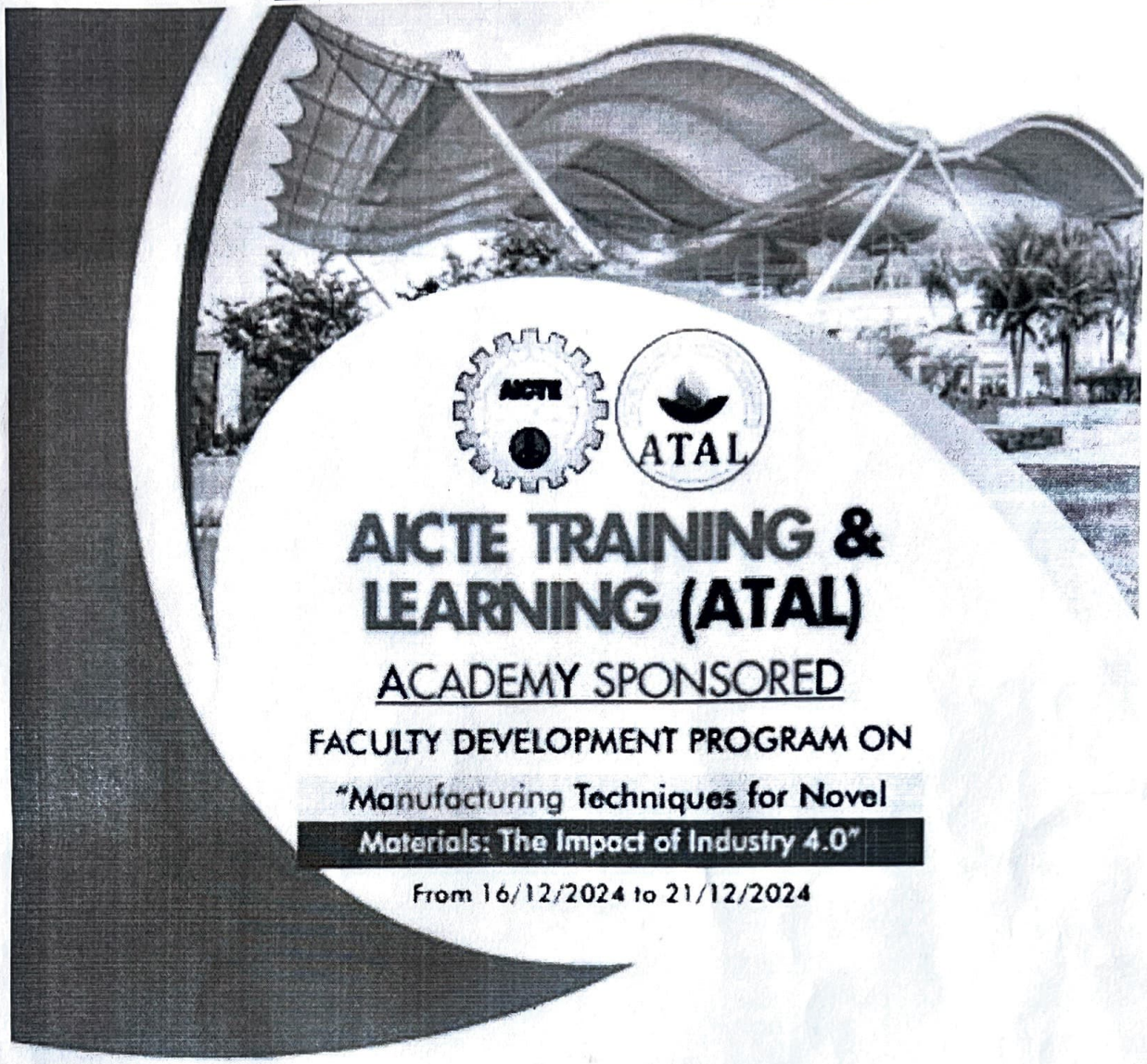
REPORT of AICTE ATAL FDP NO: 1715772131



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Department of Mechanical Engineering
MET's Institute of Engineering, Bhujbal Knowledge City,
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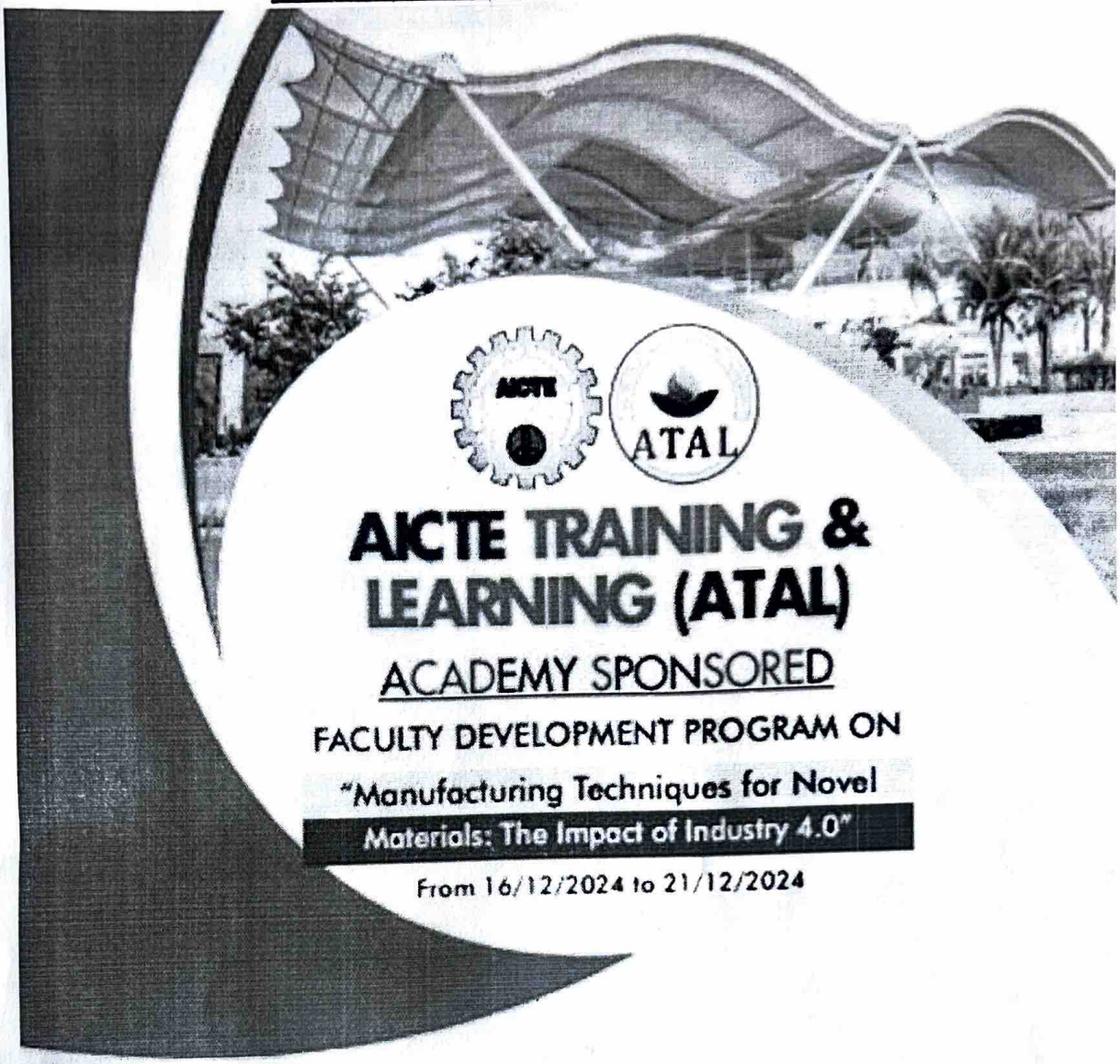

AICTE TRAINING & LEARNING (ATAL)

ACADEMY SPONSORED

FACULTY DEVELOPMENT PROGRAM ON

"Manufacturing Techniques for Novel Materials: The Impact of Industry 4.0"

From 16/12/2024 to 21/12/2024

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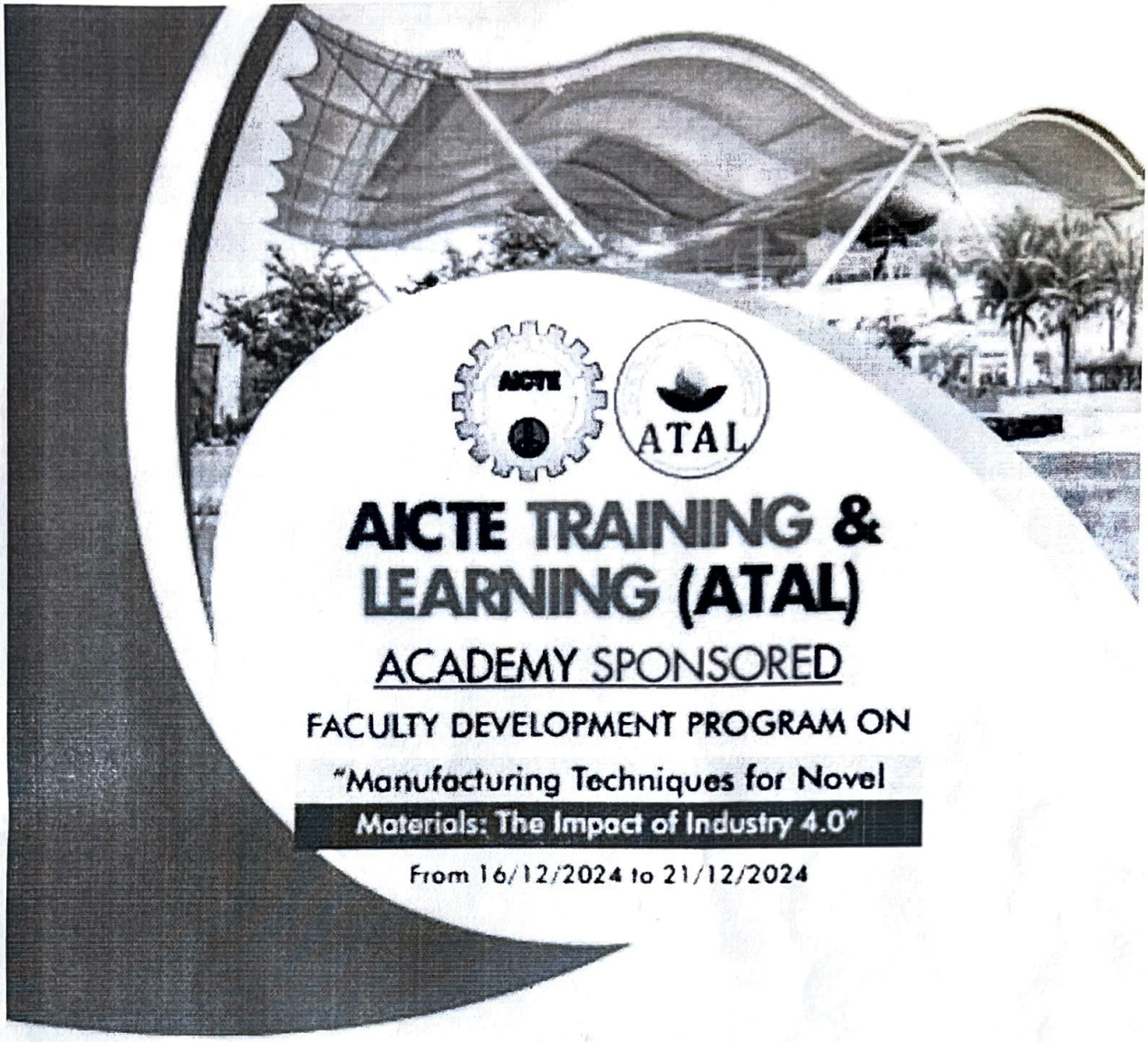

