechanical/ Automobile 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
	<p>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.</p> <p>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.</p>	

Unit. II

2	FUEL FEEDING SYSTEMS	No. of Lect.-8, Marks-16
	<p>a) Charge, intake valve and manifold, valve timing diagram, valve overlap, choked flow.</p> <p>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.</p> <p>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.</p>	

Unit. III

3	OPERATING SYSTEM	No. of Lect.-8, Marks-16
	<p>a) Cooling systems: requirement, types of cooling systems, thermostat and additives.</p> <p>b) Lubrication: Mechanism of lubrication, different methods, important properties of lubricating oils.</p> <p>c) Ignition Systems: requirement, battery ignition, magneto ignition, electronic ignition system, Ignition timing, spark timing advance.</p> <p>d) Starting methods of engines: Types of superchargers, Super charging, effect of super charging, limitations and advantages of supercharging, and turbo charging of engines.</p>	

Unit. IV

4	COMBUSTION IN SI AND CI ENGINES	No. of Lect.-8, Marks-16
	<p>a) Homogeneous and heterogeneous mixtures,</p> <p>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.</p> <p>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.</p>	

Unit. V

5	ENGINE TESTING AND PERFORMANCE	No. of Lect.-8, Marks-16
	<p>a) Measurement of indicated power, brake power, Morse test, energy balance and efficiency calculations.</p> <p>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</p>	

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

Design of Machine Element

DOME

Course Title

Short Title

Course Code

Branch - Automobile Engineering

Year – Third Year

Course Description: This course introduces undergraduate students to imparting knowledge of Machine Design. The background required includes a sound knowledge of Mathematics, mechanics, Strength of Material, and various machine components. The course aims at imparting knowledge of Machine Design.

Course Objectives

1. To provide an opportunity for students to apply knowledge of mathematics, for solution to design engineering problems.
2. To introduce numerical and machine design approach for solving design perspectives.
3. To apply the knowledge of these methods to solve practical problems with suitable software.

Course Outcome

At the end of the course the students are able to

1. Develop the engineering model with respect to aesthetic and ergonomic consideration.
2. Apply design technique to formulate and solve structural and design problems.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	3	14	40	3
Tutorials	--	--	--	--

Examination scheme:

End semester scheme (ESE)	80 marks	Duration: 03 Hrs.
Internal Sessional Examination (ISE)	20 marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Fundamental knowledge about mathematics, mechanics, strength of material and machine design.

Outline of Content: This course contains:

UNIT-I

1.	Fundamental of Design		No. of Lectures - 8 Marks : 16
	a	Mechanical Engineering design, Aesthetic considerations in design, ergonomic consideration in design.	
	b	Man/Machine closed loop system, Standardizations.	
	c	Selection of material, mechanical properties of material.	
	d	Limits, fits, tolerance, factor of safety, theories of failure.	

UNIT-II

2.	Design against fluctuating load		No. of Lectures - 8 Marks : 16
	a	Fluctuating stresses, S-N diagram for fatigue loading, endurance limit.	
	b	Endurance strength Modifying factors, stress concentration, causes and remedies, notch sensitivity,	
	c	Design of finite and infinite life under reverse stresses, cumulative damage in fatigue failure.	
	d	Solderberg & Goodman diagram, Modified Goodman diagram, fatigue design for component such as shaft, bolted joints & springs under combined stresses.	

UNIT-III

3.	Design of shaft keys and coupling		No. of Lectures - 8 Marks : 16
	a	Shafts: Introduction, types of shafts, design of shafts subjected to twisting moments, bending moments, combined twisting and bending moments.	
	b	Keys: Types of keys, design of keys.	
	c	Coupling: Design of rigid coupling & design of flexible coupling.	

UNIT-IV

4.	Design of Gears		No. of Lectures - 8 Marks : 16
	a	<u>Spur gear</u> : Design of spur gear and helical gear, laws of gearing, terminology of spur Gear, force, analysis, face width, no. of teeth, beam strength and wear strength of gear, tooth, gear tooth failure.	
	b	<u>Helical gear</u> : Terminology of helical gear, virtual no. of teeth, tooth	

		properties, force analysis, beam strength and wear strength
	c	<u>Design of bevel</u> : Terminology, force analysis, beam strength and wear strength.

UNIT-V

5.	Miscellaneous design		No. of Lectures - 8 Marks : 16
	a	Design of power screw self locking of power screws, recirculating ball screw.	
	b	Design of springs: Types application, materials of springs – stress deflection equation of helical springs, Wahl's factor, Leaf Spring.	
	c	Design of Brakes.	

References

- 1 Shigley J. E. and Mischke C. R. , "Mechanical Engineering Design", McGraw Hill Publication Co. Ltd.
- 2 Bhandari V. B. , "Design of Machine Elements", Tata McGraw Hill Publication Co. Ltd.
- 3 Design Data", P. S. G. College of Technology, Coimbatore.
- 4 Juvinal R.C., "Fundamentals of Machine Components Design", John Wiley and Sons.
- 5 P. Kannaiah, "Machine Design", Scitech publication

Course Outline

Theory of Machines – II

TOM-II

Course Title:
Code

Short Title

Course

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.

Lab - Course Outline Cover Page

Computer Graphics

CG

Course Title
Code

Short Title Course

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 Outline

Transport Management and Safety Regulation

TMSR

Course Title

Short Title

Course Code:

Branch - Automobile Engineering

Year – Third Year

Course Description: This course introduces undergraduate students to imparting knowledge of central motor vehicle act, taxation, insurance, fleet management, garage layouts, and safety aspects on the road. The course aims provide knowledge of the basic transport management which is automotive engineer must take into consideration.

Course Objectives

1. To provide students with an overall understanding of the reasons for people and goods movement, patterns of travel and to gain knowledge of the evolution of transport technologies, and their feature that fulfil the desire for travel. To obtain an understanding of the techniques and theories of studying traffic flow and transport demand and supply.
2. Manage the organization, personnel, and operational requirements for a successful transportation/distribution department.
3. The administration of a business concern or public undertaking. Management includes the actions of planning, organizing, directing, coordinating, controlling and evaluating the use of people, money, materials and facilities to accomplish missions and tasks.

Course Outcome

At the end of the course the students are able to

1. Have a critical understanding of current developments in transport and logistics systems.
2. Demonstrate critical awareness of the strategic significance of Transport and Logistics systems.
3. Be able to understand the transport and logistics theoretical frameworks.
4. Be capable of interpretation, and critical analysis of transport and logistics strategies.
5. Be able to using current theories, and reflect on their work experience to produce better transport and logistics performance.
6. Be able to find, collate, synthesize and interpret literature in areas of transport and logistics research in a cohesive and analytical fashion.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	3	14	40	3
Tutorials	--	--	--	--

Examination scheme:

End semester scheme (ESE)	80 marks	Duration: 03 Hrs.
Internal Sessional Examination (ISE)	20 marks	

Purpose of Course: Degree Requirement**Prerequisite Course(s):** Fundamental knowledge about Transport Management and Safety Regulations.**Outline of Content:** This course contains:**UNIT-I**

1.	<u>Motor Vehicle Act-1989</u>	
	No. of Lectures - 8 Marks : 16	
	a	Short Titles and definitions laws governing use of motor vehicle & vehicle transport.
	b	Licensing of drivers and conductor, Registration of vehicle, state and interstate permits.
	c	Taxation structure and methods of laving taxation, insurance type and significance.
	d	Furnishing particulars of vehicles involved in accident, award of claim tribunal.
	e	Duty of driver & conductor in case of accident, traffic rules, signals and controls, accidents causes and analysis.
	f	Liabilities and preventive measures, Design of road complex , Responsibility of driver , Public authorities, offences, penalties and procedures.
	g	Different types of forms, Government administration structure, personnel authorities and duties.

UNIT-II

2.	No. of Lectures - 8 Marks : 16	
	a	<u>Transport terminology -</u> Important terms used in road transport organization like HMTV , LMTV, Fleet utilization , breakdown rate, accident rate, route, seat km etc.
	b	<u>Cost of Services-</u> Capital cost & operating cost, fixed cost & variable cost, direct & indirect cost, excess capacity and effect on route
	c	<u>Operational productivity and efficiency</u> Productivity in road transportation organization, the environment of road transport system, Optimizing fleet and vehicle utilization, conservation of fuel and economy, control of breakdown, effective traffic operation

UNIT-III

3.	No. of Lectures - 8 Marks : 16	
	a	<u>Infrastructure in road transportation organization</u> Garages, essential requirements of garages, fleet maintenance record , bus station , bus shelter, bus stop, essential requirement, staffing, management of transport organization and its objectives, Typical depot layout structure of passages and goods transport organization
	b	<u>Motor industry</u> Manufacturing techniques and quality control of automobile components such as piston, cylinder, valves, crankshaft, camshaft, bearing.

UNIT-IV

4.	No. of Lectures - 8 Marks : 16	
	a	<u>Significance of Road Transportations</u> Road transportation as an agent of change and development ,National scene, transport policy and co-ordination, operating characteristic s in transportation, engineering flexibility ,speed and acceleration, dependability and safety performance criteria
	b	<u>Transport planning</u> Strategic planning, management control, operational control

UNIT-V

5.	No. of Lectures - 8 Marks : 16	
	a	<u>Road safety and Health</u> Driving comfort, avoiding fatigue, the road to exhaustion, poisonous car fumes, car sickness, drugs & driving first aid for motorist, first aid kits, braking & stopping interpreting the signs ,rain, floods, hot, mistcare &precaution , ice snow skidding, emergencies & road observations.
	b	<u>Accidents</u> Definition of accident, legal obligation, causes of accident, Insurance, Documentation, Analysis & preventions of accidents, Road Safety & Drivers Role , a defensive driver, driver selection test, Drivers training.
	c	<u>Security Devices</u> Dog Restraint, Rear fog lamp, guard lamp, reversing light, bonnet, brakes locks, vibrator alarm, fog lamp, Toe bar, Roof racks, Luggage containers.

References

- 1 Goverment Publication, The Motor vehicle Act, 1989.
- 2 Kadiyali.L.R., Traffic engineering and Transport Planning.
- 3 P.G.Patankar, "Road passenger Transport in India", C.I.T.T. Publication
- 4 Santosh Sharma, "Productivity In Road Transportation" A.S.R.T.V.Publication
- 5 Compendum of Transport Terms- C.I.R.T.Pune

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 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.

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

Autotronics

Atrx

Course Title

Short Title

Course

Code:

Branch - Automobile Engineering

Year – Third Year

- **Course Description:** This course introduces undergraduate students to imparting knowledge of Autotronics. The course aims provide combined knowledge of electrical, electronic and mechanical systems those are used in automobile subsystems, which the automotive engineer must take into consideration.

Course Objectives

4. To study the electronics system used in automobile.
5. Autotronics is involves the study of mechanics, electronics, control engineering and computing to generate new ways of designing and producing new, high performance machines and products

Course Outcome

At the end of the course the students are able to

1. It will provide Interest towards the automation.
2. Study about the electronics used in automobile.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	3	14	40	3
Tutorials	--	--	--	--

Examination scheme:

End semester scheme (ESE)	80 marks	Duration: 03 Hrs.
Internal Sessional Examination (ISE)	20 marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Fundamental knowledge about Electrical engineering, electronics engineering and mechanical engineering.

Outline of Content: This course contains:

UNIT-I

1.	Autotronics and Sensors in Automobiles		No. of Lectures - 8
			Marks : 16
	a	Measurement systems: Basic Principles of transductions related to Resistive, Capacitive, Inductive, Piezoelectric, Thermoelectric and Photovoltaic.	
	b	Stages of measurement, static characteristics of instruments, and commonly used automobile and electronics components.	
	c	Electromagnetic Sensors, Optical Sensor, Temperature Sensor, Manifold Absolute Pressure Sensor, Knock Sensor, Throttle position sensor, Exhaust Gas Sensors, Air flow measurement	

UNIT-II

2.	Vehicle Management System		No. of Lectures - 8
			Marks : 16
	a	ABS system, its need, layout and working.	
	b	Electronic control of suspension – Damping control, Electric power steering.	
	c	Supplementary Restraint System of air bag system – crash sensor, seat belt tightening.	
	d	Cruise control, Vehicle security systems alarms, vehicle tracking system.	
	e	Collision avoidance, Radar warning system.	
	f	Introduction to Global Positioning Systems, Electronic Stability control system.	

UNIT-III

3.	SI Engine Management		No. of Lectures – 8
			Marks : 16
	a	Feedback carburetor system, throttle body injection and multi point fuel injection system, injection system controls.	
	b	Advantage of electronic ignition systems, three way catalytic converter,	

		conversion efficiency versus lambda.
	c	Layout and working of SI engine management systems like Bosch Monojetronic, L-Jetronic and LHJetronic.
	d	Group and sequential injection techniques. Working of the fuel system components. Advantages of electronic ignition systems.
	e	Types of solid state ignition systems and their principle of operation.

UNIT-IV

4.	CI Engine Management		No. of Lectures - 8
			Marks : 16
	a	Fuel injection system, parameters affecting combustion,	
	b	Noise and emissions in CI engines.	
	c	Pilot, main, advanced, post injection and retarded post injection.	
	d	Electronically controlled Unit Injection system. Layout of the common rail fuel injection system.	
	e	Working of components like fuel injector, fuel pump, rail pressure limiter, flow limiter,	
	f	EGR valve control in electronically controlled systems.	

