A Seminar on

Role of AI in CNC Machining

Dr. Ajay Ravindra Bhardwaj

Mechanical Engg

Activity Report

Academic Year	2024-25
Program Driven by	
Quarter	III
Program / Activity Name	Capacity Building Program
Program Type	
Program Theme	Innovation and startups
Start Date	29-03-2025
End Date	29-03-2025
Duration of the Activity (in Mins)	60
Number of Student Participant	0
Number of Faculty Participant	70
Number of external Participant	--
Expenditure Amount in Rs.	
Any Remark	--
Mode of Session Delivery	Offline
Objective	
Benefit in terms of Learning / Skills / Knowledge obtained	
Feedback	
Video url (mp4)	
Photograph 1 (jpg)	Attached
Photograph 2 (jpg)	Attached
Overall report of the Activity (pdf)	As given below

Dr. P. H. Zope

Convener IIC 

Title:

Role of AI in CNC Machining

Speaker:

Dr. Ajay Ravindra Bhardwaj

Date:

[29-03-25]

Venue:

[SSBT COET Bambhori]

---

1. Introduction

A highly insightful seminar titled **"Role of AI in CNC Machining"** was delivered by **Dr. Ajay Ravindra Bhardwaj**, a distinguished expert in AI applications within manufacturing processes. The seminar highlighted the transformative potential of Artificial Intelligence (AI) in **Computer Numerical Control (CNC) machining**, a key technology in modern manufacturing. Dr. Bhardwaj's session explored how AI technologies are enhancing the efficiency, precision, and adaptability of CNC machines, helping manufacturers stay competitive in an increasingly automated world.

---

2. Objectives of the Seminar

- To introduce the concept of **AI in CNC machining** and its significance in the manufacturing industry.
- To understand the integration of AI in the optimization of CNC machining processes.
- To explore the practical applications and benefits of AI in improving machining accuracy, quality control, and predictive maintenance.
- To discuss the challenges and future prospects of AI in the CNC machining sector.

---

3. Key Highlights of the Seminar

a. Introduction to CNC Machining and AI

Dr. Bhardwaj began by explaining the traditional CNC machining process, where pre-programmed computer software directs the movement of tools to machine parts with high precision. He then discussed the limitations of traditional CNC systems, such as their dependency on manually input parameters and their inability to adapt in real-time to changing conditions. The integration of AI into CNC machining systems addresses these challenges by enabling machines to **learn**, **predict**, and **adapt** during the machining process.

b. AI Technologies in CNC Machining

Dr. Bhardwaj detailed the various AI technologies that are being integrated into CNC machining systems:

- **Machine Learning (ML):**
  Machine learning models help CNC machines learn from historical data and previous machining experiences, enabling the system to make predictions and adjustments autonomously during machining operations. For example, ML algorithms can predict tool wear and adjust machining parameters to maintain optimal performance.
- **Computer Vision:**
  AI-driven computer vision is used to monitor the machining process in real-time. Cameras and sensors analyze the workpiece and machining environment to ensure quality control. Any defects or deviations from the desired output are immediately detected, and corrective actions can be taken automatically.
- **Predictive Analytics:**
  Predictive analytics powered by AI allows manufacturers to forecast equipment failures and optimize machine performance. By analyzing historical data and real-time sensor information, AI can predict potential issues such as tool wear, machine vibrations, or temperature fluctuations, reducing downtime and maintenance costs.
- **Adaptive Control Systems:**
  AI systems with adaptive control adjust machining parameters dynamically to optimize cutting conditions, taking into account factors such as material properties, tool wear, and machine health. This leads to improved product quality and reduced production time.

c. Applications of AI in CNC Machining

Dr. Bhardwaj highlighted several real-world applications where AI has already made a significant impact on CNC machining:

- **Process Optimization:**
  AI algorithms can continuously monitor machining parameters and adjust them in real-time to optimize cutting conditions, improving both speed and quality. This adaptive approach ensures consistent part quality, even under varying conditions.
- **Automated Quality Control:**
  With computer vision and machine learning, AI systems can inspect and measure parts during the machining process, ensuring high-quality standards. This is especially useful for parts with tight tolerances, where human inspection is impractical or inefficient.
- **Tool Wear Monitoring and Predictive Maintenance:**
  AI can predict when a tool is likely to wear out or fail, reducing the need for frequent manual inspections. By monitoring tool usage patterns and wear rates, AI ensures that tools are replaced or maintained just in time, preventing machining defects and avoiding costly downtime.
- **Energy Consumption Optimization:**
  AI algorithms can analyze energy consumption patterns in CNC machining systems and suggest adjustments that reduce power usage, leading to cost savings and greater sustainability in manufacturing operations.

