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Study Level: UG	**Class & Section:** CSE(AI/ML-C)
Name of the Course: Engineering Practice	**Name of the Instructor:** Mr. Chandrashekar Goud V
Name of the Assessment: Lab Report 9	**Date of Submission:** 19-11-2024

Introduction to Additive Manufacturing

Additive manufacturing, commonly known as 3D printing, is a revolutionary technology that creates three-dimensional objects by building them up layer by layer. This innovative process offers unparalleled design freedom and the ability to produce customized, complex components.

Types of Additive Manufacturing

Fused Deposition Modeling (FDM)

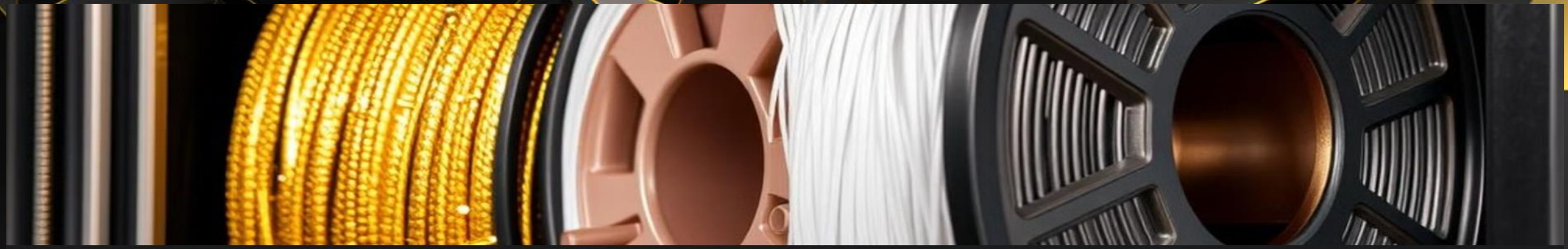
A widely used technique that extrudes thermoplastic filaments to build up layers.

Stereolithography (SLA)

Uses a UV laser to selectively cure a photosensitive resin layer by layer.

Selective Laser Sintering (SLS)

Sinters powdered materials, such as plastics or metals, using a high-power laser.



Materials Used in 3D Printing

1 Plastics

The most common materials, such as PLA, ABS, and PETG, offer a wide range of properties.

2 Metals

Increasingly used for industrial applications, including stainless steel, titanium, and aluminum alloys.

3 Composites

Reinforced materials, like carbon fiber or glass-filled polymers, provide enhanced strength and stiffness.

4 Ceramics

Specialized for high-temperature and wear-resistant applications, such as advanced industrial components.

Advantages of Additive Manufacturing

Design Freedom

Additive manufacturing allows for the creation of complex, customized geometries that are difficult or impossible to produce with traditional methods.