UNIT-V

5.	Automotive Electrical		No. of Lectures - 8
			Marks : 16
	a	D.C. generator and alternator.	
	b	Regulation for charging.	
	c	Lighting design	
	d	Dashboard instruments	
	e	Horn, warning system, wiring,	
	f	Safety devices and testing equipment.	

References

- 1 Diesel Engine Management by Robert Bosch, SAE Publications, 3rd Edition, 2004
- 2 Gasoline Engine Management by Robert Bosch, SAE Publications, 2nd Edition,
- 3 William Harry Crouse, "Automotive Electronics and Electrical Equipment", Edition 10, Gregg Division, McGraw-Hill, 1986, ISBN 0070148953, 9780070148956
- 4 William Harry Crouse, Donald L. Anglin, "Automotive Tune up", Automotive Technology Series, Publisher McGraw-Hill Gregg Division, 1977, ISBN 0070148104, 9780070148109
- 5 Ken Layne, "Automobile Electronics and Basic Electrical Systems", Volume 1, Wiley, 1989 ISBN 0471617636, 9780471617631

Course Outline

Automobile Systems

AS

Course Title

Short Title

Course Code

Branch - Automobile Engineering

Year – Third Year

Course Description: This course introduces undergraduate students to imparting knowledge of various automobile systems like starting, ignition & steering. The course aims provide knowledge of the basic structural layouts, electrical & air-conditioning operations of a vehicle which the automotive engineer must take into consideration.

Course Objectives

6. To provide a basic knowledge regarding the various systems of automobile.
7. To introduce about the components of various systems.

Course Outcome

At the end of the course the students are able to

3. Understand the various systems with their applications.
4. Understand the working of automobile systems.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	3	14	40	3
Tutorials	--	--	--	--

Examination scheme:

End semester scheme (ESE)	80 marks	Duration: 03 Hrs.
Internal Sessional Examination (ISE)	20 marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Fundamental knowledge about automobile engineering.

Outline of Content: This course contains:

UNIT-I

1.	No. of Lectures - 8 Marks : 16	
	<u>Vehicle layouts and specification</u>	
	a	Vehicle specification, vehicle layouts, types of vehicles and their applications,
	b	Two and four wheelers, cars, Light commercial vehicles, Trucks, buses, earth moving machinery, high way vehicles, agricultural tractors,
	c	Construction of automobile and various systems Of automobiles
	<u>Chassis and frames</u>	
	d	Frame, sub frame, integral construction, frame alignment.
	e	Body bumpers, doors, hood, articulated vehicles, trailers and safety consideration.

UNIT-II

2.	No. of Lectures - 8 Marks : 16	
	Battery	
	a	Introduction, Principles of battery operation, battery construction.
	b	Recharging of battery, Battery rating, battery capacity and battery efficiency.
	c	Checking specific gravity of battery, battery test.
	d	Battery charging, battery failure and battery troubles shooting.

UNIT-III

3.	No. of Lectures - 8 Marks : 16	
	a	<u>Ignition systems</u> Conventional Ignition systems: Function, types of Ignition systems, components, Battery Ignition systems, Magneto Ignition systems, Testing of Ignition circuits, Ignition systems trouble shooting.
	b	<u>Electronic Ignition systems</u> Introduction, principles of Electronic Ignition systems, pulse generator, distributor less ignition system.
	c	<u>Starting systems:</u> Starting motors, starting devices, bendix drive, overrunning clutch drive, starting motor switch and control switch, starting system troubleshooting.

UNIT-IV

4.	No. of Lectures - 8 Marks : 16	
	Design of Gears	
	<u>Wheels , Tyres, and Tubes</u>	
	a	Construction and types of wheels, wheel dimensions.
	b	Types of tyres, tyre property , tyre material, consideration in trade design, wheels and tyre trouble shooting, retyring of tyres, Tubes, Natural Rubber sand butyl flops.
	c	Rims, types, and maintenance.
	a	Construction and types of wheels, wheel dimensions.
	<u>Front axle and steering</u>	

	d	Introduction, front axle, factors of wheel alignment, steering geometry.
	e	Steering mechanisms, cornering force, understeer and oversteer, steering linkages, steering gears, steering ratio.
	f	Special steering columns, power steering, advanced steering systems.

UNIT-V

5.	<u>Air conditioning systems</u>	No. of Lectures - 8 Marks : 16
	a	Definition of basic terms of psychometry such as DBT, WBT, RH, etc. Human comfort conditions.
	b	Temperature control system, Insulation methods in auto air conditioner, Study of typical auto air conditioner, location of window air conditioner.
	c	Study of typical air conditioner systems, various parts of systems, compressor performance and its effect on overall engine performance.

References

- 1 Dr. Kripal Singh, "Automobile Engineering" vol-I&II
- 2 R.B. Gupta, "Automobile Engineering" ;Satya prakashan, New Delhi
- 3 Newton, steed and Garret, "Motor vehicle", Butterworth, London
- 4 Narang G. B. S, "Automobile Engineering", Khanna publication, New Delhi
- 5 A.W. Judge , " Modern Transmission" Chapmen and Hall std 1989
- 6 Nakara C. P., "Basic Automobile Engineering", Dhanpat Rai Publishing co.

Course Outline

Metrology and Quality Control

Course Title:

MQC

Short Title

Course Code

Branch – Mechanical/Automobile 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, tolerances, 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 texture, 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 trilogy 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: ASTM: 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, 11th 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
- 8 Study 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.

Lab - Course Outline

COMPUTER PROGRAMMING IN C / C++

C/C++

Course Title
code

Short title

Course

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 Outline

Project and Business Management

PBM

Course Title

Short title

Course

Code

Branch: Mechanical /Automobile 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 organisation, 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 Accounting”
- 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.

COURSE CONTENT

Minor Project

Course Title

MIP

Short Title

Course Code

Semester-VI

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	10	20	2

Examination Scheme Marks

Internal Continuous Assessment (ICA): 50

- 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

[illegible]

COURSE CONTENT

Seminar-I

Course Title

S-I

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.)**

Syllabus for

Final Year Mechanical Engineering

Faculty of Engineering and Technology



Course Outline

SEMESTER – VII and VIII

W.E.F 2015 – 2016

North Maharashtra University, Jalgaon
Syllabus Structure for Final Year Mechanical Engineering w.e.f year 2015-16
Semester –VII

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		
	Refrigeration and Air Conditioning	D	3	---	---	3	20	80	---	---	100	3
	Computer Aided Design and Computer Aided Manufacturing	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
	Operation Research	D	3	---	---	3	20	80	---	---	100	3
	CAD/CAM	D	---	---	2	2	---	---	25	25	50	1
	RAC	D	---	---	2	2	---	---	25	25 PR	50	1
	Elective-I	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

	Interdisciplinary Elective		Elective – I
1	Operation Research Techniques	1	Mechatronics
2	Energy Resources and Technology	2	Advanced Machine Design
		3	Machine Tool Design
		4	Automobile Engineering – I

North Maharashtra University, Jalgaon
Syllabus Structure For Final Year Electrical Engineering w.e.f year 2015-16
Semester –VIII

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		
	Mechanical Vibration	D	3	---	---	3	20	80	---	---	100	3
	Finite Element Analysis and Simulation Techniques	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
	Mechanical Vibration	D	---	---	2	2	---	---	25	25	50	1
	Finite Element Analysis and Simulation Techniques	D	---	---	2	2	---	---	25	25 PR	50	1
	Elective-II	D	---	---	2	2	---	---	25	25	50	1
	Industrial Lecture*	E	---	---	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

Elective-II		Elective – III	
1	Tribology	1	Introduction to Robotics
2	Power Plant Engineering	2	Advanced Welding Technology
3	Process Equipment Design	3	Energy Conservation and Management
		4	Automobile Engineering – II
		5	Thermal Equipment design

Course Outline

Refrigeration and Air Conditioning

RAC

Course Title:

Short Title

Course Code

Branch- Mechanical Engineering

Year-Fourth Year

Course Description: This course Familiarize under graduate students with the terminologies associated with refrigeration & air conditioning, basic principles of psychrometry and applied psychometrics, refrigerants; vapor compression refrigeration and multi-stage vapor compression systems, components of vapor compression systems and other types of cooling systems.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03
Practical	02	14	28	01

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): Fundamental knowledge of Engineering Thermodynamics, Applied Thermodynamic, and Heat Transfer

Outline of Content: This course contains:

UNIT-I

1.	Refrigeration systems	No. of Lectures –9, Marks : 16
	a	Introduction, standard rating of refrigerating machine, coefficient of performance of refrigerator and heat pump.
	b	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.
	c	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

2.	Vapour compression refrigeration system	No. of Lectures-9, Marks : 16
	a	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.
	b	Compound vapour compression system with inter cooling, flash chamber, multi compressor and multi evaporators systems.
	c	Cascade refrigeration system, production of dry ice.

UNIT - III

3.	Vapour absorption refrigeration systems	No. of Lectures-8, Marks : 16
	a	Vapour absorption refrigeration simple & modified vapour absorption refrigeration systems, Electrolux refrigerator.
	b	Desirable properties of solvent, absorbent & refrigerant combinations, aqua ammonia & lithium bromide refrigeration system use of enthalpy concentration charts.

UNIT - IV

4.	Basic of Psychometric	No. of Lectures -8, Marks : 16
	a	Psychometric- properties of moist air, psychometric chart and process, mixing of air stream, bypass factor, sensible heat factor, room sensible heat factor, Gross sensible heat factor, humidifying efficiency, air washer.
	b	Study of various types of psychometers, sling, aspirating, and industrial type.

UNIT-V

5.	Air Conditioning System	No. of Lectures -8, Marks : 16
	a	Introduction to industrial and comfort air conditioning, human requirements of comfort, effective temperature and comfort chart.
	b	Air conditioning load calculations, inside and outside design conditions, Building cooling & heating load calculation, Effective sensible heat factor advanced psychrometry.
	c	Window and central air conditioning systems year round air conditioning.

Text Book and 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.
7. Faye C McQuistom, "Heating Ventilating and Air conditioning", Wiley India Pvt. Ltd. New Delhi

Course Outline

Computer Aided Design and Computer Aided Manufacturing CAD/CAM

Course Title: Short Title Course Code

Branch- Mechanical Engineering

Year-Fourth Year

Course Description: The course presents the elements of solid modeling, creation of parts of increasing complexity and the assembly of parts to form a final design, along with mechanism simulation. The operation and programming of CNC machines is covered.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03
Practical	02	14	28	01

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): Fundamental knowledge about the Design and Automation of Manufacturing Process, Strength of Materials, Engineering Mechanics, etc

Outline of Content: This course contains:

UNIT-I

1.	Introduction To CAD/CAM And Networking	No. of Lectures-9, Marks : 16
	a	Define CAD/CAM, Product Life Cycle & CAD/CAM, and Application of Computers for Design Process, Selection of a CAD system, Desirable relationship of CAD/CAM database, Benefits & Application of CAD.
	b	Hardware in CAD, Introduction, The Design Work Station, The graphics terminal, Operator input/output devices,
	c	Computer communication, Principle of networking, Classification of network, Transmission media & interface, LAN system.

UNIT - II

2.	Computer Aided Graphics	No. of Lectures –9, Marks : 16
	a	Introduction, Graphic Primitives, Point plotting, Drawing of lines, Co ordinate system used in graphic element, Transformation in graphics,
	b	2D transformation, Homogeneous transformation, Concatenate co ordinate transformation, Translation, Rotation, Scaling, Mirror, Reflection, Inverse co ordinate transformation, clipping,
	c	3D transformation, View Port, Windowing, Standardization in graphics IGES files.

UNIT - III

3.	Computer Aided Modeling & Automation	No. of Lectures–8, Marks : 16
	a	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
	b	AUTOMATION: Concept of Automation, Types of Automation, Advantages & limitations of Automation, Levels of Automation, Advanced Automation Function.

UNIT - IV

4.	Computer Aided Manufacturing	No. of Lectures –8, Marks : 16
	a	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
	b	CNC PROGRAMMING Axis of CNC Machines, Manual Part Programming using G and M codes Adoptable to Fanuc Controller for Lathe.

UNIT-V

5.	Introduction to FMS, GT and Robotics	No. of Lectures–8, Marks : 16
	a	FMS – Introduction, Components of FMS, Types of FMS, Application & Benefits, Planning & implementation issue, Typical FMS layout.
	b	GT – Part families, Part classification & coding, optic coding system, Multiclass coding system, Application of GT.
	c	Robotics – Robot Anatomy, Robot Control System, End effectors, Sensors, Industrial Robot, Application and its selection.