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AICTE TRAINING & LEARNING (ATAL) ACADEMY SPONSORED FACULTY DEVELOPMENT PROGRAM ON

"Manufacturing Techniques for Novel Materials: The Impact of Industry 4.0"

From 16/12/2024 to 21/12/2024

List of Participant ATAL FDP NO: 1715772131

Sr. No.	Participant Name	Name of Institute
1	Mr. Manik Shivaji Nathe 1	MET's IoE, Adgaon, Nashik
2	Mr. Nandkishor O Warbhe	MET's Institute of Technology-Polytechnic, Nashik
3	Mr. Amol Vadnere	METs Institute of Technology-Polytechnic, Nashik
4	Dr. Rahul R. Chakule	Loknete Gopinathji Munde IoE Education and Research,
5	Dr. Gaurav Dinkar Sonawane	METs IoT B.Tech, Nashik
6	Dr. Santosh Shelke	Government Polytechnic, Jalgaon
7	Mr. Prashant Badgujar	METs IoT B.Tech, Nashik
8	Dr. Chandrashekhar D. Mohod	Guru Gobind Singh CoE and Research Center, Nashik
9	Mr. Vishal Dhore	Guru Gobind Singh CoE & Research Centre, Nashik
10	Mr. Nilesh Sitaram Gaikwad	MVP's KBT College of Engineering, Nashik
11	Mr. Kishor Wamanrao Kale	KCT's Late G. N. Sapkal COE, Anjaneri
12	Mr. Nitin Aniruddha Kharche	Padm. Dr. V. B. Kolte College of Engineering, Malkapur
13	Mr. Harshal Balasaheb Wagh	MET BKC IOT Btech, Nashik
14	Dr. Sagarkumar J Aswar	MET BKC IOT Btech, Nashik
15	Mr. Santosh Rama Shekokar	Padm. Dr.V.B.Kolte College of Engineering, Malkapur
16	Mr. Patil Manoj Subhash	MVPS KBTCOE, Nashik
17	Mr. Ganesh Jagannath Pagar	SNJB'S Shri HHJB Polytechnic, Chandwad
18	Dr. Harshal Ashok Chavan 2	MET Institute of Engineering, Nashik
19	Dr. Amol Yograj Chaudhari 3	MET Institute of Engineering, Nashik
20	Dr. Sachin Kamalakar Dahake 4	MET's Institute of Engineering, Nashik
21	Mr. Ashwin Diliprao Patil 5	MET Institute of Engineering, Nashik
22	Dr. Sachin Prabhakar Kakade 6	MET Institute of Engineering, Nashik
23	Mr. Ramakant Madhukar	Dr. VO B Kolte college of Engineering, Malkapur
24	Mr. Nirgude Sharad Kisan 7	MET's Institute of Engineering, Nashik
25	Dr. Vishal N Sulakhe	Sandip University, Nashik
26	Mr. Pranav Gajanan Firke	Padm. Dr. V. B. Kolte College Of Engineering, Malkapur
27	Dr. Yugesh Kharche	Padmashri Dr. V. B. Kolte College of Engineering,
28	Mr. Vaibhav Eknath	MET BKC IOT Polytechnic, Nashik
29	Dr. Amol Rasane	Pune Vidyarthi Griha's College of Engineering, Nashik
30	Mr. Vishwas Palve	Vidyavardhini's College of Engineering & Technology,
31	Mr. Dipak J Chaudhari	Vidyavardhini's College of Engineering & Technology,
32	Dr. Aarti Rajendra Deshmukh	Ashland India Pvt. Ltd., Hydrabad
33	Mr. Jitendra Deepak Chavan	Thakur College of Engineering, Kandivali, Mumbai
34	Mr. Datta Pawase	Loknete Gopinathji Munde IoE Education & Research,
35	Mr. Rahul Namdev Chandore	SNJB's Late Sau K.B.Jain, COE, Chandwad
36	Mr. Dipak Harinarayan Darekar	SNJB CoE, Chandwad
37	Mr. Sudhir Ashok Shardul	Pune Vidyarthi Griha's College of Engineering & S. S.
38	Dr. Kiran Rameshrao Kaware	SOET, Sandip University, Nashik
39	Mr. Raju Sidhu Pawar	GES's R. H. Sapat COE M.S. & R, Nashik
40	Mr. Digambar Shankar	G E S's R. H. Sapat C O E M S & R Nashik
41	Miss. Mukti Pramod Kadam	Guru Gobind Singh Polytechnic, Nashik

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Sr. No.	Participant Name	Name of Institute
42	Mrs. Tapasya Pritish Gaikwad	Guru Gobind Singh Polytechnic, Nashik
43	Mr. Rahul Rajaram Sonawane	Jawahar Education Society's IoT, Management &
44	Mr. Pratik Kiran Sonawane	Matoshri College of Engineering and Research Centre, Nashik
45	Dr. Deshmukh Deepak	Pravara rural Engineering College Loni, Ahmednagar
46	Mr. Swapnil Dipak Ratanakar	Shatabdi IoE and Research, Nashik
47	Mr. Tushar D Patil	Sandip Foundation's SIEM, Nashik
48	Mr. Harshal Suresh Deore	SNJB's K B Jain College of Engineering, Chandwad
49	Mr. Sandip Vitthal Deshmukh	Amrutvahini Polytechnic, Sangmaner
50	Mr. Manoj Balasaheb Satpute	Amrutvahini Polytechnic, Sangmaner

Dr. D. D. Deshmukh
co-cordinator

Dr. S. D. Kalpande
Coordinator

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Department of Mechanical Engineering

Schedule of FDP

Day 1 (16/12/2024)	Day 2 (17/12/2024)	Day 3 (18/12/2024)	Day 4 (19/12/2024)	Day 5 (20/12/2024)	Day 6 (21/12/2024)
9:00 – 9:30- Inauguration					
9:30 – 12:00 Session 1 1. Name of the Expert :Prof.Prashant P. Date 2. Designation : Professor 3. Organization:IIT Bombay 4. Experience in Years:38 5. Topic to be taught: Smart Materials – Processing and Applications	9:30 – 12:00 Session 3 1. Name of the Expert : Prof. G. S. Dangayach 2. Designation : Professor-HAG 3. Organization: MNIT, Jaipur 4. Experience in Years: 35 5. Topic to be taught: Sustainable Manufacturing in the Era of Industry 4.0	9:30 – 12:00 Session 5 1. Name of the Expert :Dr. Vivek D. Kalyankar 2. Designation : Associate Professor 3. Organization: SVNIT, Surat 4. Experience in Years: 21 5. Topic to be taught: Modern Welding and Joining Technologies and Their Role in Industry 4.0	9:30 – 12:00 Session 7 1. Name of the Expert :Mr.AshishkumarUmap 2. Designation :Senior Manager 3. Organization: Hindustan Aeronautics Limited, Nashik 4. Experience in Years: 22 5. Topic to be taught:Data-Driven Manufacturing Processes and Role of IoT in Manufacturing Industries	9:00 – 11:30 Session 8 1. Name of the Expert : Prof. V. K. Soni 2. Designation : Professor 3. Organization: MANIT,Bhopal 4. Experience in Years:30 5. Topic to be taught: Novel Materials and Industry 4.0 - Research Avenues	9:30 – 12:00 Session 10 1. Name of the Expert : Dr. S. A. Mastud 2. Designation :Associate Professor 3. Organization: VJTI, Mumbai 4. Experience in Years: 20 5. Topic to be taught: Micromachining for Novel Materials
12:00 – 1:00 Article Discussion 1. Title of the Research Paper:Industry 4.0 Technologies: Critical Success Factors for Implementation and Improvements in Manufacturing Companies 2. Name of the journal:Production Planning & Control- Taylor and Francis 3. Year of Publication:2021	12:00 – 1:00 Article Discussion 1. Title of the Research Paper :On the Performance of Metallurgical Behaviour of Stellite 6 Cladding Deposited on SS316L Substrate with PTAW Process 2. Name of the journal:Canadian Metallurgical Quarterly (Taylor and Francis) 3. Year of Publication:2022	12:00 – 1:00 Article Discussion 1. Title of the Research Paper :Deposition Characteristics of Multitrack Overlay by Plasma Transferred Arc Welding on SS316Lwith Co-Cr Based Alloy–Influence of Process Parameters 2. Name of the journal: High Temperature Materials and Processes 3. Year of Publication: 2019	12:00 – 1:00 Hands on training /Labs: 3 D Printing and MCQ test	11:30 – 1:45 Session 9 1. Name of the Expert : Dr. P. William 2. Designation : Dean R and D 3. Organization: Sanjivani Group of Institutes, Kopargaon, MH, India Research Fellow, Western Caspian University, Baku, Azerbaijan Adjunct Faculty, Victorian Institute of Technology, Australia Research Affiliate, Amity University Dubai, UAE 4. Experience in Years: 12 5. Topic to be taught: Research Methodology	12:00 – 1:00 Article Summary
1:00 – 2:00 Lunch	1:00 – 2:00 Lunch	1:00 – 2:00 Lunch	01:00 – 1:30 Lunch	1:45 – 2:30 Lunch	1:00 – 2:00 Lunch
2:00 – 4:30 Session 2 1. Name of the Expert : Prof.BabasahebSankapal 2. Designation : Professor 3. Organization: VNIT, Nagpur 4. Experience in Years: 24 5. Topic to be taught: Novel Materials for Energy Harvesting and Storage Applications	2:00 – 4:30 Session 4 1. Name of the Expert : Mr. JaywantNagrale 2. Designation : Manager 3. Organization: BOSCH, Limited, Nashik 4. Experience in Years: 25 5. Topic to be taught: Material Characterization Techniques and Failure Investigations	2:00 – 4:30 Session 6 1. Name of the Expert :Dr. Dhiraj Deshmukh 2. Designation: Associate Professor 3. Organization: MET's IOE, Nashik 4. Experience in Years: 15 5. Topic to be taught:Advanced Coating and Surface Modifications Techniques	1:30 – 5:30 Industrial visit 1. Name of the Organization: Nashik Engineering Cluster 2. Complete address with pin code: "Sahastrarashmi" C-10, MIDC, Ambad, Nashik - 422010. Maharashtra 3. Industry Type: Engineering Cluster 4. Area of specification :Materials Additive manufacturing and surface treatments	2:30 – 4:30 Article Discussion 1. Title of the Research Paper : Optimization of Ultrasonic Assisted Friction Stir Welding (UAFSW) of Electrical Grade AA 6101T-64 and Cu 2. Name of the journal: International Journal on Interactive Design and Manufacturing (IJIDeM), Springer 3. Year of Publication: 2024	2:00 – 4:00 MCQ Test 5 & Reflection Journal
4:30 – 5:30 Hands on training /Labs: CNC Machine-MCQ Test 1	4:30 – 5:30 Hands on training /Labs: Material Testing- MCQ Test 2	4:30 – 5:30 Hands on training /Labs: FFT Analyser-MCQ Test 3		4:30 – 5:30 Hands on training /Labs: CAD/CAM-MCQ Test 4	4:00 – 5:00 Valedictory Session

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AICTE TRAINING & LEARNING (ATAL) ACADEMY SPONSORED FACULTY DEVELOPMENT PROGRAM ON "Manufacturing Techniques for Novel Materials: The Impact of Industry 4.0" From 16/12/2024 to 21/12/2024

REPORT of ATAL FDP NO: 1715772131

Day 1
Date: 16th December 2024

1.1 Inauguration (9:00 AM – 9:30 AM):

The AICTE Training & Learning (ATAL) Academy-sponsored Faculty Development Program (FDP) on **"Manufacturing Techniques for Novel Materials: The Impact of Industry 4.0"** was held from December 16 to 21, 2024. The inaugural session on December 16 began at 9:00 AM with a welcome address by Dr. D. D. Deshmukh, Co-Coordinator of the FDP. Prof. S. D. Kalpande, Coordinator and Head of the Department of Mechanical Engineering outlined the program's objectives, emphasizing its focus on Industry 4.0 technologies and their transformative impact on manufacturing and education. He highlighted how sessions would explore innovations like smart materials, artificial intelligence (AI), the Internet of Things (IoT), and automation, which are revolutionizing the design, production, and utilization of materials. He also discussed advancements in manufacturing techniques such as additive manufacturing, CNC machining, welding and joining, and micromachining, stressing the importance of updating academic curricula to align with these technologies.