d. Case Studies and Examples

Dr. Bhardwaj shared several case studies that demonstrate the successful application of AI in CNC machining:

- **AI in Aerospace Manufacturing:**
  In aerospace industries, AI-driven CNC machines are used for manufacturing critical parts with high precision, such as turbine blades. Machine learning algorithms help optimize the cutting process, reducing material waste and improving the quality of the parts.
- **AI in Automotive Industry:**
  In the automotive sector, AI is used for automated quality control during CNC machining of engine parts. Computer vision systems inspect the machined parts for defects such as cracks or dimensional inaccuracies, ensuring that only high-quality components move forward in the production process.

e. Benefits of AI in CNC Machining

Dr. Bhardwaj emphasized the following key benefits of integrating AI into CNC machining processes:

- **Increased Efficiency and Productivity:** AI systems optimize machining operations, reduce cycle times, and ensure faster throughput.
- **Improved Precision and Quality:** Real-time adjustments and predictive maintenance reduce errors and improve product quality.

- **Cost Savings:** AI minimizes material waste, reduces downtime, and lowers energy consumption, leading to significant cost savings.
- **Enhanced Flexibility:** AI allows CNC machines to adapt to changes in production conditions, making them more versatile and capable of handling a broader range of products.

f. Challenges and Future Prospects

While AI offers numerous advantages, Dr. Bhardwaj also discussed the challenges faced in its adoption:

- **Integration Complexity:** Integrating AI into existing CNC systems can be complex, requiring significant investment in software, hardware, and skilled personnel.
- **Data Quality:** AI systems rely on high-quality data for training and accurate predictions. Ensuring consistent and accurate data collection is critical to the success of AI applications in CNC machining.
- **Resistance to Change:** There may be resistance from employees and management in adopting AI technologies, especially in traditional manufacturing environments.

Looking to the future, Dr. Bhardwaj is optimistic that AI will continue to drive the evolution of CNC machining. He predicts that **autonomous machining systems** will become more prevalent, allowing for fully automated, highly efficient production processes.

---

4. Interactive Session

During the interactive Q&A session, participants had the opportunity to ask Dr. Bhardwaj about specific AI applications in different manufacturing environments. Some key discussions included:

- The potential for AI to help small and medium-sized enterprises (SMEs) in the CNC machining sector.
- The role of AI in enhancing CNC machines' adaptability to diverse materials.
- How AI can address the skill gap in the manufacturing workforce.

Dr. Bhardwaj provided valuable insights on overcoming these challenges and shared resources for professionals looking to implement AI solutions in their operations.

---

5. Conclusion

The seminar concluded with a reflection on the transformative potential of AI in CNC machining. Dr. Bhardwaj reiterated that AI is not just a tool for improving efficiency but a catalyst for the future of manufacturing, driving smarter, more sustainable, and more

competitive production environments. He encouraged the attendees to start exploring AI integration into their CNC systems to stay ahead of the curve.


Village
Bambhori
Google
Decimal
DMS
Latitude
21.014052
21°0'50" N
Longitude
75.502683
75°30'9" E
2025-03-29(Sat) 03:51(pm)


Village
Bambhori
Google
Decimal
DMS
Latitude
21.014052
21°0'50" N
Longitude
75.502683
75°30'9" E
2025-03-29(Sat) 03:51(pm)

Roll no.	Name	Sign
54	Kalyani Bapu Patil	
17	Chaitali . K. Mali	
60	Megha Manoj Patil	
45	Devayani Samadhan patil	
74	Shruti Kiran patil.	
73	Shrishti Rakesh Patil	
80	Teena Hemraj Patil	
28	Vijyala Narendra Narkhede	
33	Vishakha Pramod Nikam	
46	Devyani Pravin Patil	
38	Ankita Sanjay Patil	
71	Rutuja Ravindra Patil	
32	Lavanya Santosh Nikam	
63	Pranjal Mukunda Patil	
02	Bhagyashri Anant Khewalkar	
79	Tanvi Vineshsing Patil	
70	Ranjana Dnyaneshwar Patil	
19	Prapti Shravan Mali	
53	Jayshree G. Patil	
08	Bhumika Dilip Mahajan	
10	Khushi Rajendra Mahajan	
06	Priyanka Bhagwan Magare	
39	Ankita Vilas Patil	
37	Keerti Kaduba Pardeshi	
36	Trupti Dyaneshwar Palve	
55	Khushi Vinayak Patil	
78	Tanushri Pandharinath Patil	
07	Aniket Balwant Mahajan	
05	Prajwal Vinod Machhar	
59	Mayur Surgh Patil	