Text Book and Reference Books**Text Book and References Books**

1. Ibrahim Zeid and R. Sivasubramanian - CAD/CAM – Theory and Practice Tata McGraw Hill Publishing Co. 2009
2. Ibraim Zeid, “Mastering CAD/CAM” – Tata McGraw Hill Publishing Co. 2000

3. Chandrupatla T.R. And Belegunda A.D. -Introduction to Finite Elements in Engineering” -Prentice Hall India
4. Segerling L.J. - Applied Finite Elements Analysis” John Wiley and Sons.
5. Rao P.N., Introduction to CAD/CAM Tata McGraw Hill Publishing Co.
6. Groover M.P.-Automation, production systems and computer integrated manufacturing” -Prentice Hall of India
7. Yoram Koren - Robotics McGraw Hill Publishing Co.
8. James G. Keramas, Robot Technology Fundamentals, Delmar Publishers.
9. S.R.Deb, Robotics Technology and Flexible Automation, Tata McGraw Hill.
10. Lakshiminarayana H. V. Finite Element Analysis (Procedures in Engineering), University Press, 2004.
11. Chandrupatla T. R., Finite Element Analysis for Engineering and Technology, University Press, 2009.
12. Seshu P. Text book of Finite Element Analysis, PHI Learning Private Ltd. New Delhi, 2010.
13. P. Radhkrishnan, S. Subramanyam, V. Raju ,”CAD/CAM/CIM” , New Age Publication.
14. Mikell P. Grover, Emory W. Zimmers ,”Computer Aided Design and Manufacturing” , P.H.I.
15. Zeid ,”CAD/CAM” ,T.M.H.
16. B.S.Pabla, M.Adithan ,”CNC Machine “, New Age International(P) Ltd.
17. Rao, Tiwari, Kundra ,”Computer Aided Manufacturing” ,T.M.H.
18. CAD/CAM & AUTOMATION by FarazdakHaidri

Interdisciplinary Elective Course Outline

Operation Research Techniques

ORT

Course Title:

Short Title

Course Code

Branch- Mechanical Engineering

Year-Fourth Year

Course Description: This course introduces under graduate students to imparting knowledge of various decision making techniques.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03

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): Fundamental knowledge about mathematics & statics.

Outline of Content: This course contains:

UNIT-I

1.	Linear Programming	No. of Lectures –9, Marks : 16
	a	Operation Research – An Introductions The history of OR, Definition, Features, of OR, models and modeling in OR, OR approach to problem solving, methods for solving OR models, phases of OR, Advantages of OR study, Shortcomings of OR approach, OR Models in Practice, Applications of OR.
	b	Linear Programming- Introduction, general Stricture of LP model, Assumption of an LP model, Advantages and Limitations of Linear programming, Applications areas of LP, steps of LP Model formulation, Graphical solution methods of LP problem, maximization, minimization, feasible, infeasible and unbounded solution.

UNIT - II

2.	Linear Programming	No. of Lectures –9, Marks : 16
	a	Linear programming – The simplex method Introduction, standard form of an LP problem, simplex algorithm (maximization, minimization case) Degeneracy in simplex problem, unbounded Infeasible solution.
	b	Duality in Linear programming, formulation of dual LPP, Advantages of duality, rules for constructing the Dual from primal, sensitivity Analysis in LP

UNIT - III

3.	Transportation Theory		No. of Lectures –8, Marks : 16
	a	Transportation problem introduction, mathematical model of transportation problem, Algorithm, methods for finding initial solution northwest corner method ,Least cost method, vogels Approximation method, test for optimality steps of MODI method, maximization problem, unbalanced, degeneracy, prohibited transportation Routes problem.	
	b	Assignment problem- introduction, mathematical models of assignment problem, solution method of assignment problem, Hungarian method, maximization case, unbalanced Restrictions on assignment, travelling salesman, problem	

UNIT - IV

4.	Decision Making Theory		No. of Lectures –8, Marks : 16
	a	Decision Theory- Introduction, steps in decision making process types of decision making Environments, Decision tree	
	b	Theory of games- introduction ,Two person Zero sum game, pure strategies, maximin, minimax principles, game with saddle point, mixed strategy games, The principles of dominance ,games without saddle point,algebraic method, arithmetic method, sub game method, Graphical method.	

UNIT-V

5.	Sequencing		No. of Lectures –8, Marks : 16
	a	Replacement and maintenance method- Introduction, types of failure- gradual failure ,sudden failure Replacement of items whose efficiency deteriorates with time, Replacement of items that completely fail, individual replacement policy, Group replacement policy, staffing problem ,failure trees.	
	b	Sequencing problem- Introduction notations, Terminology, and assumptions of sequencing problem, Processing n jobs through two machines, Processing n jobs through three machines, Processing n jobs through four machines, Processing n jobs through five machines	

Text Book and Reference Books

1. Hira , Gupta , "Operation Research
2. Taha , "Operation Research"
3. S.D. Sharma, "Operation Research", Khanna Publication
4. Manohar Mahajan, "Operation Research.
5. J. K. Sharma , "Operation Research, Problem and Solution" , Macmillan
6. N. D. Vohra , "Quantitative Techniques in Management" ,TATA McGraw Hill
7. Ravindran, " Operation Research Principles and Practice ",Wiley India Pvt.Ltd. New Delhi

Interdisciplinary Elective Course Outline

Energy Resources and Technology

ERT

Course Title:

Short Title

Course Code

Branch- Mechanical Engineering

Year-Fourth Year

Course Description: This course provides an introduction to energy systems, renewable energy resources, with a scientific examination of the energy field and an emphasis on alternate energy sources and their technological applications. The course will explore society's present needs and future energy demands and also focus on renewable energy sources and technological aspects of solar, biomass, wind power, geothermal, and nuclear energy conservation methods.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03

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): Fundamental knowledge of Thermodynamics.

Outline of Content: This course contains:

UNIT-I

1.	Energy Overview and Thermal Power Plants	No. of Lectures-9, Marks : 16
	A	Energy Overview: Basics of energy – Types of energy and its utilization – Energy Characteristics – Energy Measures – global energy scenario – India energy scenario – Types of energy and its utilization, Environmental aspects of energy utilization – Public health issues related to environmental Pollution
	B	Overview of Thermal Power Plants, Types of fuels – Coal quality, By products of combustion, Thermal power plant cycle, General layout of modern thermal power plants, Environmental aspects of thermal power plants

UNIT - II

2.	Solar Photovoltaic Energy Conversion	No. of Lectures-9, Marks : 16
	a	Photovoltaic Conversion, Silicon Solar Cells, Photovoltaic Modules, Module efficiency, PV panels and arrays, Solar Photovoltaic Systems (SPS), Solar PV lighting systems, PV Lanterns, Solar water Pumping, PV Roof top technology, Life cycle cost estimates.

UNIT - III

3.	Solar Thermal Energy Conversion	No. of Lectures -8, Marks : 16
	a	Liquid Flat Plate collectors, transmissivity, heat losses and heat loss coefficients, thermal analysis, Concentrating collectors, types, performance analysis of cylindrical parabolic collector.
	b	Solar water heating system, solar cookers, Solar Distillation, Solar Cooling, Solar Ponds, Solar power plants, Concentrated Solar Power Plants.

UNIT - IV

4.	Wind and Nuclear Energy Conversion	No. of Lectures-8, Marks : 16
	a	Wind Energy Conversion-Principles of wind energy conversion, Site selection considerations, Wind, Power plant design, Types of wind power conversion systems, Operation, maintenance and economics.
	b	Nuclear Energy Conversion - Chemical and nuclear equations, Nuclear reactions, Fission and fusion, Energy from fission and fuel burn-up, Radioactivity, Neutron energies, Fission reactor types, Nuclear power plants, Fast breeder reactor and power plants, Production of nuclear fuels.

UNIT-V

5.	Biomass, Geothermal and Ocean Thermal Energy Conversion	No. of Lectures -8, Marks : 16
	A	Energy from biomass - Sources of biomass, Different species, Conversion of biomass into fuels, Energy through fermentation, Pyrolysis, gasification and combustion, Aerobic and anaerobic bio-conversion, Properties of biomass, Biogas plants, Types of plants, Design and operation, Properties and characteristics of biogas.
	B	Geothermal energy – Availability, system development and limitations Ocean thermal energy conversion – Wave and tidal energy – Scope and economics

Text Book and Reference Books

1. K.M. Mittal: Non-conventional Energy Systems-Principles, Progress and Prospects, Wheeler Publications, 1997.
2. Kothari: Renewable Energy Sources and Emerging Technologies, PHI, Eastern Economy Edition, 2012
3. G.N. Tiwari: Solar Energy-Fundamentals, Design, Modelling and Applications, Narosa Publishers, 2002.
4. M.M. E1- Wakil; Power Plant Technology, McGraw Hill, 1985.
5. M.M. E1-Wakil: Nuclear Power Engineering, McGraw Hill, 1962.
6. Mukherjee and Chakrabarti, Fundamentals of Renewable Energy systems, New age International Publishers, 2004.
7. S.P. Sukhatme, Solar Energy: Principles of Thermal Collection and Storage, Tata McGraw Hill, 2003.

Elective-I
Course Outline

Mechatronics

MTX

Course Title:

Short Title

Course Code

Branch- Mechanical Engineering

Year-Fourth Year

Course Description: This course introduces to graduate students the basic mechatronics system components, and the design principles of using mechatronics to meet functionality requirements of products, processes and systems.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03
Practical	02	14	28	01

Examination scheme:

End semester exam (ESE)	80 Marks	Duration: 03 hours
Internal Sessional exam (ISE)	20 Marks	

Prerequisite Course(s): Fundamental knowledge of Electrical and Electronic systems and Drives.

Outline of Content: This course contains:

UNIT-I

1.	Introduction to Mechatronics system		No. of Lectures-9, Marks : 16
	a	Mechatronics system, Modeling and Design, Design concept evolution, Application areas.	
	b	Dynamic Models, Model types, Model Development, Lumped model of a distributed system, Kinetic energy equivalence, Natural frequency equivalence, Analogies to mechanical, electrical, thermal and fluid elements	

UNIT - II

2.	Component Interconnection and Signal Conditioning		No. of Lectures -9, Marks : 16
	a	Introduction to Basic components, need of interconnections, impedance characteristics, resistance, inductors, capacitors, amplifiers.	
	b	Introduction to Analog and digital filters, Analog to Digital and Digital to Analog converters, Bridge circuits (Wheatstone, Maxwell), Signal Analyzers and Display devices.	

UNIT - III

3.	Sensors and Transducers		No. of Lectures -8, Marks : 16
	a	Motion transducers, potentiometer, variable inductance transducers, Permanent magnet transducers, variable capacitance transducers, Piezoelectric Sensors, Effort Sensors, strain gauges, torque sensors, tactile	
	b	Optical sensor and Lasers, Thermo-Fluid Sensors, shaft encoders, optical encoders, Digital tachometer, Hall effect Sensors, Linear encoders, Digital resolvers	

UNIT - IV

4.	Electrical Actuators		No. of Lectures -8, Marks : 16
	a	Stepper motors, construction and Principle of operation, torque motion characteristics, damping, control, selection and applications of stepper motors	
	b	D.C. motors, construction and operations, static torque characteristic, brushless D. C. Motors, control and selection of D.C. Motor	
	c	Induction Motors, construction, working, characteristic, torque speed relationship, Consecution, working and control of synchronous motors.	

UNIT-V

5.	Mechanical Actuators		No. of Lectures -8, Marks : 16
	a	Linear Actuators, Hydraulic and Pneumatic actuators, components of Hydraulic control system	
	b	Pumps, motors, valves, feedback control, constant flow systems, pump controlled hydraulic actuators, pneumatic control system, Flapper valves, and hydraulic circuits.	

Text Book and Reference Books

1. Clarence W de Silva, Mechatronics: An Integrated Approach, CRC Press ISBN 0849312744
2. W Bolton, Mechatronics: A multi-disciplinary approach, Fourth edition, Pearson education ISBN 9788131732533.
3. Boucher, T. O., Computer automation in manufacturing - an Introduction, Chapman and Hall, 1996.
4. HMT ltd. Mechatronics, Tata McGraw-Hill, New Delhi, 1988.
5. Deb, S. R., Robotics technology and flexible automation, Tata McGraw-Hill, New Delhi, 1994.
6. Bolton, W., Mechatronics: electronic control systems in mechanical and electrical engineering, Longman, Singapore, 1999.

Elective-I

Course Outline

Advanced Machine Design

AMD

Course Title:

Short Title

Course Code

Branch- Mechanical Engineering

Year-Fourth Year

Course Description: This course provides a broad treatment of stress, strain, and strength with reference to engineering design and analysis. Major emphasis is placed on the analytical and experimental methods of determination of stresses in relationship to the strength properties of machine elements under various loading conditions. Also considered are deflection, post-yield behavior, residual stresses, thermal stresses, creep, and extreme temperature effects as applied to the design of fasteners, shafts, power trains, and rotational machinery.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03
Practical	02	14	28	01

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): Fundamental knowledge of Theory of Machine, Machine Design.

Outline of Content: This course contains:

UNIT-I

1.	CAMS	No. of Lectures –9, Marks : 16
	a	Advanced curves: 2-3 polynomial, 3-4-5 polynomial, 4-5-6-7 polynomial & higher order polynomial.
	b	Polydyne cams: 3-4-5 cam, cycloidal cam.
	c	Pressure angle, radius of curvature, force on follower and cam, cam design with elasticity of part is considered, ramps.

UNIT - II

2.	Springs	No. of Lectures –9, Marks : 16
	a	Helical springs under static and fatigue or variable loading, buckling of helical compression spring, vibration and surging of helical springs, Optimum design of helical spring.
	b	Design analysis of Belleville springs, ring spring, volute spring, rubber springs and mountings.

UNIT - III

3.	Design Against Fatigue	No. of Lectures –8, Marks : 16
	a	Fatigue Damage theories, Cycle counting Techniques, Stress based fatigue Analysis & design: one dimensional analysis, multiaxial analysis, and Cumulative damage.
	b	Strain based fatigue Analysis & design: one dimensional analysis, multiaxial analysis .Surface integrity & fatigue life improvement.

UNIT - IV

4.	System Approach	No. of Lectures –8, Marks : 16
	a	Introduction, System approach to design mathematical model, Dynamic response to a distributed system, Dynamic response to a lumped system
	b	Modeling the elasticity's, Modeling the masses, Modeling the inertia, Modeling friction and damping
	c	Mathematical model for shock analysis, Cam system, Value engineering approach to design problem.