Dr. Dhiraj Deshmukh, Co-coordinator of the FDP, introduced the chief guest, Prof. P.P. Date from IIT Bombay. Prof. Date was felicitated by Principal Prof. V.P. Wani before officially inaugurating the program. In his address, Prof. Wani underscored the importance of Faculty Development Programs in bridging the gap between academia and the rapidly evolving industrial landscape. He spoke about the need for faculty members to stay updated on technological advancements to ensure the delivery of high-quality education. He emphasized the transformative impact of Industry 4.0 technologies—automation, data exchange, IoT, and smart systems—on the manufacturing sector. Prof. Date then explored the role of smart and novel materials in advanced manufacturing processes, particularly their applications in energy efficiency, sustainability, and innovation.

Prof. Date encouraged participants to actively engage, collaborate with experts, and embrace continuous learning to address challenges in research and industry. He appreciated the organizing team, speakers, and participants for their contributions, making the FDP a platform for knowledge sharing and growth. The session concluded with Prof. Kalpande and Dr. Deshmukh reiterating the program's significance and extending their gratitude to all involved. The inaugural session, marked by the felicitation of the chief guest, set the tone for an engaging and enriching series of discussions over the following days.

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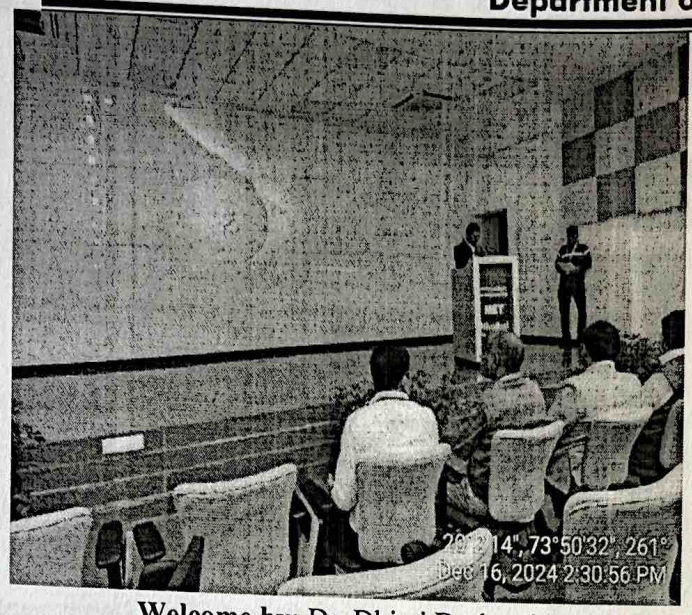
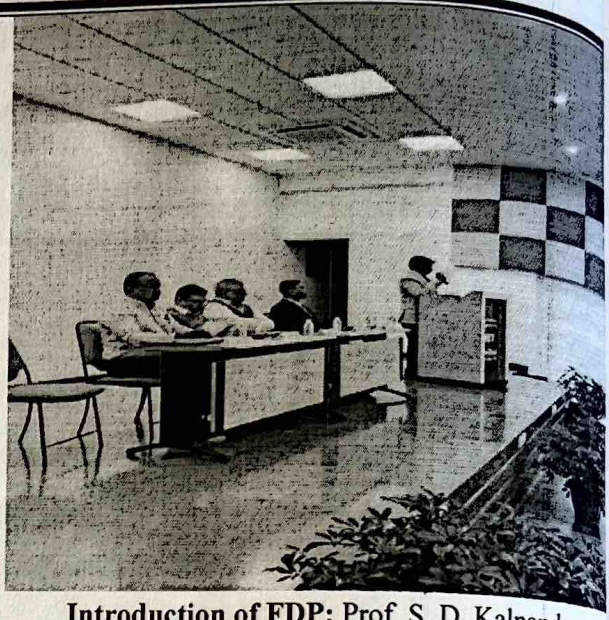
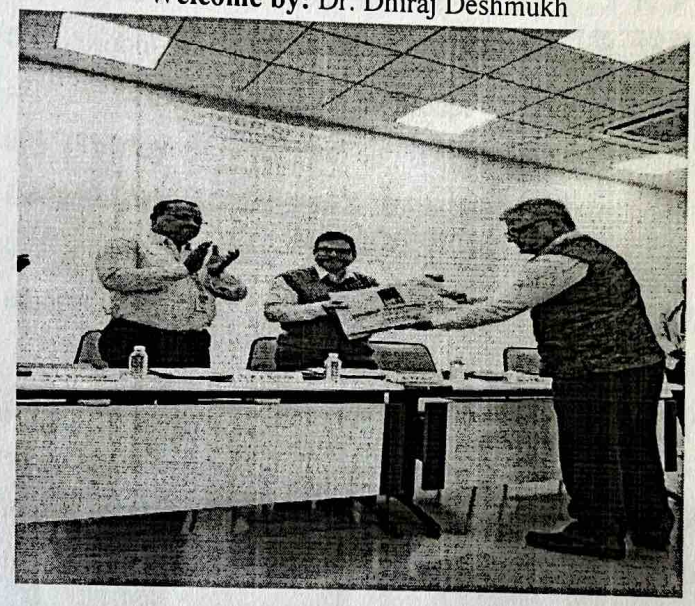


Welcome by: Dr. Dhiraj Deshmukh



Introduction of FDP: Prof. S. D. Kalpande



Felicitation of Chief Guest Prof. P. P. Date by Principal Prof. V. P. Wani

Inaugural speech: Prof. V. P. Wani, Principal

1.2 Session 1: (9:30 AM – 12:00 PM)

The first session featured **Prof. Prashant P. Date**, professor at IIT Bombay, as the speaker. Prof. Date delivered an insightful lecture on the topic **"Smart Materials – Processing and Applications,"** providing a comprehensive overview of the subject. He began by introducing smart materials and highlighting their unique properties that distinguish them from conventional materials. Prof. Date discussed advanced techniques for processing smart materials, emphasizing their role in enhancing manufacturing efficiency and enabling innovative solutions. He also explored the industrial applications of smart materials, particularly their integration with Industry 4.0 technologies. The talk shed light on how these materials are shaping the future of manufacturing, making the session an engaging and informative experience for all participants.

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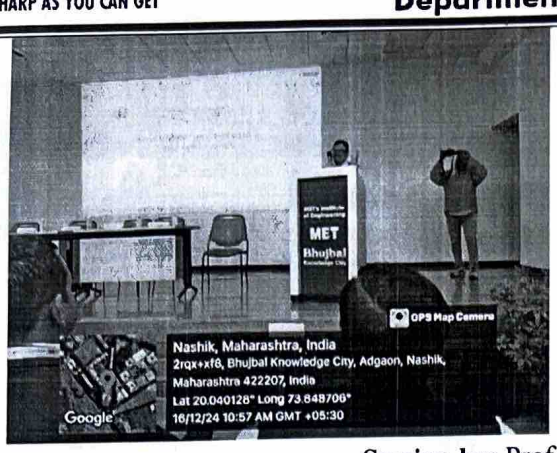
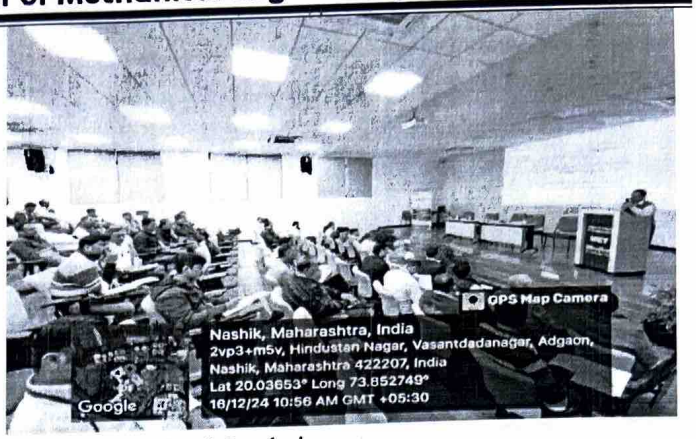




Session by: Prof. P. P. Date, IITB, Mumbai

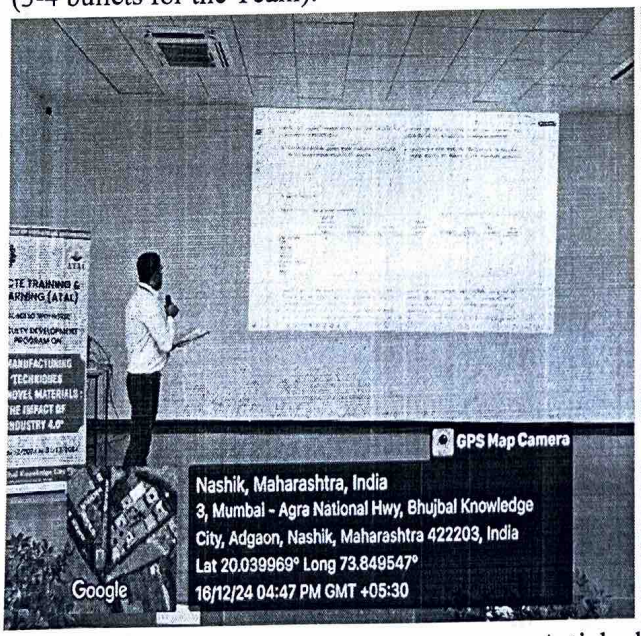
1.3 Article Discussion: (12:00 PM – 1:00 PM)

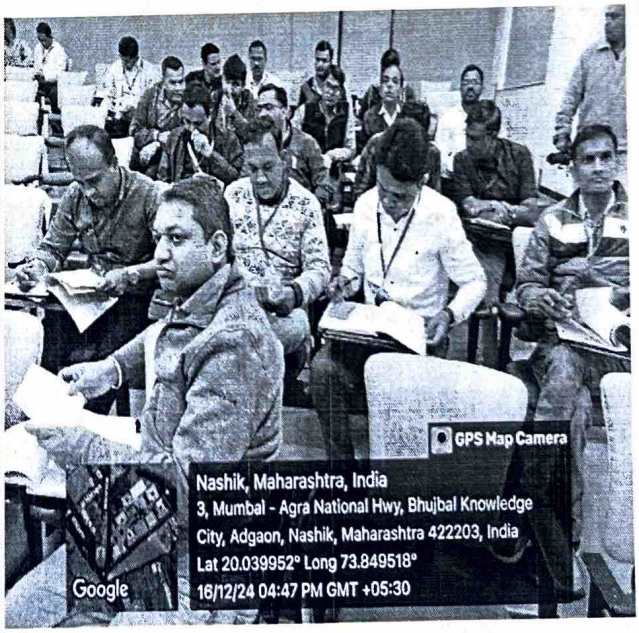
Research Paper: Industry 4.0 Technologies: Critical Success Factors for Implementation and Improvements in Manufacturing Companies.

