PRAGATI ENGINEERING COLLEGE

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#1-378, ADB Road, Surampalem – 533 437, Near Peddapuram, E.G.Dist., A.P.
(Approved by AICTE, Permanently Affiliated to JNTUK, Kakinada)
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Ph: 08852 – 252233, 252234, 252235 Fax: 08852 – 252232, website:www.pragati.ac.in

DEPARTMENT OF MECHANICAL ENGINEERING

Academic year: 2024-25

Date: 11-09-2024

CIRCULAR

Additive Manufacturing Club of Mechanical Engineering Department in association with Career Guidance Cell is organizing a Seminar to the Mechanical Engineering students on 13th September 2024. The Theme of the Seminar is *"Challenges in Additive Manufacturing Processes"*.

Event	:	Seminar.
Date of the Event	:	13th September 2024.
Venue	:	Cad Lab.

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Copy to:

1. **HOD-ME.**
2. **Departmental file.**
3. **AM Club In-charge – ME.**
4. **Career Guidance Cell In-charge – ME.**

Learning is Supreme Deity

PRAGATI ENGINEERING COLLEGE

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INDUSTRY 4.0 CLUBS

ADDITIVE MANUFACTURING CLUB

ORGANISED BY DEPARTMENT OF MECHANICAL ENGINEERING IN ASSOCIATION WITH CAREER GUIDANCE CELL

CHALLENGES IN ADDITIVE MANUFACTURING PROCESSESS

SPEAKER :

Mr. B.Bharath Kumar
Assistant Professor

FACULTY COORDINATOR

Mr. P. Ram Prasad
Assistant Professor
Mechanical Engineering Department

VENUE: Cad Lab
DATE: 13th September 2024
TIME: 1:00 PM Onwards

STUDENT COORDINATOR

Mr. M.Yadidya
III Year Mechanical Engineering Department

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DEPARTMENT OF MECHANICAL ENGINEERING

A SEMINAR

ON

"CHALLENGES IN ADDITIVE MANUFACTURING PROCESSES"

A.Y 2024-25 Dt. 13.09.2024

A Seminar on "Challenges in Additive Manufacturing Processes" was conducted to by Additive Manufacturing Club, Mechanical Department in association with Career Guidance Cell. A total of 37 students from II Year Mechanical Engineering students were participated for the event. Participations made to sit in Cad Lab and all are interested students were allowed. **Mr. B.Bharath Kumar** interacted well with the students.

Additive manufacturing (AM), often referred to as 3D printing, has revolutionized the manufacturing industry by allowing for the creation of complex geometries and customized parts. However, despite its advantages, there are several challenges associated with additive manufacturing processes. These challenges can be broadly categorized into technical, material, operational, and regulatory aspects:

1. Material Limitations

- Limited Material Choices: Not all materials are suitable for AM. While metals, polymers, and composites are widely used, the selection is still limited compared to traditional manufacturing methods.
- Material Properties: The mechanical properties (e.g., strength, toughness) of 3D-printed parts may differ from those made using conventional processes due to microstructural variations during printing.
- High Cost of Materials: Materials for AM, especially high-quality metals or specialty polymers, tend to be expensive.

2. Surface Finish and Precision

- Surface Roughness: AM often results in parts with a rough surface finish, requiring post-processing to achieve smoother finishes.

- Dimensional Accuracy: Achieving high precision can be difficult in certain AM processes, which may result in deviations from design specifications.
- Layer Delamination: Poor bonding between layers can lead to defects such as delamination or cracking, especially under mechanical loads.

3. Build Speed and Size Constraints

- Slow Production Rates: Many AM processes are slower than traditional methods, making them less efficient for high-volume production.
- Build Volume Limitations: The size of parts is constrained by the build envelope of the 3D printer, limiting the production of large-scale components in one go.

4. Post-Processing Requirements

- Need for Post-Processing: Many AM parts require significant post-processing, such as heat treatment, machining, or polishing, to meet functional requirements or improve surface finish and mechanical properties.
- Support Structures: Some AM techniques require support structures during printing, which need to be removed afterward, adding time and cost.

5. Process Control and Reproducibility

- Process Variability: There is often variability in the AM process, even between prints using the same machine and settings. Ensuring repeatability and consistency remains a challenge.
- Process Monitoring: The lack of real-time monitoring and control mechanisms can lead to undetected defects or failures during the build process.