UNIT-V

5.	Optimum Design	No. of Lectures –8, Marks : 16
	a	Introduction to optimum design, Adequate design, Johnson's method of optimum design.
	b	Case of normal specifications, Case of redundant specifications, Case of incompatible specifications.

Text Book and 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. FarazdakHaideri ,” Machine Design”, Nirali Prakashan.
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

Elective-I
Course Outline

Machine Tool Design

MTD

Course Title:

Short Title

Course Code

Branch- Mechanical Engineering

Year-Fourth Year

Course Description: The course aim of imparting the knowledge of Machine tool Design the background required include a knowledge of Mathematics, Engineering materials, Theory of Machines, Engineering Mechanics.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03
Practical	02	14	28	01

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): Fundamental knowledge of Workshop Practice, Manufacturing Process.

Outline of Content: This course contains:

UNIT-I

1.	Principles of Machine Tool Design and Drives No. of Lectures-9, Marks : 16	
	a	Introduction – Machine tools, classification. Working and auxiliary motion in machine tools.
	b	Mechanical and Hydraulic transmission elements.
	c	Devices for Intermittent motion. Reversing and differential mechanism.
	d	General requirement of machine tool design. Engineering Design process applied to machine tools.
	e	Machine tool drive – Types of speed and feed regulation, classification of speed and feed boxes.
	f	Design of speed box - Stepped regulation of speed, selection of range ratio, geometric progression, structural diagram.
	g	Design of feed box in details.
	h	Development of gearing diagram.

UNIT - II

2.	Design of machine tool structure	No. of Lectures–9, Marks : 16
	a	Function of machine tool, structure and their requirements, design criteria for machine tool structure.
	b	Materials and its properties, dynamic and static stiffness.
	c	Profile of machine tool structure, factors affecting on the stiffness of machine tool structures.
	d	Basic design procedure machine tool structure.
	e	Design of beds and columns.
	f	Design of Housing, Design of bases and tables.
	g	Design of Cross rails, arms, saddle and carriages.
	h	Design of Rams.

UNIT - III

3.	Design of Guide ways and power Screws	No. of Lectures–8, Marks : 16
	a	Function and types of Guide ways, types of slide ways and types of anti friction ways.
	b	Design of slide ways – Shapes, materials, method of adjusting clearance in slide ways.
	c	Design criteria and calculation for slide ways – (i) for wear (ii) for stiffness
	d	Guide ways operating under liquid friction conditions – (i) hydrodynamic slide ways (ii) Hydrostatic slide ways
	e	Design of Aerostatic and anti-friction guide ways.
	f	Combination guide ways and protecting devices for slide ways.
	g	Design of Power screw – (i) Design of sliding friction power screw
	h	(ii) Design of rolling friction power screw.

UNIT - IV

4.	Design of Spindles and Spindle supports.	No. of Lectures–8, Marks :
	a	Function of spindle unit and requirement, material of spindle
	b	Effect of machine tool compliance on machinery accuracy.
	c	Design calculation of spindles – Deflection of spindle axes due to bending and compliance of spindle support. Optimum spacing between spindle support.
	d	Deflection due to compliance of tapered joint permissible deflection and design for stiffness.
	e	Anti-friction bearings and sliding bearings.
	f	Dynamics of machine tools – Forced vibration in machine tools.

	g	Dynamic characteristics of machine elements
	h	Stability analysis – Static and dynamic cutting processes, characteristics. Regenerative chatter.

UNIT-V

5.	Control System in Machine tools and Industrial Robots. No. of Lectures–8, Marks : 16	
	a	Function, requirements and classification, control system for changing speeds and feed with simple centralized control
	b	Control system for changing speeds and feed with pre-selective control Control system for changing speeds and feed with Selective control
	c	Control system for executing and forming auxiliary motion. Manual control system.
	d	Automatic control system and adaptive control system.
	e	Industrial robot and its application.- Introduction and basic function of robotic elements, mobility of robot.
	f	Reliability in operation and various control system in robots.
	g	Robot language – Robot language outline, general description of programming language. Real time, geometric modeling, movements.
	h	Sensors, tools, programming ARL, HARL, AL, VAL, AML, IRL, LM and MCL.

Text Book and Reference Books

1. D. K Pal, S. K. Basu, "Design of Machine Tool", 4th Edition. Oxford IBH 2005, ISBN 81-204-0968.
2. F. Koenigsberger, "Design Principles of Metal Cutting Machine Tools", The Macmillan Company New York 1964.
3. Bhattacharya and S. G. Sen., "Principles of Machine Tool", New central book agency Calcutta, ISBN 81-7381-1555.
4. N. S. Acherkan, "Machine Tool", Vol. I, II, III and IV, MIR publications.
5. N.K. Mehta, "Machine Tool Design", Tata McGraw Hill, ISBN 0-07-451775-9.
6. DR. V. P. Singh, "Mechanical Vibration", S. Chand & Sons., New Delhi.

Elective-I

Course Outline

Automobile Engineering I

AE-I

Course Title:

Short Title

Course Code

Branch- Mechanical Engineering

Year-Fourth Year

Course Description: The course aim of imparting the knowledge of different parts uses in automobile, the background required include knowledge of Engineering materials, IC engine.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03
Practical	02	14	28	01

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): Fundamental knowledge of IC engine, Theory of Machine.

Outline of Content: This course contains:

UNIT-I

1.	Introduction to Automobile		No. of Lectures –9, Marks : 16
	a	Introduction to Automobile, History of Automobile, Types of Automobile, Automobile Industry	
	b	Special Purpose Vehicle, Chassis, Classification of Chassis, Integral and Chassis less Construction	
	c	Frame, Function s of the frame, Types of the Frame, Defects in Frame, Sub Frame, Body	
	d	Introduction to Safety System, Seat Belt System, Power Seats, Air Bag System, Electric Mirrors, Central Locking and Electric Window, Electric Horns, Windscreen Wiper System, Analog and Digital Speedometer	

UNIT - II

2.	Automobile Suspension	No. of Lectures –9, Marks : 16
	a	Introduction, Function of Suspension system, Requirements of a Suspension System, Torque Rod
	b	Stabilizer Bar, Air Suspension, Hydraulic Suspension
	c	Types of Suspension Spring, Plastic springs for motor cars, Shackle, Shock Absorber
	d	Front Axle Suspension System, Rear Suspension System, Spring and Suspension trouble shooting chart

UNIT - III

3.	Automobile Steering	No. of Lectures –8, Marks : 16
	a	Introduction, Principle of Correct Steering, Requirements of steering system, Steering system functions
	b	General arrangement of steering system, Steering gears and linkages
	c	Power steering, Reversible and irreversible steering, Factor Affecting under-steering and over-steering
	d	Steering Gear, Steering gear ratio, Turning radius, Wheel alignment, Caster and Camber angle, Toe-in Toe-out, Steering Trouble and Causes, Factor Affecting the Steering Operation

UNIT - IV

4.	Automobile Wheels, Tyres and Tubes	No. of Lectures–8, Marks :
	a	Introduction, Wheel Assembly, Wheel and Tyre Sizes, Types of wheels, Wheels balance, Rims
	b	Tyres, Types of tyres, Tyres Construction and Constituents, Tyres thread Patterns, Load Ratings
	c	Tyres Selections and Tyre Properties, Tyres Pressure and wear, Causes of Tyre Wear, Tyre size, Tyres maintenance, Factors increase life of tyres
	d	Tubes , Types of Tubes, Wheels and tyre troubles

UNIT-V

5.	Automobile Transmission (Gear Box & Clutch)	No. of Lectures–8, Marks : 16
	a	Introduction, Purpose of Transmission, Types of Transmission, Gear-boxes with different speed gear, Three speed and Four speed Gear-box, Gear shifting, Gear box troubles Lubrication of gear box
	b	Introduction., Clutch and its functions, Principles of Operations, Requirement of Clutch, Main Parts of clutch, Types of friction materials, Properties of good clutch lining, Types of clutches, Clutch Maintenance, Clutch troubles and their causes Factors Affecting the Power Transmitted by the Clutch, Propeller Shaft, Universal Joint, Rear Axle

Text Book and Reference Books

1. Automobile Engineering Vol. 1 & 2 by Dr. Kripal Singh, (Standard Publishers Distributors)
2. A textbook of Automobile Engineering I & II by P. S. Gill, (S. K. Kataria& Son's).
3. Automobile Engineering by R. B. Gupta, (SatyaPrakashan).
4. Automobile Engineering by Dr. V. M. Domkundwar, (DhanpatRai&Company).
5. A textbook of Automobile Engineering by R. K. Rajput, (Laxmi Publication Pvt. Ltd.).
6. Automobile Engineering by K. M. Moeed, (S. K. Kataria& Son's).
7. Automobile Engineering by Dr. A. K. Basu, (S. Chand Company Pvt. Ltd.).

Course Outline

Operation Research

OR

Course Title:

Short Title

Course Code

Branch- Mechanical Engineering

Year-Fourth Year

Course Description: This course introduces under graduate students to imparting knowledge of various decision making techniques.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03

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): Fundamental knowledge about mathematics & statics.

Outline of Content: This course contains:

UNIT-I

1.	Linear Programming	No. of Lectures –9, Marks : 16
	a	Operation Research – An Introductions The history of OR, Definition, Features, of OR, models and modeling in OR, OR approach to problem solving, methods for solving OR models, phases of OR, Advantages of OR study, Shortcomings of OR approach, OR Models in Practice, Applications of OR.
	b	Linear Programming- Applications and model formulation, Introduction, general Stricture of LP model, Assumption of an LP model, Advantages and Limitations of Linear programming, Applications areas of LP, steps of LP Model formulation, Graphical solution methods of LP problem, maximization, minimization, feasible, infeasible and unbounded solution.

UNIT - II

2.	Linear Programming		No. of Lectures –9, Marks : 16
	a	Linear programming – The simplex method Introduction, standard form of an LP problem, simplex algorithm (maximization, minimisation case) Degeneracy in simplex problem, unbounded Infeasible solution.	
	b	Duality in Linear programming, formulation of dual LPP, Advantages of duality, rules for constructing the Dual from primal, sensitivity Analysis in LP	

UNIT - III

3.	Transportation Theory		No. of Lectures –8, Marks : 16
	a	Transportation problem introduction, mathematical model of transportation problem, Algorithm, methods for finding initial solution northwest corner method ,Least cost method, vogels Approximation method, test for optimality steps of MODI method, maximization problem, unbalanced, degeneracy, prohibited transportation Routes problem.	
	b	Assignment problem- introduction, mathematical models of assignment problem, solution method of assignment problem, Hungarian method, maximization case, unbalanced Restrictions on assignment, travelling salesman, problem	

UNIT - IV

4.	Decision Making Theory		No. of Lectures –8, Marks : 16
	a	Decision Theory- Introduction, steps in decision making process types of decision making Environments, Decision tree	
	b	Theory of games- introduction ,Two person Zero sum game, pure strategies, maximin, minimax principles, game with saddle point, mixed strategy games, The principles of dominance ,games without saddle point,algebraic method, arithmetic method, sub game method, Graphical method.	

UNIT-V

5.	Sequencing		No. of Lectures –8, Marks : 16
	a	Replacement and maintenance method- Introduction, types of failure- gradual failure ,sudden failure Replacement of items whose efficiency deteriorates with time, Replacement of items that completely fail, individual replacement policy, Group replacement policy, staffing problem ,failure trees.	
	b	Sequencing problem- Introduction notations, Terminology, and assumptions of sequencing problem, Processing n jobs through two machines, Processing n jobs through three machines, Processing n jobs through four machines, Processing n jobs through five machines	

Text Book and Reference 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. ManoharMahajan, "Operation Research.
6. J. K. Sharma , "Operation Research, Problem and Solution" , Macmillan
7. N. D. Vohra , "Quantitative Techniques in Management" , TATA McGraw Hill.
8. Ravindran, " Operation Research Principles and Practice ", Wiley India Pvt. Ltd. New Delhi

Lab Course Outline

Computer Aided Design & Computer Aided Manufacturing CAD/CAM LAB

Course Title : Short Title Course Code

Branch- Mechanical Engineering

Year-Fourth Year

Course Description: The course presents the elements of solid modeling, creation of parts of increasing complexity and the assembly of parts to form a final design, along with mechanism simulation.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation scheme:

Internal Continuous Assessment (ICA) 25Marks 50Marks

End Semester exam (ESE) (OR) 25Marks

Prerequisite Course(s): Basic knowledge about of Engineering Drawing, Computer Graphics, SOM, Design & Manufacturing.

Outline of Content: This course contains:

A. Introduction to Modeling (Using any CAD software).

1. 2D drawing using sketcher- 2 Drawings 2 Hrs.
2. 3D modeling using 3D features (Modeling of Screw jack, Brake Pedal, Clutch, Steering linkages, Carburetor, F.I.P., *any four components*)
3. Assembling and drafting (Any 2 above mentioned assemblies) with proper mating conditions and interference checking.
4. Surface Modeling (Any 2 of the above assemblies). 4 Hrs.

B. Computer Aided Manufacturing

1. Manual Part programming on CNC Lathe and CNC Milling to generate tool Path, NC Code and optimization of tool path (to reduce machining time) Using any cam software. 4 Hrs.

Note : Oral will be based on the prescribed term-work presented in the form of certified journal.