Sr No	Name of Student	Sign.	Roll No.
1)	Utkarsha. S. Patil		2
2)	Tanvi Vinod Kattar		62
3)	Utkarsha S Suryawanshi		38
4)	Gayatri Tushar Shingate		26
5)	Simran Shawaka Tadavi		41
6)	Mansi suresh shirode		27
7)	Sneha Rahilal Patil		71
8)	Sejal Dipak Sandhanshiv		21
9)	Pradnya Vijay Nikam		67
10)	Saniya Javed Shaikh		74
11)	Gauri Vijay Sonar		75
12)	Chhayashree Pralhal Patil		69
13)	Vaibhavi vinayak patil		3
14)	Triveni Ashok Solanki		29
15)	Abhijeet. Girish. Patil		68
16)	Shreyas. Vijay. Sangore		72
17)	Varad Anil Akirad		55
18)	Aryan Kamal Bajaj		53
19)	Rehan Akiloddin Shaikh		73
20)	Ganesh P. Sushir		40
21)	Yogeshwar Sopan Wagh		51
22)	OM Rajendra Talele		43
23)	chandrakant Devidas Ahire		54
24)	Faizan Lukman Tadvi		79
25)	Kalpesh Ananda Sonawane		31
26)	Chinmay Digambar Rajput		16

Roll No	Name	Sign
23	Aditya Arun more	
65	Pratik Rajesh Patil	
64	Prathamesh Avinash Pati	
26	Kunal Vasant Nannaware	
03	Amol Govinda Kumbhar	
04	Ramchandra Bhatu lohar	
50	Harshal Bharat Patil	
12	Pranav Bhaskar Mahajan	
13	Sumit Vinod Mahajan	