6. Quality Assurance and Certification

- Defect Detection: Detecting internal defects (such as voids or cracks) during printing is challenging and requires advanced techniques like CT scanning.
- Certification Standards: The lack of universally accepted standards and certification methods for AM parts, especially for safety-critical applications (e.g., aerospace, medical), makes it difficult to certify parts.

7. Design Constraints

- Design for Additive Manufacturing (DfAM): Engineers and designers must adapt their thinking to account for the unique characteristics of AM. Designing parts that take full advantage of AM's capabilities, while considering its limitations, requires specialized knowledge.
- Complexity of Models: The more complex the geometry, the more challenging it can be to print, especially when support structures and heat management are involved.

8. Cost and Scalability

- High Equipment Costs: AM machines, especially for industrial applications, can be prohibitively expensive for small and medium-sized enterprises.
- Economies of Scale: While AM is ideal for low-volume, highly customized production, it struggles with cost-effectiveness at higher production scales compared to traditional methods like injection molding or CNC machining.

9. Material Wastage

- Powder Handling (for Metal AM): In powder-bed fusion processes, unused powder can sometimes degrade over time, leading to wastage. Proper handling and recycling of powders are essential but challenging.
- Support Material Waste: The use of support structures leads to additional material waste, especially in processes like stereolithography (SLA) and fused deposition modeling (FDM).

10. Environmental Impact

- Energy Consumption: Certain AM processes, particularly metal-based ones, require a significant amount of energy, making them less sustainable in terms of energy efficiency.
- Waste Disposal: Disposal of unused or degraded materials, especially metal powders or hazardous resins, can pose environmental challenges.

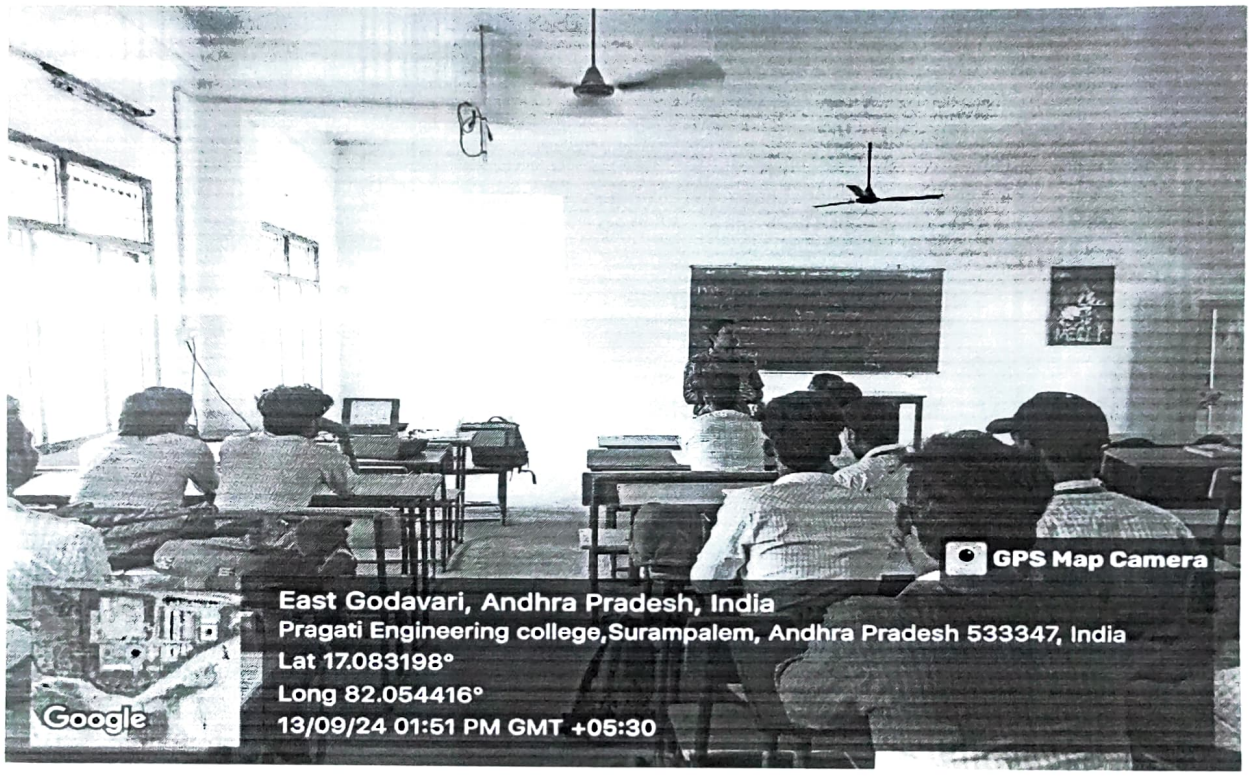
11. Intellectual Property (IP) and Security