Lab Course Outline

Refrigeration and Air Conditioning

RAC LAB

Course Title :

Short Title

Course Code

Branch- Mechanical Engineering

Year-Fourth Year

Course Description: This course Familiarize under graduate students with the terminologies associated with refrigeration & air conditioning, basic principles of psychrometry and applied psychometrics, refrigerants; vapor compression refrigeration and multi-stage vapor compression systems, components of vapor compression systems and other types of cooling systems.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation scheme:

Internal Continuous Assessment (ICA) 25Marks 50Marks

End Semester exam (ESE) (Practical) 25Marks

Prerequisite Course(s):Basic knowledge of Engineering Thermodynamics, Applied Thermodynamic, and Heat Transfer.

Outline of Content: This course contains:

- 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 : Lab file should contain any eight experiments out of the above to be performed with minimum three trials.

ESE (Practical Examination)

The Practical Examination will comprise of performing the experiment and viva on the Practical's.

Instructions for practical Exam.:-

1. Four experiments should be selected for Practical Examination.
2. The Number of Students for each Practical setup 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

**Lab Course Outline
Elective- I**

Mechatronics

MTX LAB

Course Title :

Short Title

Course Code

Branch- Mechanical Engineering Year-Fourth Year

Course Description: This course introduces to graduate students the basic mechatronics system components, and the design principles of using mechatronics to meet functionality requirements of products, processes and systems.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation scheme:

Internal Continuous Assessment (ICA)	25Marks	50Marks
End Semester exam (ESE) (OR)	25Marks	

Prerequisite Course(s): Basic knowledge of Electrical and Electronic systems and Drives.

Outline of Content: This course contains 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 certified journal.

**Lab Course Outline
Elective- I**

Advanced Machine Design

AMD LAB

Course Title :

Short Title

Course Code

Branch- Mechanical Engineering Year-Fourth Year

Course Description: This course provides a broad treatment of stress, strain, and strength with reference to engineering design and analysis. It consist study of deflection, post-yield behavior, residual stresses, thermal stresses, creep, and extreme temperature effects as applied to the design of fasteners, shafts, and rotational machinery.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation scheme:

Internal Continuous Assessment (ICA) 25Marks 50Marks

End Semester exam (ESE) (OR) 25Marks

Prerequisite Course(s): Fundamental knowledge of Theory of Machine, Machine Design.

Outline of Content: This course contains:

Term work shall consist of two assignments, two drawing sheets and two design software based problems based on above syllabus.

**Lab Course Outline
Elective- I**

Machine Tool Design

MTD LAB

Course Title :

Short Title

Course Code

Branch- Mechanical Engineering Year-Fourth Year

Course Description: The course aim of imparting the knowledge of Machine tool Design the background required include a knowledge of Mathematics, Engineering materials, Theory of Machines, Engineering Mechanics.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation scheme:

Internal Continuous Assessment (ICA) 25Marks 50Marks

End Semester exam (ESE) (OR) 25Marks

Prerequisite Course(s): Basic knowledge of Workshop Practice, Manufacturing Process, Gear Design.

Outline of Content: This course contains:

Term work shall consist of minimum five assignments and drawing sheet based on above syllabus covering all units.

Lab Course Outline Elective- I

Automobile Engineering – I

AE-I LAB

Course Title :

Short Title

Course Code

Branch- Mechanical Engineering Year- Fourth Year

Course Description: The course aim of imparting the knowledge of different parts uses in automobile, the background required include knowledge of Engineering materials, IC engine.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation scheme:

Internal Continuous Assessment (ICA) 25Marks 50Marks

End Semester exam (ESE) (OR) 25Marks

Prerequisite Course(s): Basic Knowledge of Engines, Working of Brakes and Clutches.

Outline of Content: This course contains:

1. Study of layout of a chassis and its different components of a vehicle.
2. To study model trends in automobile.
3. Study of trouble shooting in various suspension systems.
4. Study of trouble shooting in power steering.
5. Measurement of steering geometry angle for wheels alignment.
6. Study of impact on steering geometry angle of vehicle.
7. Study of different types of tyres, tubes and their defects.
8. Visit to wheel balancing and alignment center.

Term work consists of minimum six practical's from above list.

Course Title
Project-I

Short Title
P-I

Course Code

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	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. 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.

Project-I
(Lab Course Contents)

Semester-VII

Teaching Scheme:

Practical: 2 Hrs/Week

Examination Scheme:

(ICA) Internal Continuous Assessment: 25 Marks

(ESE) End Semester Examination (OR): 25Marks

- It is expected that the broad area of Project-I shall be finalized by the student in the beginning of the VII semester / extension of Minor project undertaken may be Project-I.
- A group of Minimum 3 and Maximum 5 students shall be allotted for Project-I and same project group for Project-II.
- Exhaustive survey of literature based on a clear definition of the scope and focus of the topic should be carried out by the students. The **Synopsis/Abstract** on the selected topic, after detail literature survey should be submitted to the Project coordinator appointed by Head of the department.
- Project-I may involve literature survey, problem identification, work methodology preparing specification and material procurement, collection of data, conduction of experiments and analysis. The project work shall involve sufficient work so that students get acquainted with different aspects of fabrication, design or analysis.
- Approximately more than 50% work should be completed by the end of VII semester.
- Each student group is required to maintain log book for documenting various activities of Project-I and submit group project report in the form of thermal bound at the end of semester –VII. Submit the progress report in following format:
 - a. *Title*
 - b. *Abstract*
 - c. *Introduction*
 - d. *Problem identification and project objectives*
 - e. *Literature survey*
 - f. *Case study/Analysis/Design Methodology*
 - g. *Work to be completed (Progress status)*
 - h. *Expected result and conclusion*
 - i. *References.*
- Evaluation Committee comprising of the Guide, Project Coordinator and Expert appointed by the Head of the department will award the marks based on the work completed by the end of semester and the presentation based on the project work.

Guide lines for ICA : The Internal Continuous Assessment shall be based on the active participation of the students in the Project work and knowledge / skill acquired. Assessment of the project-I for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-A**.

Guide lines for ESE: The End Semester Examination for Project shall consist of demonstration if any, presentation and oral examinations based on the project report.

Assessment of Project-I

Name of the Project: _____

Name of the Guide: _____

Table-A

S N	Name of Student	Problem Identification and project objectives	Literatur e Survey	Project Methodology/Design/PC B/ hardware/ simulation/ programming	Progres s Status	Presentatio n	Tota l
		5	5	5	5	5	25

Course Description: The course explores the knowledge of presentation and effective communication. 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 Seminar –II are to develop ability express our view, presentation and effective communication. The scope of seminar-II is study various national and international journal for design, experiments conduct, as well as to analyze and interpret data within realistic constrain such as economic, environmental, social, safety and manufacturability.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Understand literature survey for selection of seminar topics.
2. Apply knowledge of mathematics, science, and engineering for effective presentation of selected topic.
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. Practice the use of various resources to locate and extract information using offline & online tools, journals.
7. Practice the preparation and presentation of scientific papers and seminars in an exhaustive manner.

Seminar-II
(Course Contents)

Semester-VII

Teaching Scheme:

Practical: 2 Hrs/Week

Examination Scheme:

(ICA) Internal Continuous Assessment: 25 Marks

1. Each Student shall select a topic for seminar which is not covered in curriculum. Seminar topic should not be repeated and registration of the same shall be done on first come first serve basis.
2. Topic of Seminar shall be registered within a three weeks from commencement of VII Semester and shall be approved by the committee.
3. The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Seminar-II. Seminar shall be related state of the art topic of his choice approved by the committee.
4. Each student should deliver a seminar in scheduled period (Specified in time table or time framed by department) and submit the seminar report (paper bound copy/Thermal bound) in following format:
 - a. Title
 - b. Abstract
 - c. Introduction
 - d. Literature survey
 - e. Concept
 - f. Functional and Technical Details
 - g. Applications
 - h. Comparison with similar topics / methods
 - i. Future scope
 - j. References

ASSESSMENT OF SEMINAR-II

Guide lines for ICA: ICA shall be based on topic selection, presentation and Seminar-II report submitted by the student in the form of thermal bound. Assessment of the Seminar-II for award of ICA marks shall be done jointly by the guide and a departmental committee, as per the guidelines given in **Table- B**

Name of Guide: _____

Table-B

SN	Name of Student	Seminar Topic	Topic Selection	Literature survey	Report writing	Depth of understanding	Presentation	Total
			5	5	5	5	5	25

Course Description: The course explores the knowledge industry organization, new trends in manufacturing, maintenance and safety. The industrial visit provides the practical visualization of theoretical study of various engineering subject.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Practical	-	-	-	1

General Objectives: The main objective behind these visits is to explain the working of industrial equipments in running conditions to the students and tell them about the expectations of the industrialists from the fresh engineers.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Understand organizational set up of an industry.
2. Develop our self for expectations of the industrialists from the fresh engineers.
3. Understand manufacturing, material handling, maintenance, safety standard and environmental consideration in industry.
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.

Industrial Visit (Course Contents)

Semester-VII
Teaching Scheme:

Examination Scheme:
(ICA) Internal Continuous Assessment: 25 Marks

1. Industry visits to minimum two industries shall be carried out by each student preferably or college shall arrange the industrial visit during the vacation period otherwise during the regular VII semester.
2. The student should obtain appropriate certificates of visit from the concerned organizations just after the visits.
3. Every Student should submit Industrial Visit report individually at the end of Semester-VII (First Term of Final Year)
4. The report (Thermal Bound) 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 three teachers appointed by Head of the department based on following points:

Guide lines for ICA : ICA shall be based on knowledge gain by student and Industrial Visit Report submitted by the student in the form of Thermal bound. Assessment of the Industrial Visit for award of ICA marks shall be done jointly by industrial visit coordinators departmental committee based on viva - voce as per the guidelines given in **Table- C**

Table-C

SN	Name of Student	Name of Industry	Report writing	Depth of Understanding	Total
			15	10	25

**NORTH MAHARASHTRA UNIVERSITY,
JALGAON (M.S.)**

Syllabus for

Final Year Mechanical Engineering

Faculty of Engineering and Technology



Course Outline

SEMESTER –VIII

W.E.F 2015 – 2016

Course Outline

Mechanical Vibration

MV

Course Title:

Short Title

Course Code

Branch- Mechanical Engineering

Year-Fourth Year

Course Description: This course introduces undergraduate students to Mechanical Vibration. The background required includes a sound knowledge of Mathematics (Calculus), Engineering Mechanics, Strength of materials and Theory of mechanics of second year and Third year Level. The course aims at imparting knowledge of Mechanical vibration.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03
Practical	02	14	28	01

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 strength of Materials, Theory of Machines at Second year Level.

Outline of Content: This course contains:

UNIT-I

1.		Fundamental of Vibrations & Undamped Free Vibrations No. of Lectures- 9, Marks : 16
	a	Fundamental of Vibrations :- Introduction, Definitions, Vector method of representing harmonic motions, Addition of two simple harmonic motions of the same frequency, Beat phenomenon.
	b	Complex method of representing harmonic vibrations, Work done by a harmonic force on a harmonic motion.
	c	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

2.		Damped Free & Forced Vibrations of Single Degree of Freedom Systems No. of Lectures– 9, Marks : 16
	a	Damped Free Vibrations of Single Degree of Freedom Systems: - Introduction, Different types of dampings, Free vibrations with viscous damping, Logarithmic decrement.
	b	Viscous dampers, Dry friction or coulomb damping, Solid or structural damping, Slip or interfacial damping.
	c	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.
	d	Energy dissipated by damping, Forced vibrations with coulomb damping, Forced vibrations with structural damping, Vibration isolation and transmissibility.

UNIT-III

3.		Two Degree of Freedom Systems No. of Lectures–8, Marks : 16
	a	Introduction, Principal modes of vibration, Other cases of simple two degree of freedom systems, Combined rectilinear and angular modes.
	b	Undamped forced vibrations with harmonic excitation, Vibration absorbers.
	c	Critical speed of shaft- Introduction, critical speed of light shaft having single disc without damping, critical speed of light shaft having single disc with damping

UNIT-IV

4.		Multi Degree of Freedom Systems Exact Analysis & Numerical Methods No. of Lectures – 8, Marks : 16
	a	Multi Degree of Freedom Systems Exact Analysis: - Introduction, Free vibrations equations of motion, Influence coefficients, Generalized coordinates and coordinate coupling.
	b	Natural frequencies and mode shapes, Forced vibrations by Newton's second law of motion, Torsion vibrations of multi-rotor systems.
	c	Multi Degree of Freedom Systems Numerical Methods: - Introduction, Rayleigh's method, Dunkerley's method, Stodola's method.

UNIT-V

5.		Continuous Systems & Non-Linear Vibrations. No. of Lectures– 8, Marks : 16
	a	Continuous Systems: - Vibrations of strings, Longitudinal vibrations of bars, Torsional vibrations of circular shafts, Lateral vibrations of beams.
	b	Non-Linear Vibrations: - Introduction, Examples of non-linear systems, Phase plane, Undamped free vibration with nonlinear spring forces.
	c	Perturbation method, Forced vibration with non-linear spring forces, Self excited vibrations.

Text Book and Reference Books

1. Dilip Kumar Adhwarjee "Theory and Applications of Mechanical Vibrations" Laxmi Publications (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’sOut 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.
9. Sadhu singh“ Mechanical vibration & Noise control” published by Khanna Publisher New delhi.

Course Outline

Finite Element Analysis and Simulation Techniques

FEAST

Course Title:

Short Title Course Code

Branch- Mechanical Engineering

Year-Fourth Year

Course Description: This course introduces undergraduate students to Finite Element Analysis and Simulation Technique. The background required includes a sound knowledge of Mathematics, Strength of materials and Machine Design. The course aims at imparting knowledge of Finite Element Analysis and Simulation Technique.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03
Practical	02	14	28	01

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, Computational Methods, Design, Vibration, SOM etc.