- **Journal**: Production Planning & Control (Taylor and Francis)
- **Publication Year**: 2021

Participants were grouped in a team which includes 5 participants per team and they were engaged in a detailed discussion, analyzing key success factors and challenges associated with implementing Industry 4.0 technologies in the manufacturing sector. The session facilitated knowledge sharing and enhanced understanding of how Industry 4.0 impacts production systems.

After a thorough review of article by the group a template is provided with each group to write an article summary which includes **Key Principles/Practices from the Article** (3-4 bullets for the Team), Application of **Principles/Practices in your Function** (Individual) and **Key Takeaways from the Article** (3-4 bullets for the Team).





Article discussion

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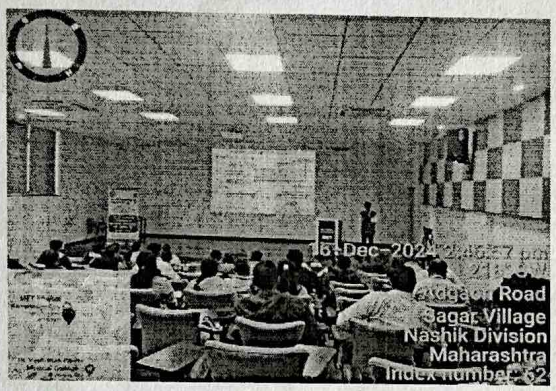
1.4 Session 2: (2:00 PM – 4:30 PM)

The second session featured Prof. Babasaheb Sankapal, a distinguished professor from VNIT Nagpur, as the resource person. Prof. Sankapal delivered an in-depth lecture on the topic **"Novel Materials for Energy Harvesting and Storage Applications,"** shedding light on cutting-edge developments in this critical area. Prof. Sankapal began by emphasizing the role of novel materials in addressing the global demand for sustainable energy solutions. He explained how innovative materials are being developed to optimize energy harvesting systems, making them more efficient and environmentally friendly. The session explored advanced applications of these materials in energy storage devices such as batteries and supercapacitors, highlighting their importance in achieving energy efficiency and reliability.

He also discussed the challenges involved in material development, including scalability, cost-effectiveness, and integration into existing energy systems. The session was highly engaging, with participants gaining a comprehensive understanding of how novel materials are revolutionizing energy systems. Prof. Sankapal encouraged questions and discussions, fostering an interactive learning environment. His detailed explanations and real-world examples provided a solid foundation for participants to explore research opportunities and industrial collaborations in the domain of energy harvesting and storage.



Session by: Prof. Babasaheb Sankapal, VNIT Nagpur

1.5 Hands-On Training (4:30 PM – 5:30 PM) by Dr. Amit S. Patil
Topic: CNC Machining

The final session of the day, held from 4:30 PM to 5:30 PM, provided hands-on training on CNC machining, with a specific focus on Canned Cycles. This session aimed to enhance participants' technical proficiency through practical demonstrations and real-time machine operations. The fundamentals and practical applications of canned cycles pre-programmed subroutines designed to simplify repetitive operations in CNC machines were thoroughly covered. Key aspects of the training included an introduction to various canned cycles, such as drilling cycles like G73 for high-speed peck drilling and G83 for deep-hole drilling. Tapping cycles, such as G84 for tapping operations, and cycles for boring and reaming, including G76 for fine boring and G85 for reaming, were also explained. Additionally, the session covered turning operations, detailing the use of canned cycles like G70, G71, and G72, with practical examples provided to illustrate their implementation.

1.6 MCQ Test 1: MCQ test was conducted to evaluate the participants' understanding of the hands on training covered on Day 1.

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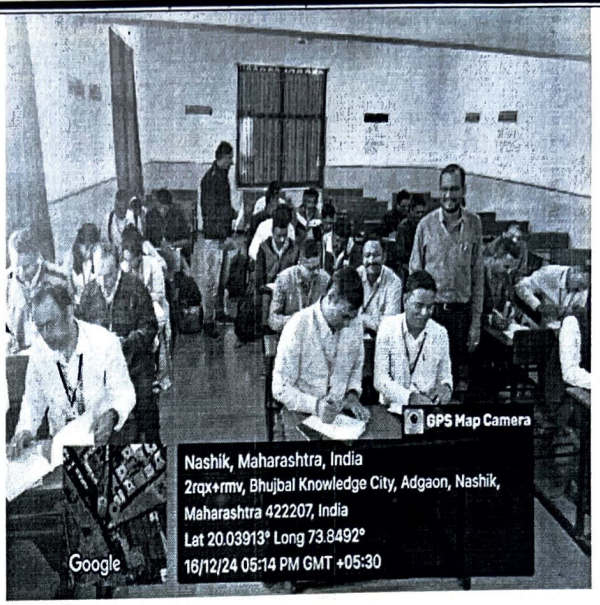
Hands on session on CNC Canned Cycle



MCQ Test

Day 2
Date: 17th December 2024

2.1 Session 3: (9:30 AM – 12:00 PM)

The second day of the AICTE Training & Learning (ATAL) Academy-sponsored Faculty Development Program (FDP) began with Session 3, titled **"Sustainable Manufacturing in the Era of Industry 4.0,"** conducted from 9:30 AM to 12:00 PM. The session was led by **Prof. G. S. Dangayach, Professor-HAG at MNIT Jaipur**. Prof. Dangayach delivered an insightful presentation on **Sustainable Manufacturing in the Era of Industry 4.0**, emphasizing their growing importance in modern industrial ecosystems. He highlighted how Industry 4.0 technologies, such as the Internet of Things (IoT), Artificial Intelligence (AI), and automation, are driving eco-friendly production processes. Through real-world examples and case studies, Prof. Dangayach illustrated successful sustainable manufacturing initiatives, demonstrating their practical application and long-term benefits. He addressed the challenges industries face in adopting sustainable practices and provided strategies to overcome them while leveraging the tools offered by Industry 4.0.

Participants gained a comprehensive understanding of the opportunities for innovation and the necessity of adopting sustainable practices in the era of smart manufacturing. The session offered valuable insights into the interplay between advanced technologies and environmental stewardship, equipping attendees with actionable knowledge to implement sustainable strategies in their own fields.

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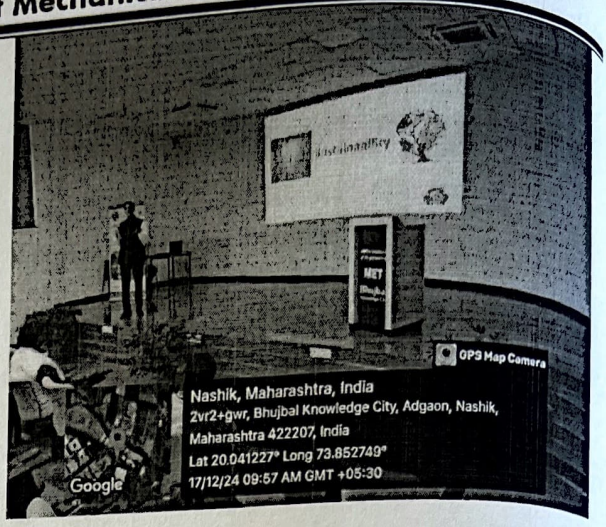

Session by: Prof. G. S. Dangayach, MNIT Jaipur

2.2 Article Discussion (12:00 PM – 1:00 PM)

Research Paper Title: On the Performance of Metallurgical Behaviour of Stellite 6 Cladding Deposited on SS316L Substrate with PTAW Process

- **Journal: Canadian Metallurgical Quarterly (Taylor and Francis)**
- **Publication Year: 2022**

Dr. Dhiraj Deshmukh headed a comprehensive discussion on the metallurgical performance of Stellite 6 cladding on SS316L substrates using the Plasma Transferred Arc Welding (PTAW) process. The key points covered included:

- Microstructural changes and their influence on mechanical properties.
- Process optimization and its impact on cladding performance.
- Applications and challenges of advanced surface modification techniques.

The participants engaged actively in the discussion, raising queries about the practical implications and the role of PTAW in industry applications.

After a thorough review of article by the group a template is provided with each group to write an article summary which includes Key Principles/Practices from the Article (3-4 bullets for the Team), Application of Principles/Practices in your Function (Individual) and Key Takeaways from the Article (3-4 bullets for the Team).

Article Discussion

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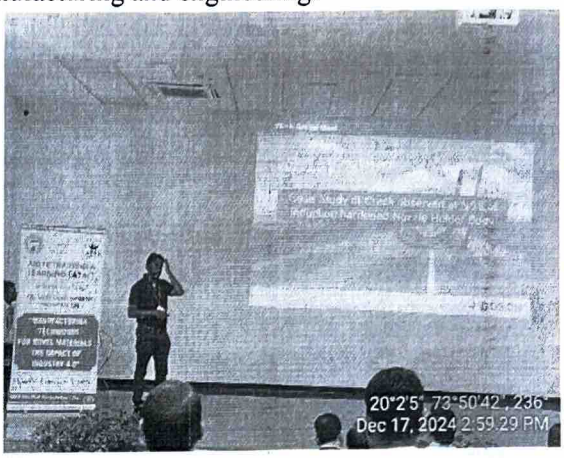
2.3 Session 4: (2:00 PM – 4:30 PM)

The next session was led by **Mr. Jaywant Nagrale**, Manager at **BOSCH Limited, Nashik,** who brought 25 years of extensive industry experience to his presentation on **"Material Characterization Techniques and Failure Investigations."** In this engaging session, Mr. Nagrale delved into the various techniques used for material characterization, including Scanning Electron Microscopy (SEM), Energy Dispersive Spectroscopy (EDS), X-Ray Diffraction (XRD), and spectroscopy. He provided a detailed explanation of how these techniques are employed to analyze material properties and structures. Mr. Nagrale also discussed failure analysis methodologies, focusing on identifying the root causes of material failures. By illustrating these concepts with industrial case studies, he demonstrated how characterization and failure analysis have been effectively applied to address real-world challenges in manufacturing and engineering.



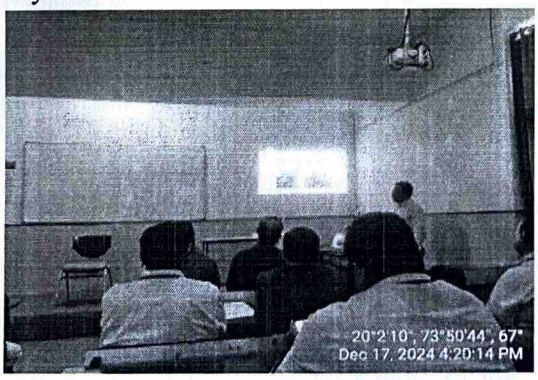
Session by: Mr. Jaywant Nagrale, Manager BOSCH Limited, Nashik

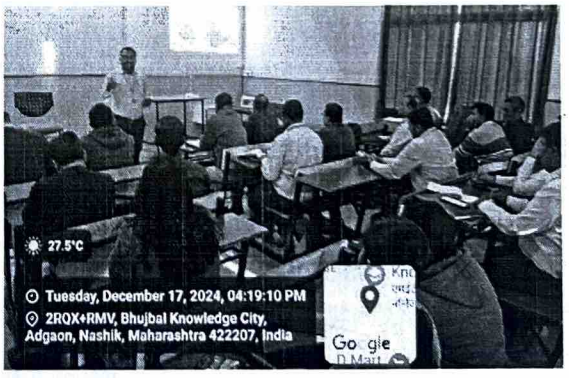
2.4 Hands-On Training (4:30 PM – 5:30 PM) by Prof. D. P. Panchave

Topic: Material Testing

- Microstructural analysis techniques for understanding material behaviour.
- Demonstration of laboratory equipment and analysis procedures.
- Practical testing of sample materials and interpretation of results.