- IP Concerns: The ease of sharing digital files for 3D printing raises concerns about IP theft or unauthorized duplication of parts.
- Data Security: As AM becomes more digitized and integrated with IoT and Industry 4.0, ensuring data security during the design-to-manufacturing process is critical.

12. Health and Safety

- Occupational Hazards: In metal AM, powder handling poses risks, as fine metal powders can be hazardous to health if inhaled. Managing these risks requires proper ventilation, containment, and handling protocols.
- Laser and Thermal Risks: Certain AM processes involve high-energy lasers or thermal processes, which can pose safety risks if not properly controlled.

PICTURES OF THE EVENT:



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Participants List

Name of the Event: Challenges in Additive Manufacturing Processes.

Venue : Cad Lab

Date : 13-09-2024

S.No	Roll No	Name	Signature
1	23A31A0312	B.B.S.D.V.Pothuraju	B.Bhaagavas
2	23A31A0340	P. Bhanu	P. Bhanu
3	23A31A0316	CH.Santhosh Kumar	CH.Santhosh.
4	23A31A0817	CH.V.V.Satyanarayana..	Ch.V.V.Satya..
5	23A31A0360	A.Rajesh	A.Rajesh.
6	23A31A0347	S.Uday	S.Uday
7	23A31A0330	M.Hemanth	M.Hemanth
8	23A31A0332	N.Yaswanth	N.Yaswanth
9	23A31A0324	I. Veera Ganesh	I Veera ganesh
10	23A31A0337	P. Vamsi	Vamsi
11	23A31A0350	V.V.V.Satyanarayan	V.V.V.Satyan
12	23A31A0308	A. Manikanta	A.manikanta
13	23A31A0309	A. Surya	A.Surya...
14	23A31A0352	K.B.S.V.V.S Tarnath Sastri	V.V.S.T.Sastri
15	23A31A0351	V. Kowshik	V.Kowshik...

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S.No	Roll No	Name	Signature
1	23A31A0303	Swapna Nagireddy.	Swapna
2	23A31A0304	R. Renuka Vijaya Durga.	Renuka.
3	23A31A0305	Revathi Midatana.	Revathi.
4	24A35A0304	D. MOULI	D. Mouli
5	24A35A0315	S. Chandu	S. Chandu
6	24A35A0306	K. pavan surya kumar	K. Pavansuryakumar
7	24A35A0303	D. Divakar	D. Divakar
8	24A35A0302	D. Lakshmi Narayana	D. Lakshminarayana
9	24A35A0314	S. Sriram	S. Sriram
10	23A31A0301	B. Shri Ramya	Ramya
11	23A31A0302	D. Avanthi	Avanthi
12	23A31A0306	S. Yohanna	Yohanna
13	23A31A0351	V. Kowshik	Kowshik
14	23A31A0352	V. Bhadri	Bhadri
15	23A31A0348	T. Narashima	Narashima

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S.No	Roll No	Name	Signature
1	23A31A0320	G.V.S.Subrahmanyam	G.V.S
2	23A31A0325	K.V.Manikanta	K.V.Manikanta
3	23A31A0321	Y. Satya Sai Suresh	Y Suresh
4	23A31A0315	B. Siva Sai	B Sai
5	23A31A0328	K. Satya Chakra Dhara.	K.S.C. Dhara
6	23A31A0331	M. Kiran Teja	M Kiran Teja
7	23A31A0327	K. Sivaji Ganesh	K. Sivaji Ganesh.
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Total – 37

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