Outline of Content: This course contains:

UNIT-I

1.		Introduction to FEA No. of Lectures –9, Marks : 16
	a	Introductory Concepts: Introduction to FEM , Discretization going from part to whole approach, Physical problem, mathematical models and finite element solution, FEA as a integral part of CAD. FEM Software's - Preprocessing, processing and post processing. Advantages and disadvantages of FEM.
	b	Conventional Numerical Methods- Finite difference method, weighted residual techniques, method of Least squares, Galerkin methods, Rayleigh-Ritz method, and Boundary Value problems, Displacement methods, equilibrium method.
	c	Finite Elements Types: One dimensional element such as two noded & three noded Spar or truss element. Two and three dimensional elements, triangular, rectangular quadrilateral.

UNIT-II

2.		One-Dimensional Analysis No. of Lectures -9, Marks : 16
	a	Discretization. Derivation of Shape functions, interpolation function, Stiffness matrices, global stiffness matrix, application of boundary, and force vectors.
	b	Assembly of Matrices - solution of problems in one dimensional structural analysis, Stepped and Taper Bars, Torsion of circular shaft, thin valve tubes steady state heat conduction & convection, laminar pipe flow.
	c	FEM direct approach elements stiffness, potential energy approach, treatment of boundary conditions, temperature effects.
	d	Analysis of Plane Trusses, Analysis of Beams.

UNIT-III

3.		Two-Dimensional Analysis No. of Lectures - 8, Marks : 16
	a	Introduction. Finite element analysis for two dimensional problems.
	b	Natural coordinates and coordinates transformations, Derivation of shape functions for triangular element.
	c	Application of heat transfer, analysis of structural vibration. Finite element formation of beams.

UNIT-IV

4.		Two Dimensional Vector analysis No. of Lectures- 8, Marks : 16
	a	Equations of elasticity – Plane stress, plane strain problems.
	b	Automatic mesh generation and imposition, Eigen value problems.
	c	Jacobian matrix, stress analysis of CST element.
	d	Applications to free vibration problems of rod and beam. Lumped and consistent mass matrices.

UNIT-V

5.		Simulation Theory and Application No. of Lectures- 8, Marks : 16
	a	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.
	b	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.

Text Book and Reference 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, McGraw hill publication 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

Elective- II Course Outline

Tribology

TRB

Course Title:

Short Title

Course Code

Branch- Mechanical Engineering

Year-Fourth Year

Course Description: The course aim of imparting the knowledge of Tribology. The background required includes knowledge of mathematics, chemistry, engineering materials, fluid mechanics. The objective of the course is to understand the tribological concept, bearing design and its application, lubrication practices.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03
Practical	02	14	28	01

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): Fundamental Knowledge of Physics, Chemistry, Engineering Maths, Fluid Mechanics, Machine Design and Engineering materials.

Outline of Content: This course contains:

UNIT-I

1.	Introduction to Tribology and friction and Wear No. of Lectures-9, Marks : 16	
	a	Introduction and scope, Tribology in design
	b	Tribology in Industry, Economical considerations.
	c	Friction of metals, kinds and measurements of frictions, stick slip oscillation (Vibration) and its elimination
	d	Theories of friction, frictional heating.
	e	Wear- Mechanism of wear, types of wear, measurement of wear (wear testing and wear debris analysis)
	f	Theory of wear, factor affecting on wear rate.

UNIT - II

2.	Lubrication and Hydrostatic bearings	No. of Lectures-9, Marks : 16
	a	Construction, operation, Advantages, Limitations and Application of Hydrostatic Bearing (Circular Step bearing)
	b	Flow rate and pressure distribution, Load carrying capacity and film thickness, Power losses and temperature rises in Hydrostatic Step bearing.
	c	Optimum design of hydrostatic step bearing,

UNIT - III

3.	Hydrodynamic Journal Bearing	No. of Lectures-8, Marks : 16
	a	Theory of hydrodynamic lubrication, Mechanism of Pressure development in oil film.
	b	Two dimensional Reynold Equation, (i) By Direct method (ii) By Navier's Stokes equation
	c	Infinitely long Journal Bearing, Infinitely short Journal bearing
	d	Finite length Journal bearing. Design consideration in hydrodynamic Journal bearing.
	e	Relations of variable (Raimondi & Boyd). Dimensionless parameters. Temperature rises and Heat Balance, Pettrof equation.
	f	Selection of bearing design parameters. Numerical on infinitely long bearing.

UNIT - IV

4.	Hydrodynamic Thrust Bearing and Elastohydrodynamic lubrication.	No. of Lectures-8, Marks : 16
	a	Introduction and analysis of flat pad thrust bearing (tapered pad thrust bearing)
	b	Analysis of tilting pad thrust bearing and taper land fixed pad bearing
	c	Analysis of Reynold step thrust bearing, spring mounted thrust bearing
	d	Hydrodynamic pocket thrust bearing, quantity of oil flow with circumferential groove and hole.
	e	Elastohydrodynamic lubrication, basic concept, hydrodynamic equation, Hertz equation for pressure and deformation.
	f	Ertel-Grubin equation. Application of Elastohydrodynamic lubrication.

UNIT-V

5.	Hydrostatic Squeeze film and gas lubrication.	No. of Lectures-8, Marks :
	a	Introduction, Practical Situation of Hydrostatic squeeze film lubrication. Analysis for a circular plate approaching a plane.

	b	Analysis for a approximation of square plate by using a circular plate. Analysis for rectangular plate approaching a plane.
	c	Gas Lubrication – Introduction, requirements, merits, demerits and application, Reynold Equation for a gas lubrication.
	d	Tilting pad air bearing, magnetic recording disc with flying head, porous gas bearings.
	e	Seals – Classification, functions and application in detail.

Text Book and Reference Books

1. Stolarski T.A., “Tribology of Machine Design”, Butterworth Heinemann, Oxford, 2000.
2. Bowden F.P. and Tobor D., “Friction and Lubrication of Solids”, Clarendon Press, Oxford, 1986.
3. B. C. Majumdar “Introduction Tribology and Bearings”, H. Wheeler and Company Pvt. Ltd.
4. Fuller D. D., “Theory and Practice of Lubrication for Engineers”. John Wiley and Sons.
5. Cameron A. “Basic Lubrication Theory, Wiley Eastern Ltd.
6. Hrassan & Powel, “Gas Bearing”.
7. Halling J. “Principles of Tribology”, McMillan Press Ltd.
8. Bharat Bhushan and Gupta B.K., “Handbook of Tribology”, McGraw Hill, New Delhi, 1991

Elective- II Course Outline

Power Plant Engineering

PPE

Course Title:

Short Title

Course Code

Branch- Mechanical Engineering

Year-Fourth Year

Course

Description: To understand the various components, operations and applications of different types of power plants.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03
Practical	02	14	28	01

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): Fundamental knowledge of Engineering Thermodynamic, Turbo Machinery.

Outline of Content: This course contains:

UNIT-I

1.		Thermal Power Plants	No. of Lectures –9, Marks : 16
	a	Thermal power stations. Main components and working of power stations, thermodynamics cycles, fuel handling, combustion and combustion equipment, problem of ash disposal, circulating water schemes and supply of makeup water.	
	b	Choice of pressure of steam generation and steam temperature, selection of appropriate vacuum economizer, air pre-heater, feed water heaters and dust collection. Characteristics of turbo alternators, steam power plant, heat balance and efficiency.	
	c	Boilers and steam generation, general classification, fire tube and water tube boilers, natural circulation and forced circulation boilers, high pressure, high temperature boilers, supercritical pressure boilers, boiler mounting and accessories, feed pumps, economizers, super heaters, air pre-heaters; boiler furnaces, heat generation rates, water walls.	

UNIT-II

2.		Diesel and Gas turbine Power Plant	No. of Lectures-9, Marks : 16
	a	Diesel power plants: Diesel engine performance and operation, plant layout, log sheets, selections of engine size.	
	b	Gas turbine plants: Plant layout, methods of improving output and performance fuel and fuel systems, methods of testing, open and closed cycle plants, operating characteristics	

UNIT- III

3.		Hydroelectric and Nuclear Power Plant	No. of Lectures-8, Marks : 16
	a	Hydroelectric plants: Penstocks, water turbines, specific speed, turbine governors, hydro-plant auxiliaries, plant layout, automatic and remote control of hydroplants, pumped projects, cost of hydroelectric project.	
	b	Nuclear power plants: Elements of nuclear power plants, nuclear reactor fuel moderators, coolants, control.	
	c	Fusion energy: Control through fusion of hydrogen and helium. Energy release rates-present status and problems. Future possibilities.	

UNIT- IV

4.		Renewable Energy Power Plant	No. of Lectures-8, Marks : 16
	a	Basic bio-conversion mechanism; source of waste; simple digester; composition and calorific values of bio-gas.	
	b	Wind energy generation; Special characteristics; Turbine parameters and optimum operation; Electrical power generation from wind/tidal energy.	
	c	Ocean thermal energy conversion; Geothermal energy-hot springs and steam injection; Power plant based on OTEC and geothermal springs.	

UNIT-V

5.		Solar Energy Power Plant	No. of Lectures -8, Marks : 16
	a	Energy from the sun: Techniques of collection; Storage and utilisation; Types of solar collectors; Selective surfaces; Solar thermal processes; Heating; Cooling; Drying; Power generation, etc.	
	b	Direct energy conversion methods: Photoelectric, thermoelectric, thermionic, MHD (magneto-hydrodynamics) and electro-chemical devices; Solar cells, Solar Concentrators	

Text Book and Reference Books

1. Domkundwar and Arora "Power Plant Engineering", Dhanpat Rai and 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.
5. R. Yadav - Steam and Gas turbines, central publishing house, Allahabad
6. G. D. Rai Non conventional energy sources,

Elective- II Course Outline

Process Equipment Design

PED

Course Title:

Short Title

Course Code

**Branch- Mechanical Engineering
Year**

Year-Fourth

Course Description: The student should have basic understanding of Mechanical and Process Design aspects of Process Equipment Design. Introduction to various codes (ASTM, API, Japanese, German etc.) used in chemical process industries and their application. Basic Engineering design approach and selection of pressure vessel components such as Head, closure, flanges, gasket, nozzles etc, Design of process vessel support Mechanical design of process equipment such as pressure vessel, shell & tube

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03
Practical	02	14	28	01

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): Fundamental knowledge of mathematics, thermodynamic, machine design.

Outline of Content: This course contains:

UNIT-I

1.	Introduction to Process Equipment Design 16	No. of Lectures-9, Marks :
	a	Nature of process equipments, General design procedure.
	b	Fabrication techniques, choice of materials, resistance to corrosion, Design considerations.
	c	Stress, Elastic instability, theories of failure, creep, economic consideration

UNIT-II

2.	Design of Machine Elements		No. of Lectures –9, Marks : 16
	a	Introduction, shaft, keys and pins, couplings, bearing, belt and pulley.	
	b	Chain drive, gear drives, joints, fasteners, brackets, gaskets, mechanical seal.	

UNIT-III

3.	Design of Pressure Vessels		No. of Lectures –8, Marks : 16
	a	Introduction, operating condition, uses, codes.	
	b	Selection of material, design conditions and stress.	
	c	Design of shell and its components, supports, thermal stress	

UNIT-IV

4.	Design of Heat Exchangers and Evaporators		No. of Lectures–8, Marks : 16
	a	Introduction, type of heat exchangers, design of shell.	
	b	Design of tube heat exchangers	
	c	Evaporators:- Introduction, types, materials, design considerations.	

UNIT-V

5.	Process Equipment Design and Standards		No. of Lectures–8, Marks : 16
	a	Role of process equipment designers, basic process requirements of plants/projects.	
	b	Introduction of design codes and standards IS, ASME, API, BS and its application.	
	c	Plant design management system.	

Text Book and Reference Books

1. Joshi M.V. and Mahajan V.V., "Process Equipment Design", McMillan, India, 1996.
2. Harvey J.F., "Pressure Vessels Design", Van Nostrand Co., 1974.
3. Singh K.P. & Soler A. L., "Mechanical Design of Heat Exchangers ", Arcturus Publishers, New Jersey, 1984.
4. Moss Demis R., "Pressure Vessel Design Manual", Gulf Publishing Co., Houston, 1987.
5. "Handbook of Piping Design", CRC Press, 1992.
6. IS 2825: 1969, Code for Unfired Pressure Vessels.
7. "ASHRAE Handbook : Fundamentals", ASHRAE, 1985. 8. ASME Code, Section 8th, Division -I, Division-II.

Elective- III Course Outline

Introduction to Robotics

Robotics

Course Title:

Short Title

Course Code

Branch- Mechanical Engineering

Year-Fourth Year

Course Description: This course is aimed to provide exposure on the Robot anatomy, sensors, kinematics, applications and problems associated with their design.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03
Practical	02	14	28	01

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): Fundamental knowledge of Mathematics, Automation, Mechatronics.

Outline of Content: This course contains:

UNIT-I

1.	Basic Concept In Robotics	No. of Lectures -9, Marks : 16
a	Historical perspective of robot, classification of robot, automation and robotics, robot anatomy, basic structure of robotics.	
b	resolution, accuracy and repeatability, classification and structure of robotics system, point to point and continuous past system, control loop of	
c	Robotic application Current and future.	