Participants gained valuable exposure to laboratory procedures, enhancing their skills in material testing and analysis.





Hands on session Material microstructure testing

2.5 MCQ Test 2: The day concluded with an MCQ-based assessment to evaluate participants' understanding of the topics covered material testing. The test provided a platform for participants to reflect on their learnings and reinforced key concepts discussed throughout the sessions.

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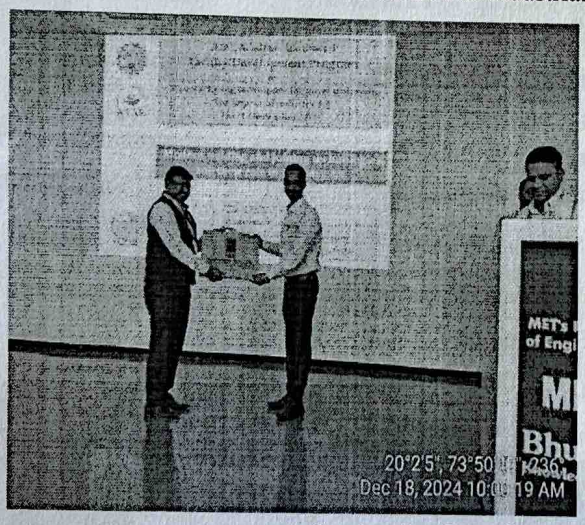
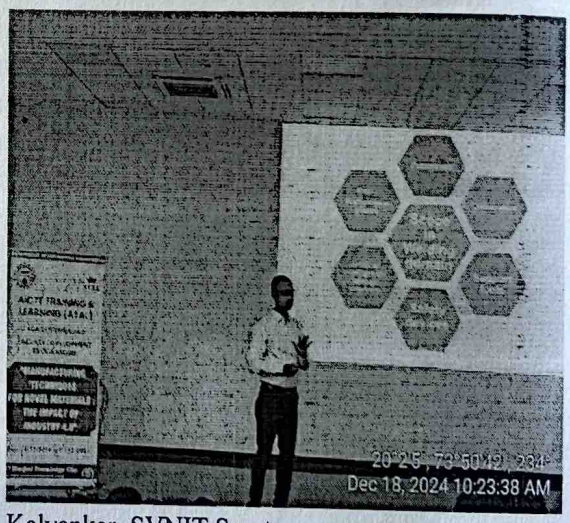
Day 3
Date: 18th December 2024

3.1 Session 5: (9:30 AM – 12:00 PM)

Dr. Vivek D. Kalyankar, Associate Professor at SVNIT, Surat with 21 years of experience, conducted an engaging session on **"Modern Welding and Joining Technologies and Their Role in Industry 4.0."** on Day 3 of the Faculty Development Program, from 9:30 AM to 12:00 PM,

Dr. Kalyankar provided an in-depth exploration of advanced welding techniques and their integration into the framework of Industry 4.0. The session highlighted the transformative impact of automation and digital manufacturing on modern fabrication methods. A key focus was placed on the role of smart sensors and real-time monitoring systems in enhancing welding accuracy and reliability. Dr. Kalyankar also discussed the application of Artificial Intelligence (AI) and Machine Learning (ML) in predictive analysis, which helps anticipate defects and optimize welding parameters for superior outcomes. Furthermore, the session examined how Industry 4.0 technologies contribute to improved quality control and production efficiency in welding processes, showcasing their potential to revolutionize traditional practices. By integrating these emerging technologies, manufacturers can achieve greater precision, reduce waste, and streamline operations. Participants left the session with a comprehensive understanding of how modern welding and joining technologies are evolving in response to digital advancements, equipping them to embrace these innovations in academic and industrial settings.





Session by: Dr. Vivek D. Kalyankar, SVNIT Surat

3.2 Article Discussion (12:00 PM – 1:00 PM)

Research Paper Title: Optimization of Ultrasonic Assisted Friction Stir Welding (UAFSW) of Electrical Grade AA 6101T-64 and Cu

- **Journal: International Journal on Interactive Design and Manufacturing (IJIDeM), Springer**
- **Year of Publication: 2024**

Prof. Kalpande introduced the concept of Ultrasonic Assisted Friction Stir Welding (UAFSW), which combines traditional Friction Stir Welding (FSW) with ultrasonic vibrations to enhance joint quality, reduce welding forces, and improve material flow. The research focused on welding two materials AA 6101T-64

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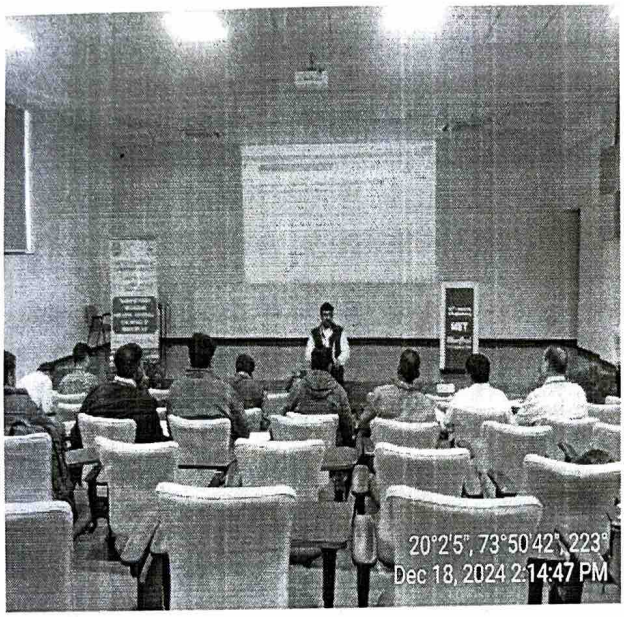
aluminum alloy and copper commonly used in electrical and thermal applications. The paper outlined the objectives of optimizing welding parameters to achieve improved tensile strength, microstructural refinement, and the reduction of defects such as voids and cracks. Parameters such as tool rotation speed, welding speed, ultrasonic frequency, and amplitude were systematically optimized using Taguchi's method and Response Surface Methodology (RSM).

Dr. Kalpande concluded the discussion by highlighting the principles of Friction Stir Welding and Ultrasonic Assistance, emphasizing how ultrasonic vibrations promote grain refinement and improve material flow. He also explained the role of optimization techniques like statistical and experimental design tools in identifying the best welding parameters. The session underscored the potential of UAFSW for joining dissimilar materials, particularly in electrical and thermal systems, marking it as a promising technique for the manufacturing and electrical sectors.

After a thorough review of article by the group a template is provided with each group to write an article summary which includes Key Principles/Practices from the Article (3-4 bullets for the Team), Application of Principles/Practices in your Function (Individual) and Key Takeaways from the Article (3-4 bullets for the Team).



Article Discussion by: Prof. S. D. Kalpande

3.3 Session 6: (2:00 0M – 4:30 PM)

Dr. Dhiraj D. Deshmukh delivered a session focused on **Advanced Coating and Surface Modification Techniques**, providing participants with a deep dive into the fundamental concepts, recent advancements, and practical applications of surface engineering. Dr. Deshmukh began the session by introducing various coating techniques, discussing both traditional and advanced methods. He emphasized the role of coatings in improving material properties such as wear resistance, corrosion protection, and aesthetic appeal. The discussion then moved to surface modification methods, covering techniques like thermal spraying, physical vapor deposition (PVD), chemical vapor deposition (CVD), and electroplating. Dr. Deshmukh also provided insights into cutting-edge technologies such as laser-based and plasma-assisted surface modifications, highlighting their importance in modern manufacturing processes. The session explored the diverse

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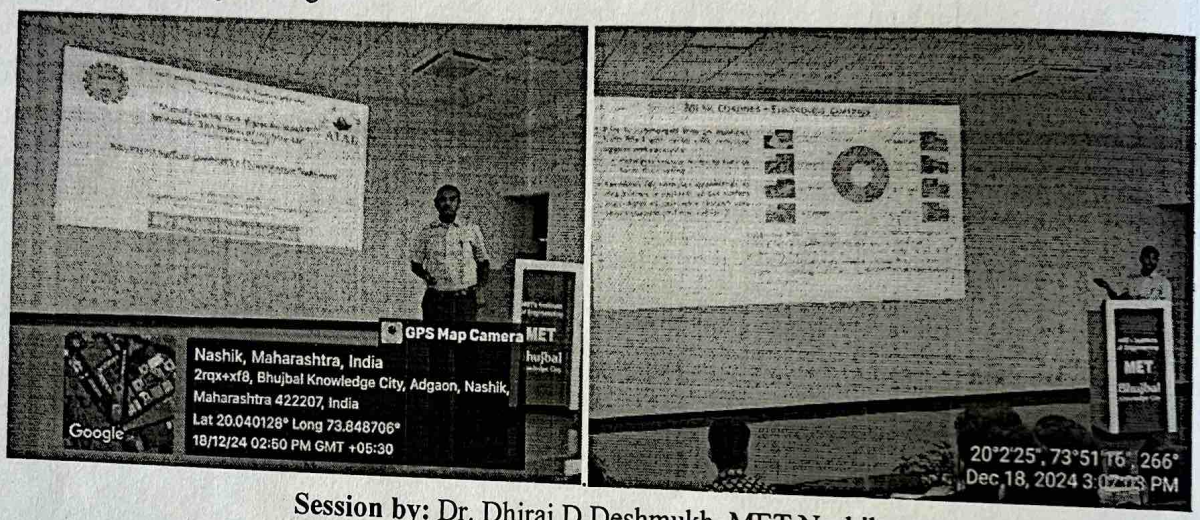
applications of advanced coatings across various industrial sectors, including automotive, aerospace, biomedical, and energy industries. Dr. Deshmukh presented real-world case studies demonstrating how these coatings significantly extend the lifespan of materials, offering practical examples of their impact on performance and durability. Throughout the session, participants were encouraged to engage in interactive discussions and Q&A sessions, which helped bridge theoretical knowledge with practical applications.

Dr. Deshmukh concluded by stressing the importance of innovative coating techniques in modern engineering and encouraged participants to explore this field further through research and application. The session was both informative and well-received by the attendees, offering valuable insights into the evolving field of surface engineering.



Session by: Dr. Dhiraj D Deshmukh, MET Nashik

3.4 Hands-On Training (4:30 PM – 5:30 PM) by Dr. S. R. Suryawanshi
Topic: FFT Analyzer
Key Highlights:
The hands-on session involved training on the FFT (Fast Fourier Transform) Analyzer. The practical demonstration included:

- Basics of FFT and its role in analysing signal frequencies.
- Real-time data acquisition and analysis.
- Practical applications in vibration analysis and fault detection in manufacturing.

Participants actively performed exercises and experiments using the FFT Analyzer, enhancing their practical skills.