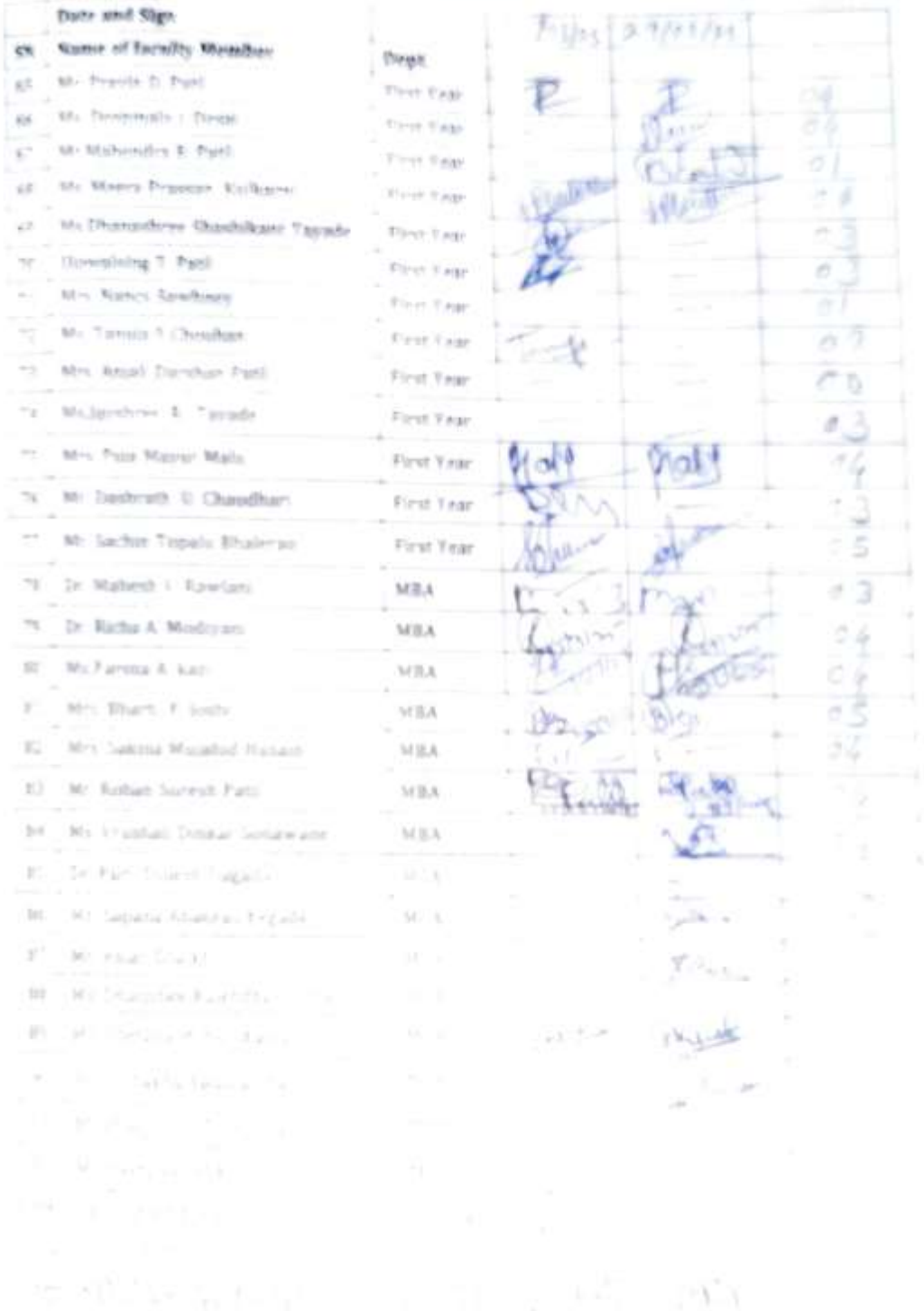
Attendance Sheet

	Date and Sign		1st 03/25	29/03/25	
SN	Name of faculty Member	Dept.			
1	Dr. P.A. Shirule	Civil			02
2	Dr. F.I. Chavan	Civil			04
3	Dr. Sonali B. Patil	Civil			03
4	Mr. J.N. Kale	Civil			03
5	Ms.Jyoti R.Mali	Civil			05
6	Pankaj Ramdas Punase	Civil		—	03
7	Ms. Dipika Purushottam Mali	Civil		—	01
8	Kalyani Ganesh Bendale	Civil	—	—	00
9	Dr .K.P. Adhiya	Computer			04
10	Dr. Manoj E Patil	Computer			04
11	Mr. Ashish T.Bhole	Computer	—		04
12	Dr. Akash D.Waghmare	Computer		—	04
13	Dr. Dnyaneshwar K. Kirange	Computer			04
14	Dr.Pankaj H. Zope	Computer	—	-	03
15	Dr, Surendra P. Ramteke	Computer	—		04
16	Ms. Shital A. Patil	Computer			03
17	Mr. Sarkarsinha Harshinha Rajput	Computer			05
18	Mr. Mohan Pramod Patil	Computer			05
19	Mr. Ramkrishna Hari Patil	Computer			05
20	Mr. Pramodgiri B. Gosavi	Computer			02
21	Msr. Priyanka Vinod Medhe	Computer	—		04
22	Mr. Krunal Chadrashekhar Pawar	Computer	—		03
23	Ms. Pooja Mukundrao Khandar	Computer	—		03
24	Ms. Ashwini Arun Kakde	Computer		—	03
25	Ms. Mayuri Rajesh Chandratre	Computer			04
26	Ms. Shama S Pawar	Computer	—		03
27	Mr. Mohammed Shafique Shaikh	Computer			05
28	Ms. Tejashri Anil Patil	Computer	—	—	—
29	Ms. Prachi Pushkaraj Chaudhari	Computer	—	—	—
30	Ms. Utkarsha Prmod Narkhede	Computer	—	—	—
31	Ms. Soniya Premraj Chaudhari	Computer	—	—	—
32	Ms. Dipali Daulatrao Phadat	Computer	—	—	—
33	Mr. V. S. Pawar	Electrical			03