UNIT-II

2.	Mechanical Systems: Components, Dynamics And Modeling No. of Lectures-9, Marks : 16	
	a	Objectives, Motivation, Review elementary concept, Motion Conversion, Modeling of Mechanical systems.
	b	Kinematics chain, Forces encountered in Moving coordinate systems, Lagrange's Analysis of Manipulator.

UNIT-III

3.	Drives And Control System No. of Lectures -8, Marks : 16	
	a	Hydraulic, DC servomotors, basic control system, concept and models, control system analysis.
	b	Robot activation and feedback component, positional and velocity sensors.
	c	Actuators, power transmission system, Application of robot in manufacturing.

UNIT-IV

4.	End Effectors, Sensors And Vision Systems No. of Lectures-8Marks:16	
	a	End Effectors Types of end effectors, mechanical grippers, vacuum, magnetic, adhesive grippers, tools as end effectors, Gripper selection and
	b	Introduction to Sensors: Need of sensors in a robotic system, selection of sensors, photo sensors, limit switches.
	c	Range sensors, proximity sensors, touch / sensors. VISION SYSTEMS: concept of low level and high-level vision in a robotic system.

UNIT-V

5.	Robot Programming No. of Lectures -8, Marks : 16	
	a	Methods of robot programming, lead through programming methods, a robot program as a path in space.
	b	Motion interpolation WAIT, SIGNAL, AND DELAY commands.
	c	ROBOT LANGUAGES: The textual robot languages, generation of robot programming languages, robot language structure, constant, variables and

Text Book and Reference Books

1. Richard D. Klafter, Thomas A. Chmielewski and Michael Negin, "Robotic Engineering - An Integrated Approach", Prentice Hall India, 2002.
2. Groover," Industrial Robotics", McGraw Hill Publication Co. Ltd.
3. John J. Craig, "Introduction to Robotics Mechanics and Control", Pearson Education Inc.,
4. M. P. Groover, "Industrial Robotics - Technology, Programming and Applications".
5. Niku," Introduction to Robotics: Analysis System and Application", Pearson Education

Elective- III Course Outline

Advanced Welding Technology

AWT

Course Title:

Short Title

Course Code

Branch- Mechanical Engineering

Year-Fourth Year

Course Description: This course is aimed to provide deeper knowledge of materials technology of welding, quality techniques at production by welding, Knowledge of current computer systems and cost for welding operations.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03
Practical	02	14	28	01

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): Fundamental knowledge of workshop technology, manufacturing process, material science.

Outline of Content: This course contains:

UNIT-I

1.		Conventional welding Technology	No. of Lectures-9, Marks : 16
	a	Introduction: Importance and application of welding, classification of welding process. Selection of welding process	
	b	Brief review of conventional welding process: Gas welding, Arc welding, MIG, TIG welding. Resistance welding. Electroslag welding, Friction welding etc. Welding of MS, CI, Al, and Stainless steel & Maurer/Schaefflar Diagram. Soldering & Brazing.	

UNIT-II

2.		Advanced welding Techniques	No. of Lectures-9, Marks : 16
	a	Principle and working and application of advanced welding techniques such as Plasma Arc welding, Laser beam welding, Electron beam welding, Ultrasonic welding etc.	

UNIT- III

3.		Advanced welding Techniques	No. of Lectures-8, Marks : 16
	a	Advanced welding Techniques (continued): Principle and working and application of advanced welding techniques such as explosive welding/ cladding, Underwater welding, Spray-welding / Metallising, Hard facing.	

UNIT- IV

4.		Metallurgy and Weld Life	No. of Lectures -8, Marks : 16
	a	Weld Design: Welding machines/equipments and its characteristics and arc-stability, Weld defects and distortion and its remedies, Inspection/testing of welds, Weld Design, Welding of pipe-lines and pressure vessels.	
	b	Life predication. 4 51 Thermal and Metallurgical consideration: Thermal considerations for welding, temperature distribution, Analytical/Empirical analysis/formulae, heating & cooling curves.	
	c	Metallurgical consideration of weld, HAZ and Parent metal, micro & macro structure. Solidification of weld and properties.	

UNIT-V

5.		Advance welding	No. of Lectures -8, Marks : 16
	a	Welding Under The Influence Of External Magnetic Field: Parallel Field, Transverse Magnetic Field, Longitudinal Magnetic Field, Improvement Of Weld Characteristics By The Application Of Magnetic Field, Magnetic Impelled Arc Welding.	
	b	Fundamentals Of Underwater Welding- Art And Science: Comparison Of Underwater And Normal Air Welding, Welding Procedure, Types Of Underwater Welding, Underwater Wet Welding Process Development.	

Text Book and Reference Books

1. Little R.L., "Welding Technology", Tata McGraw Hill, New Delhi, 1994.
2. Ghosh A. and Mallik A.K., "Manufacturing Science", East West Press, 1985.
3. Davies A.C., "The Science and Practice of Welding", Cambridge University, New York, 1989.
4. Balchin N.C., "Health and Safety in Welding and Allied Processes", Jaico Publishing House, Mumbai, 1989.
5. Rao P. N., "Manufacturing Technology", Tata McGraw Hill, 1990.
6. Mukharjee P. C., "Fundamental of Metal Casting Technology", Tata McGraw Hill, 1970.
7. Jeffus Larry "Welding Principles and Applications" Delmar Publishers, 1999.

Elective- III Course Outline

Energy Conservation and Management

ECM

Course Title:

Short Title Course Code

Branch- Mechanical Engineering

Year-Fourth Year

Course Description: Compare and contrast energy management practices and opportunities, including monitoring. Describe and analyse energy efficiency tools. Describe key issues in energy resource management and green building. Discuss and discern the history of energy sources and the conservation of and future of resources needed to maintain our economy. Describe and discuss a variety of world and regional energy policies. Communicate reasons for environmental protection and renewable energy implementation. Explain energy accounting and analysis and how it is used in energy assessment. Demonstrate understanding of rate of return and life cycle cost analysis.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03

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): Fundamental knowledge of basic thermodynamic, energy conservation systems, Applied Thermodynamics and Fluid Mechanics.

Outline of Content: This course contains:

UNIT-I

1.	Energy Scenario	No. of Lectures –9, Marks : 16
	a	Commercial and Non-commercial energy, primary energy resources, commercial energy production, final energy consumption, Indian energy
	b	2Sectoral energy consumption (domestic, industrial and other sectors), energy needs of growing economy, energy intensity, long term energy
	c	Energy security, energy conservation and its importance, energy strategy for the future, Energy Conservation Act 2001 and its features.

UNIT-II

2.	Basics of Energy its various forms and conservation	
	No. of Lectures-9, Marks : 16	
	a	Electricity basics – Direct Current and Alternative Currents, electricity tariff, Thermal Basics-fuels, thermal energy contents of fuel, temperature and pressure, heat capacity, sensible and latent heat, evaporation, condensation, steam, moist air and humidity and heat transfer.
	b	Evaluation of thermal performance – calculation of heat loss – heat gain, estimation of annual heating & cooling loads, factors that influence thermal performance, analysis of existing buildings setting up an energy management programme and use management – electricity saving

UNIT-III

3.	Energy Management & Audit	
	No. of Lectures –8, Marks : 16	
	a	Definition, energy audit, need, types of energy audit. Energy management (audit) approach-understanding energy costs.
	b	Bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel and energy substitution.
	c	Financial Management: Investment-need, appraisal and criteria, financial analysis techniques-simple payback period, return on investment, net present value, internal rate of return, cash flows, risk and sensitivity analysis; financing options, energy performance contracts and role of Energy Service Companies (ESCOs).

UNIT-IV

4.	Energy Monitoring and Measurement	
	No. of Lectures-8, Marks : 16	
	a	Defining monitoring & targeting, elements of monitoring & targeting, data and information-analysis, techniques – energy consumption, production, cumulative sum of differences (CUSUM). Energy Management Information Systems (EMIS)
	b	Basic measurements – Electrical measurements, Light, Pressure, Temperature and heat flux, Velocity and Flow rate, Vibrations, etc. Instruments Used in Energy systems: Load and power factor measuring equipments, Wattmeter, flue gas analysis, Temperature and thermal loss measurements, air quality analysis etc. Mathematical and statistical modelling and analysis.

UNIT-V

5.	Energy Efficiency in Thermal Utilities and systems	
	No. of Lectures-8, Marks : 16	
	a	Energy efficiency in thermal utilities like boilers, furnaces, pumps and fans , compressors, cogeneration (steam and gas turbines), heat exchangers, lighting system, Motors belts and drives, refrigeration system.
	b	Heat Recovery and Co-generation:- Heat recovery from ventilation, air co-generation of heat and electricity, heat recovery and bottoming cycles.

Text Book and Reference Books

1. Energy Engineering and Management Amlan Chakrabarti Prentice hall India 2011
2. Energy Management Principles, CB Smith, Pergamon Press, New York,
3. Bureau of energy efficiency –Hand outs New Delhi .
4. Energy Management Hand Book. W. C. Turner. John Wiley and sons
5. Handbook on Energy Efficiency, TERI, New Delhi, 2009
6. Energy Auditing and Conservation; Methods, Measurements, Management & Case Study, Hamies, Hemisphere Publishing , Washington, 1980.
7. Industrial Energy Management & Utilization, Write, Larry C Hemisphere Publishers, Washington, 1998.
8. Energy Conservation In Process Industry, W. F. Kenny

Elective- III Course Outline

Automobile Engineering – II

AE-II

Course Title:

Short Title

Course Code

Branch- Mechanical Engineering

Year-Fourth Year

Course Description: This course introduces undergraduate students to Automobile Engineering.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03

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): Basic knowledge of theory of machine, IC Engine, Applied Thermodynamic.

Outline of Content: This course contains:

UNIT-I

1.		Automobile Brakes No. of Lectures –9, Marks : 16
	a	Introduction, Braking Requirements, Function of the brakes, Classification of the brakes
	b	Hydraulic Brakes, Power Brakes, Air Brakes, Brake Efficiency & Stopping Distance, Factor Controlling the Stop of an Automobile
	c	Brake Lining, Brake Testing & Testers, Brake Service

UNIT-II

2.		Automobile Electrical System No. of Lectures–9, Marks : 16
	a	Introduction to Starting System, Lead-Acid Battery, Recharging of Battery, Charging procedure, Battery voltage, Battery Capacity, Battery Rating, Battery Life, Factors affecting Battery life, Battery testing, Battery troubles
	b	Introduction to Ignition System-Types, Introduction Charging System, Spark Plug Introduction To Wiring System, Standard Color coding, Tracking faults in wiring, Functioning of the Electrical system in an Automobile, Improvement in Electrical system in an Automobile

UNIT- III

3.		Automobile Heating, Ventilation and Air Conditioning No. of Lectures-8, Marks : 16
	a	Nature of Heat, Heating System, Air Conditioning System and its Operational Principle, Air Conditioning System and its Operational Principle, Air Conditioning Components, Effect of Air Conditioning on Fuel Economy
	b	Air Conditioning System Refrigerant, Conventional Heating and Ventilation, Air Distribution Parts, Automatic Climate Control, Automatic Temperature Control System, Air Conditioning Troubleshooting, Heating System Troubleshooting

UNIT- IV

4.		Alternative Fuelled Automobiles No. of Lectures-8, Marks : 16
	a	Introduction, Battery of Electrical Vehicle(EV), Fuel Cell-as a Source of Energy, Solar Powered Automobiles, Hybrid Drives, Drive Motors
	b	Compressed Natural Gas (CNG) Operated Automobiles, Liquefied Petroleum Gas (LPG) as a Substitute Fuel
	c	Future Alternative Fuels for IC Engine, Particular tips for getting more Mileage, How to Save Fuel, Biodiesel- Another substitute for existing fuel, Future Trends in Automobile Development

UNIT-V

5.		Automobile Emissions and its Control No. of Lectures-8, Marks : 16
	a	Introduction, Air Pollution- Environment & Health Impacts, Major Pollutants and their Sources of Emission, Pollutants and Mechanism of their Formation, Mechanism of Pollutants Formation in SI Engine
	b	Smoke, Causes of Smoke, Factor Affecting Diesel Smoke, Comparison of Diesel & Gasoline Engine emission, Harmful Effects of Different Pollutants, Emission Control System
	c	Regulation and Norms on Exhaust Emission, Introduction to Green House Effect and Global Warming, Noise Pollution and its Control, EURO & Indian Emission Standards

Text Book and Reference Books

1. Automobile Engineering Vol. 1 & 2 by Dr. Kripal Singh, (Standard Publishers Distributors).
2. A textbook of Automobile Engineering I & II by P. S. Gill, (S. K. Kataria & Son's)
3. Automobile Engineering by R. B. Gupta, (Satya Prakashan)
4. Automobile Engineering by Dr. V. M. Domkundwar, (Dhanpat Rai & Company)
5. A textbook of Automobile Engineering by R. K. Rajput, (Laxmi Publication Pvt. Ltd.)
6. Automobile Engineering by K. M. Moeed, (S. K. Kataria & Son's)
7. Automobile Engineering by Dr. A. K. Basu, (S. Chand Company Pvt. Ltd.)

Elective- III Course Outline

Thermal Equipment Design

TED

Course Title:

Short Title

Course Code

Branch- Mechanical Engineering

Year-Fourth Year

Course Description: This course introduces undergraduate students to Thermal equipment design. The background required includes a sound knowledge of Mathematics, Engineering Thermodynamics, Applied Thermodynamics and Fluid Mechanics, Heat transfer and Refrigeration and Air-conditioning. The course aims at imparting knowledge of design of thermal equipments.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03

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, Engineering Thermodynamics, Applied Thermodynamics and Fluid Mechanics, Heat transfer and Refrigeration and Air-conditioning.