3.5 MCQ Test 3: An MCQ-based test was conducted to assess participants' understanding of the hands on sessions on FFT.

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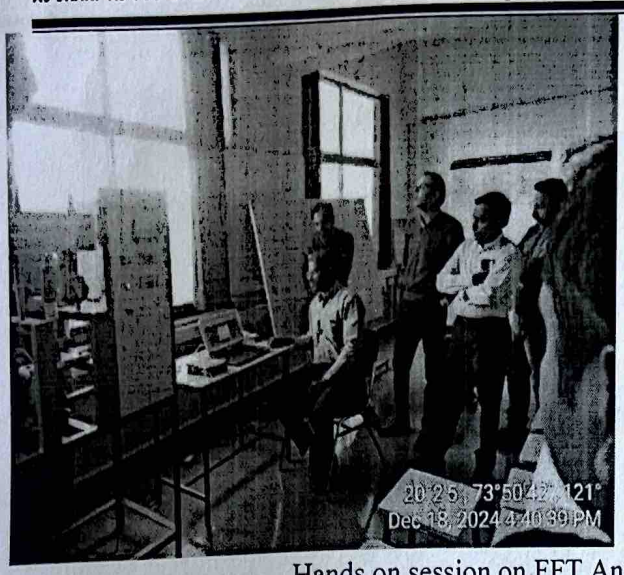
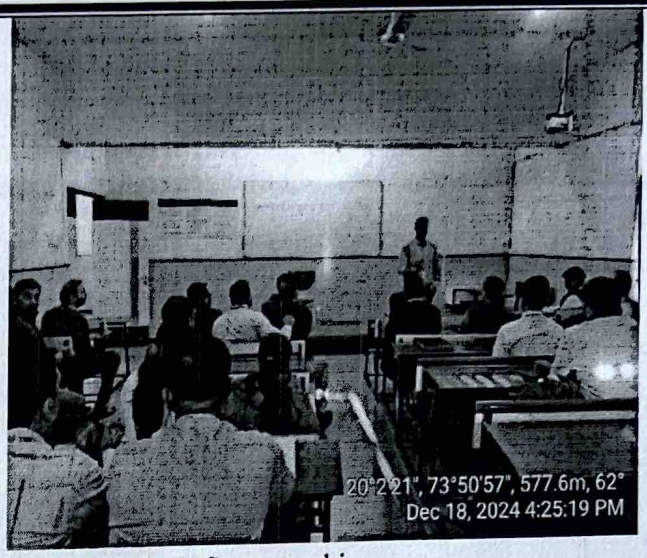


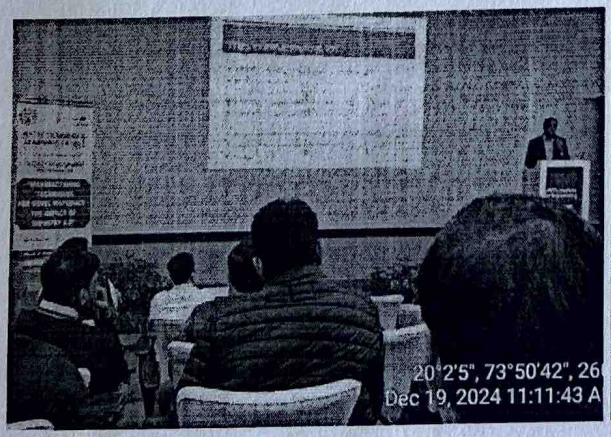


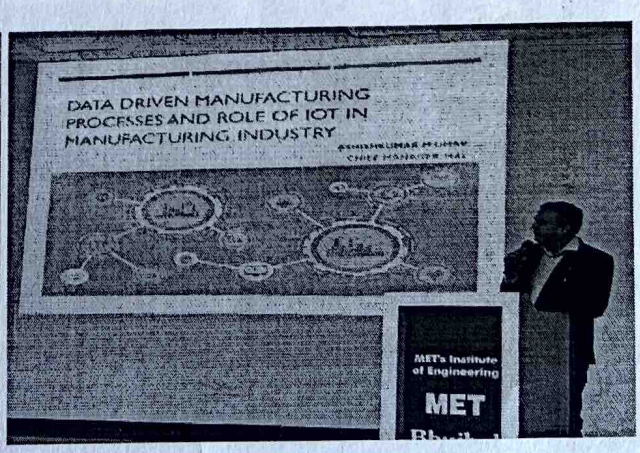
Hands on session on FFT Analyser by Dr. S. R. Suryavanshi

Day 4
Date: 19th December 2024

4.1 Session 7: (9:30 AM – 12:00 PM)

Mr. Ashishkumar Umap (Senior Manager, Hindustan Aeronautics Limited, Nashik) delivered an insightful session on **Data-Driven Manufacturing Processes and the Role of IoT in Manufacturing Industries.** He began by discussing the integration of the Internet of Things (IoT) for real-time monitoring and optimization of manufacturing workflows, highlighting its potential to enhance operational efficiency. He also emphasized the benefits of predictive maintenance, which can significantly reduce downtime by anticipating equipment failures before they occur. The session included several case studies, showcasing the successful application of data analytics in manufacturing to improve both efficiency and quality. Additionally, Mr. Umap led a discussion on the challenges faced in the industry, particularly around the implementation of advanced technologies, and explored future trends, including the role of AI-driven automation in further revolutionizing manufacturing processes. The session was highly interactive, with participants actively engaging in Q&A and sharing their perspectives on the application of IoT in their respective fields, making it a valuable learning experience for all.





Session by: Mr. Ashishkumar Umap, HAL Nashik

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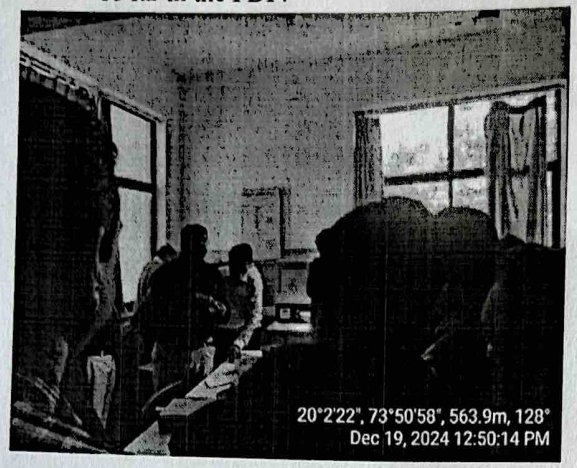
4.2 Hands-On Training (12:00 PM – 1:00 PM) by Mr. V. P. Tawalkar

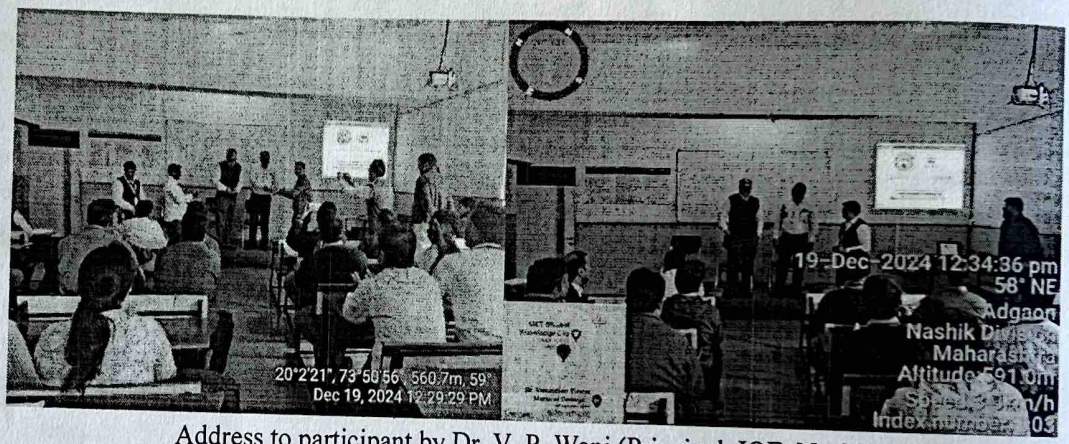
Topic: 3D Printing

Highlights: Participants received practical exposure to 3D printing technologies.

- Demonstration included material selection, design preparation, and actual printing.
- The session concluded with MCQ Test 4, assessing participants' understanding of concepts covered so far in the FDP.



Hands on training on 3 D Printing



Address to participant by Dr. V. P. Wani (Principal, IOE, Nashik)

4.3 Industrial Visit (1.30 PM-5.30 PM)

Venue: Nashik Engineering Cluster
Address: "Sahastrarashmi," C-10, MIDC, Ambad, Nashik - 422010, Maharashtra.
Industry Type: Engineering Cluster
Area of Specification: Materials Testing, Additive Manufacturing, and Surface Treatments
Overview: On the 4th day of the program, an industrial visit was conducted at Nashik Engineering Cluster, located at "Sahastrarashmi," C-10, MIDC, Ambad, Nashik - 422010, Maharashtra. Held from 1:30 PM to 5:30 PM, the visit provided participants with an invaluable opportunity to observe advanced manufacturing techniques and Industry 4.0 applications in a practical industrial setting.

The visit included a guided tour of the state-of-the-art facilities, showcasing areas of specialization such as materials testing, additive manufacturing, and surface treatments. Participants were given live demonstrations of cutting-edge equipment used in quality testing and 3D printing, offering insights into the precision and efficiency of modern industrial practices. The program also facilitated discussions with industry experts, who shared their perspectives on ongoing innovations and their transformative impact on

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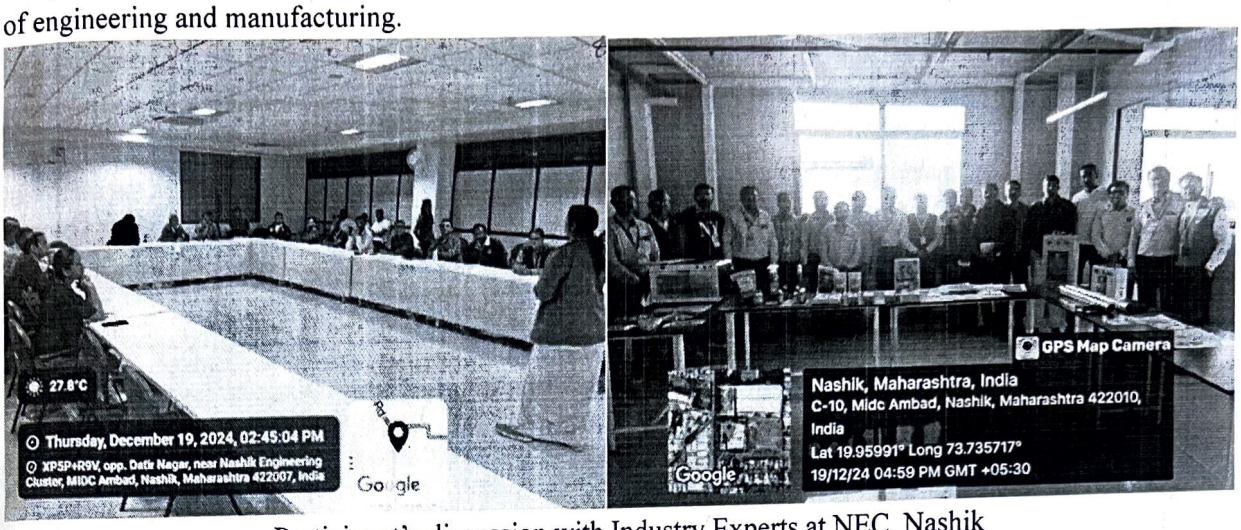
various sectors. This visit underscored the critical importance of collaboration between academia and industry in keeping pace with rapid technological advancements. It provided participants with a comprehensive understanding of how advanced technologies and innovative processes are driving the future of engineering and manufacturing.



Participant's discussion with Industry Experts at NEC, Nashik

Group Photo of Participants at NEC Nashik

Day 4 of the ATAL FDP was highly engaging and productive. The expert lecture, hands-on training, and industrial visit together provided participants with a comprehensive understanding of modern manufacturing techniques and Industry 4.0 technologies. The knowledge gained will be instrumental in fostering innovation and enhancing professional practices. After Industrial visit the group of participant are provided with the blank visit report for writing visit summary which includes key learning's and takeaways of visit.