Attendance Sheet

	Date and Sign				
SN	Name of faculty Member	Dept.		29/03/25	
34	Mr. M.Mujtahid Ansari	Electrical			05
35	Dr. Suhas M. Shembekar	Electrical		—	04
36	Dr.Rajesh R Karhe	Electrical			04
37	Mr. Muqeem Khan	Electrical	—		04
38	Mr. Tanveer Khatik	Electrical		—	04
39	Mr. Vijay Abaji Shinde	Electrical			02
40	Dr. M.P. Deshmukh	E&TC	—		04
41	Dr. V.M. Deshmukh	E&TC			04
42	Dr. N.M. Kazi	E&TC			04
43	Dr. Atul H. Karode	E&TC		—	04
44	Mr. Sunil K.Khode	E&TC		—	03
45	Ms.Rajashri B Patil	E&TC			05
46	Dr. P.G. Damle	Mechanical		—	04
47	Mr. N. K. Patil	Mechanical	—		04
48	Dr. K.Shrivastav	Mechanical		—	02
49	Dr. Devendra B. Sadaphale	Mechanical			04
50	Dr. P. M. Solanki	Mechanical		—	04
51	Dr. Ajay R. Bhardwaj	Mechanical		29/3/25	03
52	Dr. Dipak C. Talele	Mechanical			05
53	Dr. Vijay R. Diware	Chemical	—		04
54	Dr. S. A. Thakur	Chemical	—	—	03
55	Mr. V. P. Sangore	Chemical	—		04
56	Mrs. Sarika S. Pawar	Chemical		—	03
57	Mrs. Ruchita S. Naik	Chemical		—	04
58	Dr. Sandip S. Patil	First Year			05
59	Dr. K. S. Patil	First Year	—	—	03
60	Dr. Sunita S. Patil	First Year	—		04
61	Dr. Prashant N. Ulhe	First Year			05
62	Mr. Amol Chandrakan Wani	First Year	—	—	03
63	Ms. Priti Ramesh Sharma	First Year		—	03
64	C.U. Nikam	First Year		—	01

Attendance Sheet



Attendance Sheet

	Date and Sign		08/02/25	15/2/25	08/03/25	
SN	Name of faculty Member	Dept.				
1	Dr. P.A. Shirule	Civil				2
2	Dr. F.I. Chavan	Civil				2
3	Dr. Sonali B. Patil	Civil				1
4	Mr. J.N. Kale	Civil.				1
5	Ms.Jyoti R.Mali	Civil				3
6	Pankaj Ramdas Punase	Civil				2
7	Ms. Dipika Purushottam Mali	Civil				0
8	Kalyani Ganesh Bendale	Civil				0
9	Dr .K.P. Adhiya	Computer				2
10	Dr. Manoj E Patil	Computer				2
11	Mr. Ashish T.Bhole	Computer				3
12	Dr. Akash D.Waghmare	Computer				3
13	Dr. Dnyaneshwar K. Kirange	Computer				2
14	Dr.Pankaj H. Zope	Computer				2
15	Dr, Surendra P. Ramteke	Computer				3
16	Ms. Shital A. Patil	Computer				1
17	Mr. Sarkarsinha Harshinha Rajput	Computer				2
18	Mr. Mohan Pramod Patil	Computer				0
19	Mr. Ramkrishna Hari Patil	Computer				2
20	Mr. Pramodgiri B. Gosavi	Computer				
21	Msr. Priyanka Vinod Medhe	Computer				2
22	Mr. Krunal Chadrashekhar Pawar	Computer				2
23	Ms. Pooja Mukundrao Khandar	Computer				2
24	Ms. Ashwini Arun Kakde	Computer				2
25	Ms. Mayuri Rajesh Chandratre	Computer				2
26	Ms. Shama S Pawar	Computer				2
27	Mr. Mohammed Shafique Shaikh	Computer				3
28	Ms. Tejashri Anil Patil	Computer				
29	Ms. Prachi Pushkaraj Chaudhari	Computer				
30	Ms. Utkarsha Prmod Narkhede	Computer				
31	Ms. Soniya Premraj Chaudhari	Computer				
32	Ms. Dipali Daulatrao Phadat	Computer				
33	Mr. V. S. Pawar	Electrical				3