Outline of Content: This course contains:

UNIT-I

1.	Engineering Design	No. of Lectures –9, Marks : 16
	a	Introduction to engineering design, Decision in an Engineering undertaking, Design Vs Analysis, Synthesis for Design, Selection Vs Design.
	b	Designing a workable system: workable system design and analysis, creativity in concept selection, workable Vs. optimum system,
	c	Economics: Interest, Lump sum compounded annually and more than annually, compound amount factor, present worth factor, future and uniform series amount, Gradient factor, Shift in time, Taxes , Depreciation
	d	Decision making to design a food freezing plant
	e	Decision making to optimize thickness of insulation in refrigerated ware house
	f	Decision making to optimize of natural convection air cooled condenser

UNIT-II

2.	Modeling of thermal equipments and simulation No. of Lectures-9, Marks : 16	
	a	Matrices, Solution of simultaneous equation, Polynomial presentation (polynomial, one variable a function of other variable and $n+1$ data points), simplification.
	b	Method of Least square, the art of equation fitting,
	c	Selecting Vs simulating, (Heat exchanger), System simulation, Information flow diagrams, Successive substitution method, pitfalls in successive substitution method
	d	Newton Raphson method for multivariable and convergence characteristics, Compare successive substitution method and Newton Raphson method

UNIT-III

3.	Optimization	No. of Lectures -8, Marks : 16
	a	Introduction, levels of optimization, Mathematical representation of optimization problem
	b	Setting up the mathematical statement of optimization problems, Properties of objective function, Unconstrained optimization and Constrained optimization problem
	c	Mathematical proof of Lagrange multiplier method, Test of Maxima and minima, Kunhn-tuker conditions, Unimodal function and search method
	d	(Only basic introduction to all methods no numerical will be asked) Dichotomous search, Fibonacci search method, Introduction to multivariable optimization, Multivariable optimization, Conjugate gradient method

UNIT-IV

4.	Mathematical Modeling- Thermodynamic properties No. of Lectures-8, Marks : 16	
	a	Introduction, Criteria for fidelity of representation, Linear and non linear regression analysis.
	b	Thermodynamic properties, Internal energy, enthalpy, clayperon equation, P-T relation at saturated condition, specific heats, Maxwell relation.
	c	P-V-T equation (Vander walls equation), Building and full set of data.
	d	Introduction to steady state simulation, convergence and divergence in successive substitution, partial substitution in successive substitution, Evaluation of Newton Rapson Technique and characteristics for heat exchangers

UNIT-V

5.	Dynamic behavior of thermal system	No. of Lectures–8, Marks : 16
	a	Introduction, Significance, Scope, Approach, One dynamic element in steady state simulation for refrigeration plant etc. (Heat exchanger)
	b	Laplace Transform and Inverse of Laplace transforms, Blocks, Block Diagram and Transfer function, Feed control loop, Time constant block (Consider Temperature sensing bulb in a fluid duct)
	c	Stability analysis, Normalizing the variable for Inversion to the time (Take the case to regulate the air pressure in a reservoir)
	d	Translating the physical situation in block diagram (take example for air heating system and its control), non linearity's

Text Book and Reference Books

1. J.P. Holman 1992 "Heat Transfer" McGraw Hill VII Edition.
2. P. Kothandaraman "Fundamentals of Heat and Mass Transfer".
3. D.S. Kumar "Heat and Mass Transfer" D. S. Kumar S. K. Kataria & Sons, Delhi.
4. P. K. Nag "Heat Transfer" Tata McGraw Hill Publishing Company Ltd., New Delhi.
5. Thermal Design and Optimization, Adrian Bejan, George T. Satsaronis, Michael J. Moran John Wiley & Sons, 1996.
6. Design and Optimization of Thermal Systems, Second Edition (Mechanical Engineering) by Yogesh Jaluria.
7. Design of thermal systems, W. F. Stoecker, McGraw hill book company.

Lab Course Outline

Mechanical Vibration

MV LAB

Course Title :

Short Title

Course Code

Branch- Mechanical Engineering

Year-Fourth Year

Course Description:

This lab includes different practical of Mechanical Vibration. The course aims at imparting knowledge of natural frequency and modes of vibration.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation scheme:

Internal Continuous Assessment (ICA) 25Marks 50Marks

End Semester exam (ESE) (OR) 25Marks

Prerequisite Course(s): Mathematics (Calculus) at First year level and strength of Materials, Theory of Machines at Second year Level.

Outline of Content: This course contains:

- 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 : Lab file should contain at list five experiments from above mentioned list.

ESE (Oral Examination). The Oral Examination will comprise of viva on the above experiments.

Lab Course Outline

Finite Element Analysis and Simulation Techniques

Course Title:	Short Title	Course Code
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Branch- Mechanical Engineering

Year-Fourth Year

Course Description: The background required includes a sound knowledge of Mathematics, Strength of materials and Machine Design. The course aims at imparting knowledge of Finite Element Analysis and Simulation Technique.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation scheme:

Internal Continuous Assessment (ICA)	25Marks	50Marks
End Semester exam(ESE)(PR)	25Marks	

Prerequisite Course(s): Mathematics, Computational Methods, Design, Vibration, SOM etc.

Outline of Content: This course contains:

- 1 Analysis of I-cantilever beam.
- 2 Analyzing Flow in a System of Pipes.
- 3 Analysis of Trusses.
- 4 Modal Analysis of Spring-Mass System.
- 5 Modal Analysis of continuous System.
- 6 Thermal analysis of any component.
- 7 Stress strain analysis of any component.
- 8 Kinematic Analysis and simulation of slider crank Mechanism.

Note : Lab file should contain any five experiments by using any design software

ESE (Practical Examination) The Practical Examination will comprise of performing the experiment and viva on the Practical's.

Lab Course Outline Elective- II

Tribology

TRB LAB

Course Title :

Short Title

Course Code

Branch- Mechanical Engineering

Year-Fourth Year

Course Description: The background required includes knowledge of mathematics, chemistry, engineering materials, fluid mechanics. The objective of the course is to understand the tribological concept, bearing design and its application, lubrication practices.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation scheme:

Internal (ICA)	Continuous Assessment	25Marks	50Marks
End Semester exam (ESE) (OR)		25Marks	

Prerequisite Course(s): Fundamental Knowledge of Physics, Chemistry, Engineering Maths, Fluid Mechanics, Machine Design, and Engineering materials.

Outline of Content: This course contains:

Any EIGHT of the following performance practical and Assignments.

- 01 Practical on Journal Bearing apparatus.
- 02 Practical on Tilting pad thrust bearing apparatus
- 03 Friction in Journal Bearing
- 04 Practical on Brake line friction test rig.
- 05 Practical using Pin on disc test rig.

Note : Any 03experiments should be performing from above list and 03assignment include in the course based on curriculum of this course.

Guidelines for ICA: ICA will be based on Practical assignments submitted by the student in the form of journal.

Lab Course Outline Elective- II

Power Plant Engineering

PPE LAB

Course Title :

Short Title

Course Code

Branch- Mechanical Engineering Year- Fourth Year

Course Description: To understand the various components, operations and applications of different types of power plants.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation scheme:

Internal Continuous Assessment (ICA) 25Marks 50Marks

End Semester exam (ESE) (OR) 25Marks

Prerequisite Course(s):

Outline of Content: This course contains:

1. Study of Fluidized Bed Combustor.
2. Study of Environmental Impact of Thermal Power Plant.
3. Study of Demand supply scenario of Electricity.
4. Study or visit of Co-generation Plant.
5. Study or visit of Non conventional power plant.
6. Efficiency measurement of Standalone Solar PV System.
7. Measurement of current-voltage characteristics of two solar cells connected
a) in series and b) in parallel.

Note : Lab file should consist of any six experiments to be performed from above list

ESE (Oral Examination)

The Oral Examination will be based on the all five units of Power Plant Engineering.

Lab Course Outline
Elective- II

Process Equipment Design

PED LAB

Course Title :

Short Title

Course Code

Branch- Mechanical Engineering Year- Fourth Year

Course Description: The student should have basic understanding of Mechanical and Process Design aspects of Process Equipment Design. Basic Engineering design approach and selection of pressure vessel components such as Head, closure, flanges, gasket, nozzles etc, Design of process vessel support Mechanical design of process equipment.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation scheme:

Internal Continuous Assessment(ICA) 25Marks

50Marks

End Semester exam (ESE) (OR) 25Marks

Prerequisite Course(s): Fundamental knowledge of mathematics, thermodynamic, machine design and engineering drawing.

Outline of Content: This course contains:

1. Design and drawing of pressure vessels.
2. Design and drawing of storage vessels.
3. Assignment on safety measure in process equipment design.
4. Study of pressure relief devices.
5. Study of vessels under external pressure.
6. Study of design codes and standards.

Note : Lab file should consist of minimum **five 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 students in oral examination.

Industrial Lecture**IL****Course Description:**

The gap between industry's needs and the academic community's aspirations appears to be considerably large. There exists a strong feeling, at least in the academic circles, that unless technology driven initiatives find a surer place in the industrial sector in this country, the academia-industry interaction is likely to remain confined to developmental activities with limited exploratory or research-based content. As institutes committed primarily to creation and growth of technological knowledge, technical institutes have an important role to play in the industrial sector of the country's economy. This fact by way of encouraging mechanisms to foster interaction between the academia and industry. Typically, academic interest in the multidimensionality of a problem leads to a tendency to explore a variety of options to arrive at a solution. This industrial lecture develops ability of student for expectations of the industrialists from the fresh engineers.

	Total Hours	Semester Credits
Lecture	06	2

General Objectives: The domains in which interaction is possible are:

- Placement and entrepreneurship development.
- Industry participation in technology development involving some exploratory work.
- Academic intervention in solving specific industry problems.
- Laboratory utilization by industry.
- Continuing education programme.

Course Outcomes:

Upon successful completion of this course the students will be able to:

- Understand need, requirement and expectation of industry from fresh engineers.
- Understand importance of laboratory practices throughout carrier of engineer. Design and conduct experiments, as well as to analyze and interpret data.
- 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.
- Function on multidisciplinary teams, communicate effectively.
- Identify, formulate, and solve engineering problems by understanding professional and ethical responsibility.
- Recognition of the need for, and an ability to engage in life-long learning.
- Use the techniques, skills, modern engineering tools and software necessary for engineering practice.

**Industrial Lecture
(Course Contents)**

Semester-VIII
Teaching Scheme:
Lecture: 1 Hr

Examination Scheme:
(ICA) Internal Continuous Assessment: 50Marks

1. There is a need to create avenues for a close academia and industry interaction through all the phases of technology development, starting from conceptualization down to commercialization.
2. List of renowned persons from industry shall be prepared by the committee appointed by Head of the department. After approval from the Principal, Minimum five Industrial lectures in alternate week shall be arranged, which shall be delivered by the experts/Officials from Industries/Govt. organizations/ Private Sectors/Public Sectors / R&D Labs covering the various aspects.
3. Topics of Industrial Lectures shall be Technical in nature and should not be the specific contents from the curriculum.
4. Students shall submit the report based on minimum five lectures giving summary of the lecture delivered.
5. The summary should contain brief resume of the expert, brief information of his organization and brief summary of the lecture in bullet point form.

Guide lines for ICA: Assessment of the Industrial Lecture for award of ICA marks shall be done jointly by departmental committee as per attendance in industrial lecture, report submitted by student and overall performance in semester as per the guidelines given in **Table- D**

Table-D

SN	Name of Student	Attendance (05 Marks per Lecture)	Dept of Understanding (03 Marks per Lecture)	Report Writing	Total
		25	15	10	50

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	4	14	56	6

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. 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 and self learning.
8. Use the techniques, skills, modern engineering tools and software necessary for engineering practice.

**Project-II
(Lab Course Contents)**

Semester-VIII

Teaching Scheme:

Practical: 2 Hrs/Week

Examination Scheme:

(ICA) Internal Continuous Assessment: 75Marks

(ESE) End Semester Examination OR: 75Marks

1. Project-I work decided in VII semester shall be continued as Project-II
2. Students should complete implementation of ideas given in synopsis/Abstract, so that project work should be completed before end of semester.
3. Project-II may involve fabrication, design, experimentation, data analysis within realistic constraints such as economic, environmental, social, ethical, health and safety, manufacturability, and sustainability. The stage also includes testing , possible results and report writing
4. Each student's project group is required to maintain log book for documenting various activities of Project-II and submit group project report at the end of Semester-VIII in the form of Hard bound.
 - a. Title
 - b. Abstract
 - c. Introduction
 - d. Problem identification and project objectives
 - e. Literature survey
 - f. Case study/Analysis/Design Methodology
 - g. Project design and implementation details
 - h. Result and conclusion
 - i. Future scope
 - j. References.

Guide lines for ICA: ICA shall be based on continuous evaluation of students' performance throughout semester in project-II and report submitted by the students' project group in the form hard bound. Assessment of the project-II for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-E**.

Guide lines for ESE:-

In ESE the student may be asked for demonstration and questions on Project. Evaluation will be based on answers given by students in oral examination.

Assessment of Project - II

Name of the Project: _____

Name of the Guide: _____

Table-E

SN	Name of Student	Assessment by Guide (50 Marks)				Assessment by Committee (25 Marks)		Total
		Attendance, Participation and team work	Material procurement/ assembling/ Designing/ Programming	Case study/ Execution	Project Report	Dept of Understanding	Presentation	
	Marks	10	15	15	10	10	15	75