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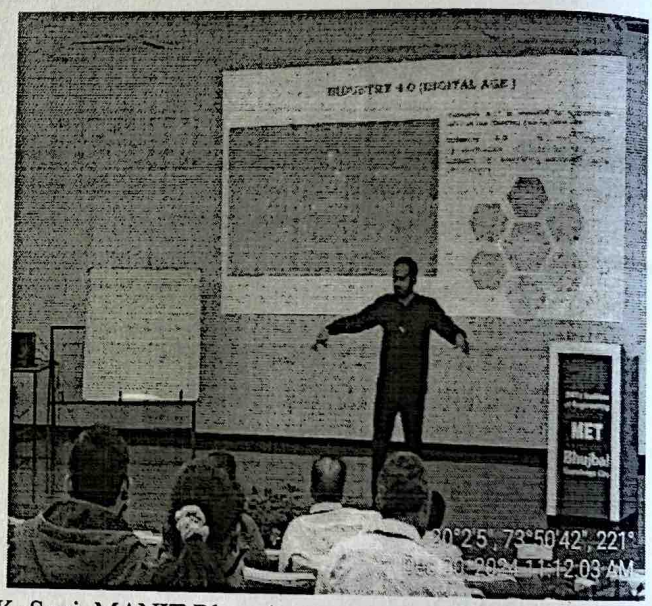
Day 5
Date: 20th December 2024

5.1 Session 8: (9:00 AM – 11:30 AM)

On day 5, Session 8 of the program, held on 20th December 2024 from 9:30 AM to 11:30 AM, **Prof. V. K. Soni**, a distinguished Professor from MANIT, Bhopal, with 30 years of experience, delivered a thought-provoking session on the topic **"Novel Materials and Industry 4.0 - Research Avenue."** Prof. Soni provided valuable insights into the transformative impact of Industry 4.0 technologies, such as IoT, AI, and robotics, on the field of novel materials and advanced manufacturing techniques. The session focused on the challenges and opportunities associated with integrating Industry 4.0 into material research, highlighting the importance of overcoming these hurdles to unlock the full potential of modern manufacturing systems. Prof. Soni also shed light on emerging trends and future research avenues in the development and application of novel materials, emphasizing their critical role in sustainable and intelligent solutions. He stressed the need for collaborative, multidisciplinary research approaches to address the complexities of advanced manufacturing. The session effectively underscored the significant influence of Industry 4.0 technologies in shaping the future of material science and reinforced the importance of aligning material research with industrial advancements to achieve sustainable growth.



Session by: Prof. V. K. Soni, MANIT Bhopal

5.2 Session 9: (11:30 PM – 1:45 PM)

The session **on "Research Methodology"** by **Dr. P. William,** held from 11:30 AM to 1:45 PM, was an enriching and comprehensive presentation that covered key aspects of academic research. Dr. William provided detailed insights into research tools, journal selection, publication strategies, and approaches to identifying research gaps and needs. The session proved to be a valuable component of the ATAL FDP, equipping participants with essential skills and strategies to enhance their research practices while emphasizing the significance of ethics and academic integrity.

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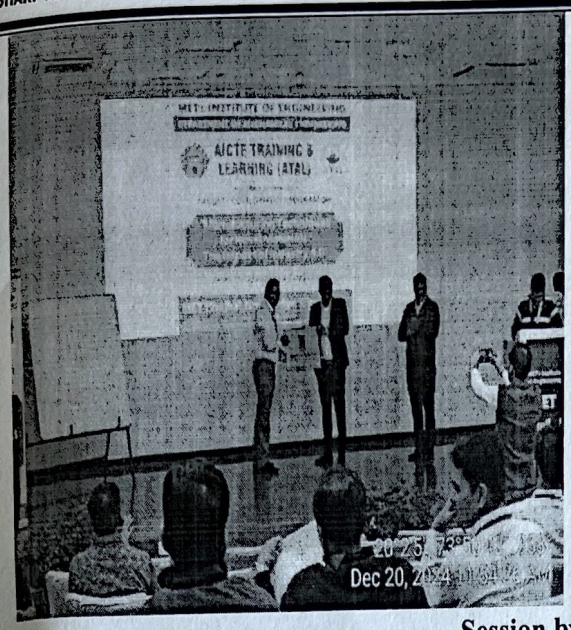

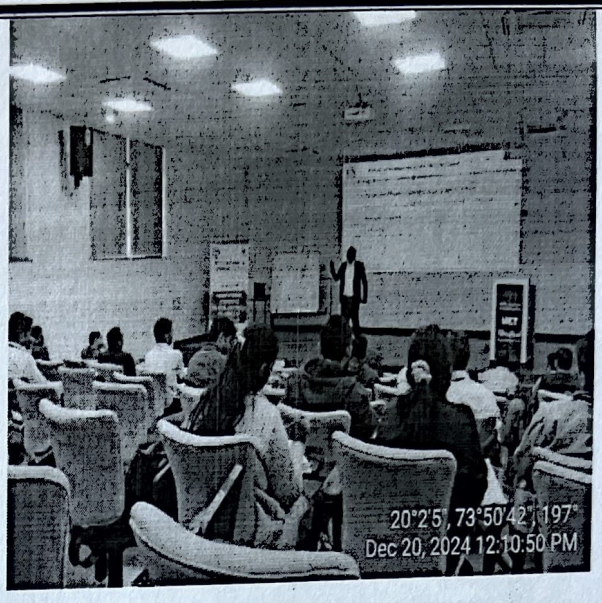

Session by: Dr. P. William

Dr. William began by introducing various tools and techniques for research and data analysis, highlighting software and methodologies that streamline data organization and interpretation. The discussion emphasized the importance of selecting tools that align with specific research objectives to ensure accuracy and efficiency. Participants also received practical tips on journal selection, including guidelines on assessing journal indexing, impact factors, and other quality metrics to maximize the visibility and impact of their publications. The session further explored strategies for identifying and defining research topics, encouraging participants to align their goals with societal, academic, and industrial needs while addressing current trends and gaps. Dr. William also underscored the importance of ethical research practices, discussing ways to maintain originality, avoid plagiarism, and uphold academic integrity.

To make the session interactive and relatable, Dr. William incorporated real-life examples and case studies, addressing participant queries with practical insights. The key takeaways included the role of advanced tools in simplifying the research process, the significance of thoughtful journal selection, the need to focus on solving real-world problems, and the importance of ethical practices for sustained academic credibility. This session served as a guide for participants to navigate the complexities of research methodology effectively.

5.3 Article Discussion: 2:30 PM – 4:00 PM

- **Research Paper Title**: Deposition Characteristics of Multitrack Overlay by Plasma Transferred Arc Welding on SS316L with Co-Cr Based Alloy – Influence of Process Parameters
- **Journal**: High Temperature Materials and Processes, **Year**: 2019

The article discussion held from 2:30 PM to 4:00 PM focused on the research paper titled "Deposition Characteristics of Multitrack Overlay by Plasma Transferred Arc Welding on SS316L with Co-Cr Based Alloy – Influence of Process Parameters" presented by Dr. Dhiraj Deshmukh. Published in the journal High Temperature Materials and Processes in 2019, the paper explores the advanced deposition processes of Plasma Transferred Arc (PTA) welding and its applications. Dr. Deshmukh provided a detailed explanation of the principles and methodologies discussed in the paper, emphasizing the deposition process and its critical role in enhancing overlay quality. He elaborated on the influence of various process parameters on the mechanical properties of the overlays and their significance in achieving high-performance outcomes. The session also highlighted the practical applications of SS316L overlays, particularly in environments demanding superior high-temperature performance. Key takeaways from the discussion included the

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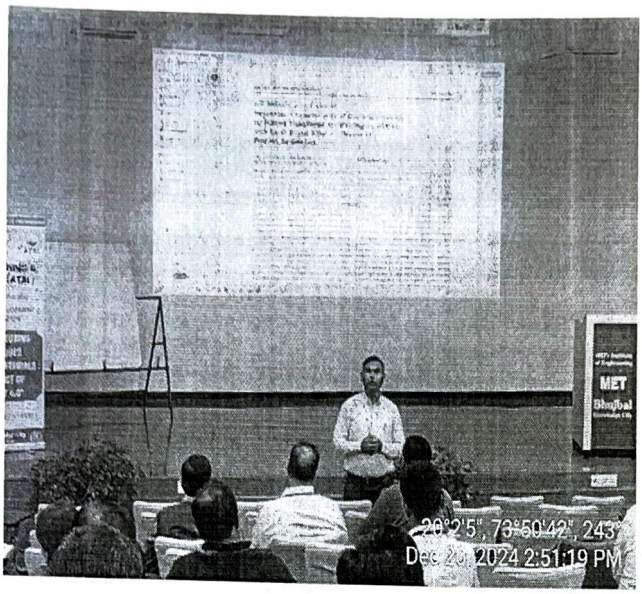
importance of optimizing process parameters to ensure high-quality overlays and the advantages of using Co-Cr based alloys to improve the thermal and mechanical performance of SS316L components. The session provided participants with a deeper understanding of the technological advancements in PTA welding and its implications for industrial applications.



Article discussion by: Dr. Dhiraj Deshmukh

After a thorough review of article by the group a template is provided with each group to write an article summary which includes Key Principles/Practices from the Article (3-4 bullets for the Team), Application of Principles/Practices in your Function (Individual) and Key Takeaways from the Article (3-4 bullets for the Team).

5.4 Hands-on Training (4:30 PM – 5:30 PM) by Mr. V.P. Chaudhari
Topic: CAD/CAM/CAE

The hands-on training session held from 4:30 PM to 5:30 PM focused on the "Use of CAE Analysis in CAD/CAM" and was conducted by expert trainer. Participants gained practical insights into the application of CAE (Computer-Aided Engineering) tools within CAD/CAM systems. The session emphasized the simulation of manufacturing processes, analysis of material behavior under varying conditions, and the benefits of integrating CAE into Industry 4.0 workflows. Through hands-on exposure to advanced simulation techniques, participants learned how CAE plays a crucial role in validating designs and optimizing manufacturing strategies. The session underscored the importance of leveraging CAE tools to enhance efficiency, accuracy, and innovation in industrial workflows.

5.5 MCQ test 5:

Following the training, a multiple-choice test (MCQ Test 5) was conducted, covering topics related to CAD, CAM, and CAE applications in manufacturing. This test reinforced the participants' understanding of the concepts and practical applications discussed during the session.