Attendance Sheet

	Date and Sign		08/02/25	15/02/25	08/03/25	
SN	Name of faculty Member	Dept.				
34	Mr. M.Mujtahid Ansari	Electrical				
35	Dr. Suhas M. Shembekar	Electrical				
36	Dr.Rajesh R Karhe	Electrical				
37	Mr. Muqeem Khan	Electrical				
38	Mr. Tanveer Khatik	Electrical				
39	Mr. Vijay Abaji Shinde	Electrical	—	—	—	
40	Dr. M.P. Deshmukh	E&TC				
41	Dr. V.M. Deshmukh	E&TC			—	
42	Dr. N.M. Kazi	E&TC		—		
43	Dr. Atul H. Karode	E&TC				
44	Mr. Sunil K.Khode	E&TC		—		
45	Ms.Rajashri B Patil	E&TC				
46	Dr. P.G. Damle	Mechanical				
47	Mr. N. K. Patil	Mechanical				
48	Dr. K.Shrivastav	Mechanical	—	—		
49	Dr. Devendra B. Sadaphale	Mechanical			—	
50	Dr. P. M. Solanki	Mechanical				
51	Dr. Ajay R. Bhardwaj	Mechanical	—			
52	Dr. Dipak C. Talele	Mechanical				
53	Dr. Vijay R. Diware	Chemical				
54	Dr. S. A. Thakur	Chemical				
55	Mr. V. P. Sangore	Chemical				
56	Mrs. Sarika S. Pawar	Chemical		—		
57	Mrs. Ruchita S. Naik	Chemical	—	—		
58	Dr. Sandip S. Patil	First Year				
59	Dr. K. S. Patil	First Year			—	
60	Dr. Sunita S. Patil	First Year				
61	Dr. Prashant N. Ulhe	First Year				
62	Mr. Amol Chandrakan Wani	First Year				
63	Ms. Priti Ramesh Sharma	First Year	—	—		
64	C.U. Nikam	First Year	—	—	—	

Attendance Sheet

	Date and Sign		08/02/25	15/2/2025	08/03/25	
SN	Name of faculty Member	Dept.				
65	Mr. Pravin D. Patil	First Year	P	P	—	2
66	Ms. Deepmala I. Desai	First Year	Desai	Desai	Desai	3
67	Mr.Mahendra B. Patil	First Year	—	—	—	0
68	Ms. Meera Prassan Kulkarni	First Year	Kulkarni	—	Kulkarni	3
69	Ms.Dhanashree Shashikant Tayade	First Year	D.	—	D.	2
70	Ujawalsing T. Patil	First Year	Patil	Patil	—	2
71	Mrs. Nancy Sawhney	First Year	—	—	—	1
72	Ms. Tanuja Y.Chouhan	First Year	—	—	Tanuja	1
73	Mrs. Anjali Darshan Patil	First Year	—	—	—	0
74	Ms.Jayshree R. Tayade	First Year	RTayade	Tayade	RTayade	2
75	Mrs. Puja Mayur Malu	First Year	—	Maly	Maly	2
76	Mr. Dashrath U. Chaudhari	First Year	DCM	—	DCM	2
77	Mr. Sachin Topalu Bhalerao	First Year				0
78	Dr. Mahesh V. Rawlani	MBA		—		1
79	Dr. Richa A. Modiyani	MBA		—		2
80	Ms.Faroza A. kazi	MBA		—		2
81	Mrs. Bharti P. Joshi	MBA				3
82	Mrs. Sakina Mujahid Husain	MBA				3
83	Mr. Rohan Suresh Patil	MBA	—	RSPatil	RSPatil	2
84	Ms. Vrushali Dinkar Sonawane	MBA			—	2
85	Dr. Puri Dinesh Dagadu	MCA				3
86	Ms. Sapana Ananrao Fegade	MCA			—	2
87	Mr. Aslan Shaikh	MCA			—	2
88	Ms. Dhanshee Rajendra Shinde	MCA	—	—	—	0
89	Ms. Chetana Mohan Kawale	MCA	Cmkawale	Cmkawale	Cmkawale	3
90	Ms. Vishakha Yadorao Pande	MCA				3
91	Ms.Bhagyashri Suresh Patil	MCA	—	—	Bpatil	1
92	Ms. Reeta Vinod Patil	MCA				0
93	Dr. Sudhir.S.Patil	Library			—	2
94	Nikita Gokul Patil	civil	—	NPatil	NPatil	2
95	V. S. Pawar	Mechanical				0
96	Ganesh Sonawane	civil	—	—	—	0