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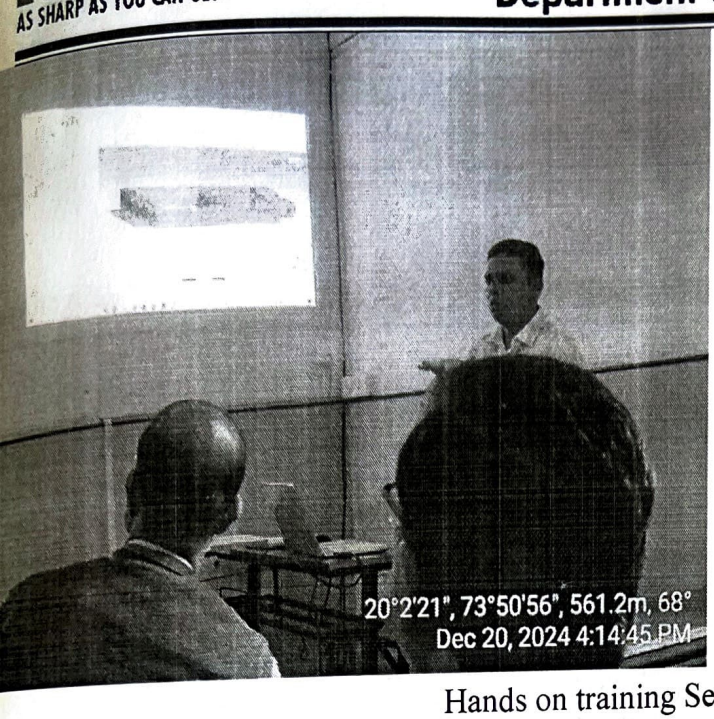

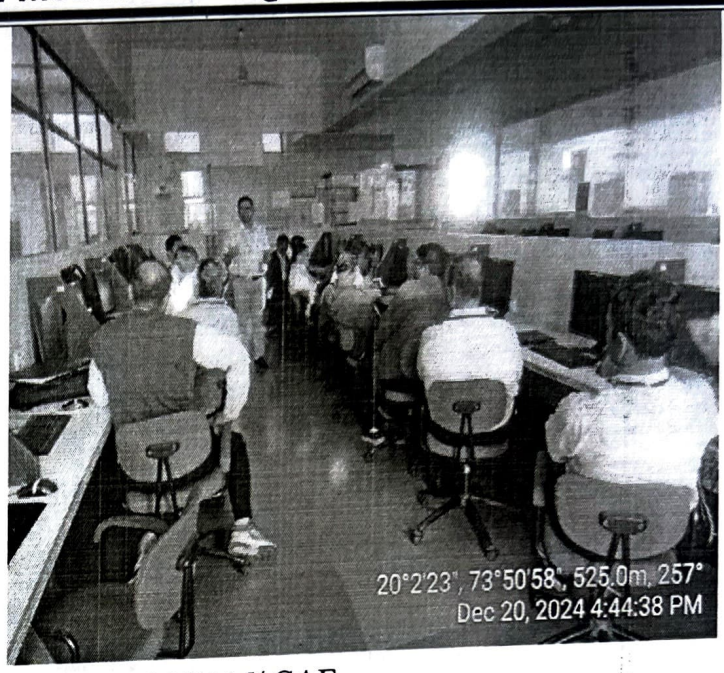

Hands on training Session on CAD/ CAM/ CAE

Day 5 provided participants with an in-depth understanding of cutting-edge manufacturing techniques and research opportunities in novel materials. The combination of expert lectures, article discussions, and practical training ensured a holistic learning experience.

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Day 6
Date: 21/12/2024

6.1 Session 10: (9:30 AM – 12:00 PM)

Dr. S. A. Mastud, an Associate Professor from VJTI, Mumbai, with 20 years of experience, delivered an insightful session on the topic **"Micromachining for Novel Materials."** The session provided a comprehensive overview of micromachining techniques tailored to novel materials, highlighting their significant advantages in precision manufacturing. Dr. Mastud emphasized the critical applications of micromachining in high-demand sectors such as aerospace and biomedical engineering, where precision and material performance are paramount. The session also addressed the challenges associated with handling novel materials during micromachining processes and offered practical solutions to overcome these difficulties. Additionally, Dr. Mastud shed light on the transformative role of Industry 4.0 technologies in enhancing the efficiency, accuracy, and sustainability of micromachining practices. The discussion offered valuable insights into how advanced technologies are reshaping the landscape of precision manufacturing for novel materials.

Session by: Dr. S. A. Mastud, VJTI, Mumbai

6.2 Reflection Journal & Article Summary (12:00 PM – 1:00 PM and 2:00 PM- 3:00 PM)

The session on *Reflection Journal and Article Summary,* held from 12:00 PM to 1:00 PM, was facilitated by Dr. S. D. Kalpande and Dr. Dhiraj Deshmukh. This interactive session aimed to provide participants with a structured approach to consolidating their learnings from the FDP. The facilitators offered detailed guidance on completing the Reflection Journal template, emphasizing the importance of identifying key takeaways, lessons learned, and actionable implementation plans. Participants were also introduced to techniques for summarizing their learnings in an article format, with a focus on making the concepts applicable to their academic and professional contexts. This exercise encouraged them to reflect deeply on the content delivered during the FDP and translate their insights into practical steps for future application. The session resulted in a heightened understanding among participants of how to effectively articulate their personal learning outcomes. They documented clear action steps and timelines for integrating the lessons into their respective roles, ensuring the knowledge gained would have a lasting and tangible impact.

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Reflection Journal Facilitator Prof. S. D. Kalpande and Dr. Dhiraj Deshmukh

6.3 MCQ Test 5 (3:00 PM – 4:00 PM)

- A comprehensive MCQ test consisting of 50 questions assessing knowledge gained throughout the FDP.
- Questions focused on key FDP themes, including Industry 4.0, micromachining, and manufacturing techniques for novel materials.

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Participants solving MCQ Test

6.4 Valedictory Function (4:00 PM – 5:00 PM)

The valedictory function, held from 4:00 PM to 5:00 PM, marked the conclusion of the FDP with reflections on its success and impact. The session commenced with concluding remarks by the FDP coordinators, who summarized the program's key objectives and outcomes. They highlighted how the sessions effectively bridged the gap between academic learning and industrial practices, particularly in the context of Industry 4.0 advancements. Participants shared their feedback, expressing appreciation for the practical value of the FDP in enhancing their academic and professional growth. Many emphasized the relevance of the topics covered, including advanced manufacturing techniques, research methodologies, and the integration of cutting-edge technologies. Their insights reflected how the program provided them with actionable knowledge to apply in their respective domains. The session also included acknowledgments of the AICTE ATAL, MET IOE, contributions made by the experts, organizers, and participants, recognizing their dedication to the program's success. The closing remarks underscored the significance of continuous learning and staying updated with evolving technological trends to remain competitive in Industry 4.0-driven environments. The interactive exchange of ideas and experiences during the valedictory function reinforced the overall impact of the AICTE ATAL Sponsored FDP in fostering professional and academic growth among all participants.

Highlights of the Valedictory Session:

- Concluding remarks by FDP coordinators, summarizing the key objectives and outcomes of the program.
- Feedback from participants, emphasizing the practical value of the FDP for their academic and professional growth.
- Acknowledgment of the AICTE, ATAL, experts, organizers, and participants for their contributions.
- Closing remarks emphasizing the importance of continuous learning in adapting to Industry 4.0 advancements. Participants Shared views about this FDP How they learned and utilize

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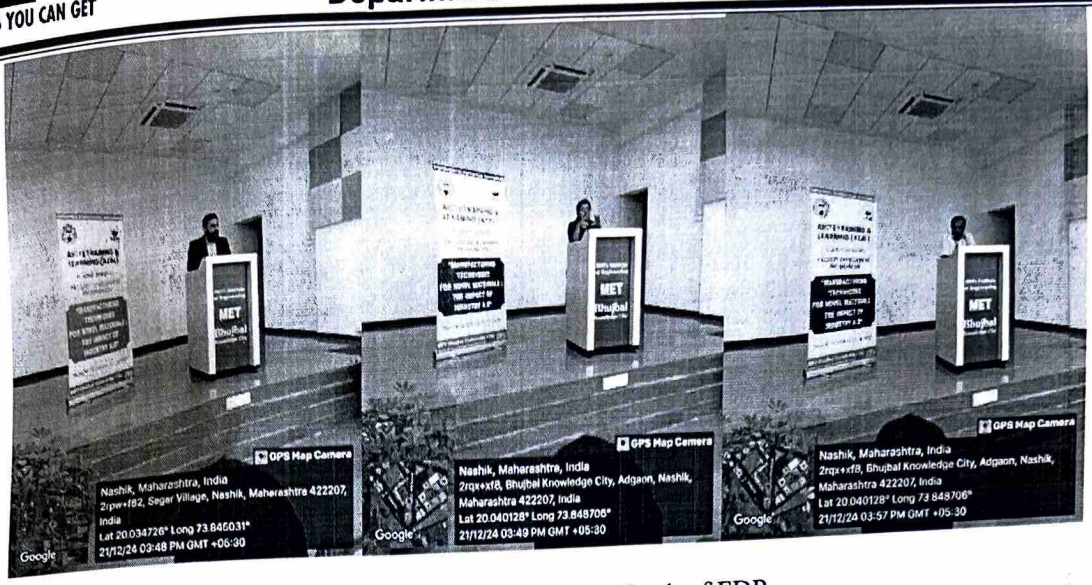
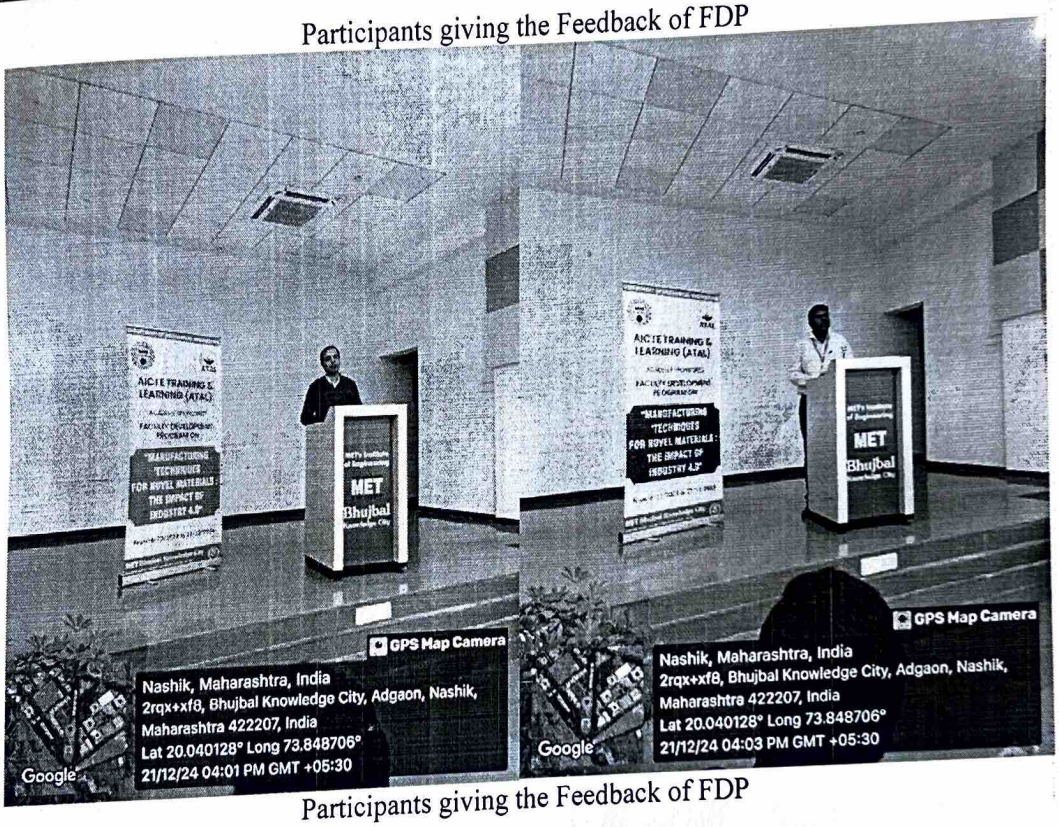


Participants giving the Feedback of FDP



Participants giving the Feedback of FDP

Overall feedback of participants: The AICTE (ATAL) sponsored FDP was highly engaging and productive. The expert sessions, hands-on training, and industrial visit together provided participants with a comprehensive understanding of modern manufacturing techniques for novel materials and Industry 4.0 technologies. The knowledge gained by participants will be instrumental in fostering innovation and enhancing professional practices.

Overall Reflection:

Successfully bridged theoretical knowledge and practical application, emphasizing the critical role of micromachining in manufacturing novel materials. The Reflection Journal activity and MCQ test provided an effective way to reinforce learning and ensure readiness for implementation in academic and industrial settings.

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Group Photo ATAL FDP Participant

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Coordinator

Head of Department
Mechanical Engineering
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Prof. V. P. Wani
Principal

Principal
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