Rapid Prototyping

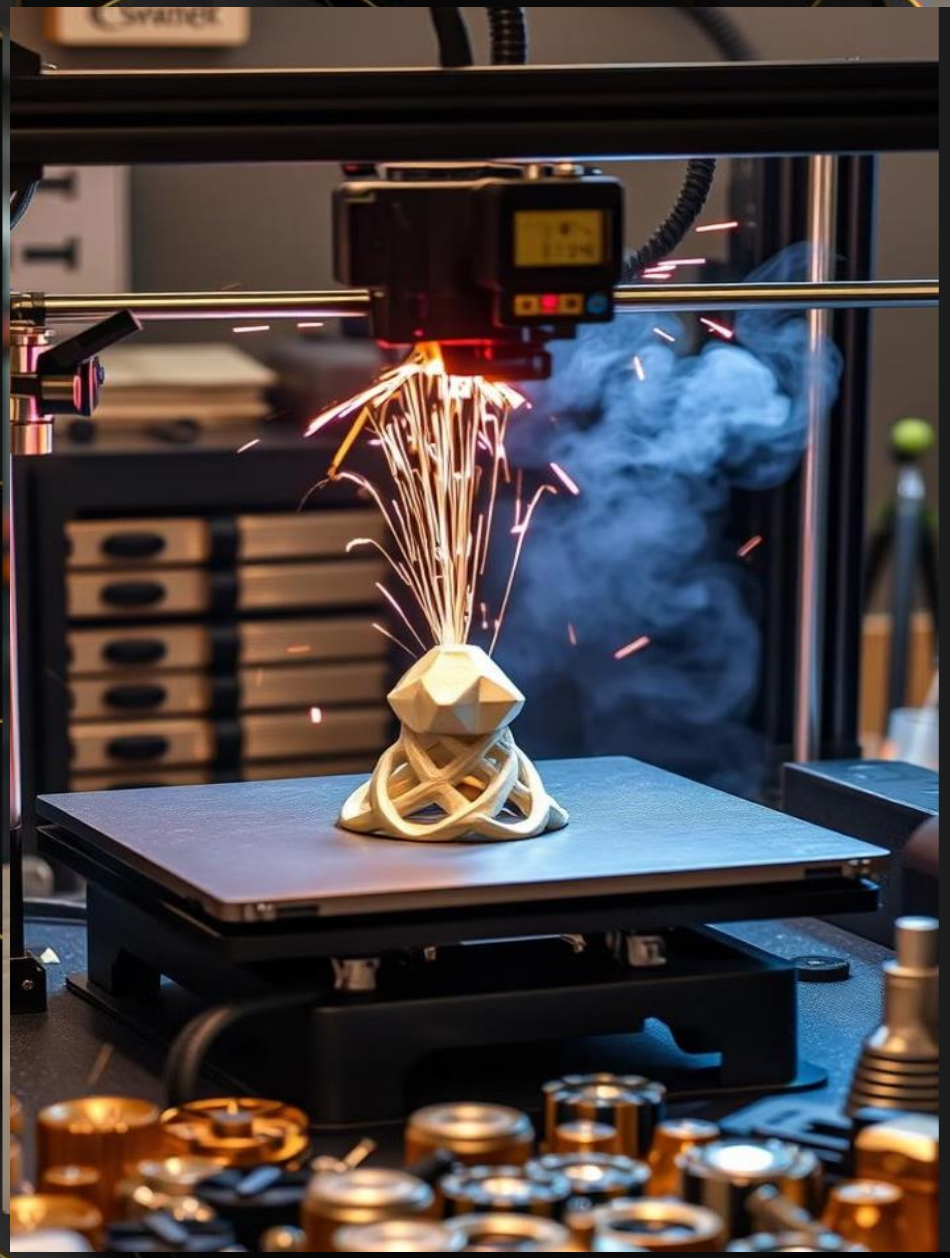
The layer-by-layer approach enables quick iteration and testing of new product designs, accelerating the development process.

On-Demand Manufacturing

Parts can be produced as needed, reducing inventory costs and lead times compared to traditional mass production.

Material Efficiency

Additive manufacturing typically generates less waste than subtractive manufacturing, making it a more sustainable option.



Disadvantages of Additive Manufacturing

1

Speed Limitations

The layer-by-layer building process can be slower than traditional manufacturing methods, especially for large parts.

2

Build Size Constraints

The maximum size of 3D-printed parts is often limited by the dimensions of the printer's build chamber.

3

Post-Processing

Many 3D-printed parts require additional finishing steps, such as cleaning, support removal, and surface smoothing.

Applications of 3D Printing in Various Industries

Healthcare

Producing customized medical devices, prosthetics, and personalized surgical guides.

Aerospace

Fabricating lightweight, complex aerospace components and rapid prototyping of new designs.

Automotive

Manufacturing custom parts, tooling, and end-use components for the automotive industry.

Industrial

Producing specialized tools, jigs, and fixtures to streamline manufacturing processes.

Emerging Trends in Additive Manufacturing

1

Multi-Material Printing

The ability to combine various materials within a single print, enabling the creation of more complex and functional parts.

2

4D Printing

The integration of shape-changing materials that can transform over time, expanding the design possibilities.

3

AI-Enhanced Design

The use of artificial intelligence to optimize part designs, improve material selection, and streamline the manufacturing process.

4

Sustainable Manufacturing

The development of eco-friendly materials and closed-loop recycling systems to promote a more sustainable additive manufacturing industry.

The Future of Additive Manufacturing

1

Increased Automation

The integration of advanced robotics and AI-driven systems to streamline the additive manufacturing process.

2

Unprecedented Design Capabilities

Breakthroughs in materials science and computational design tools will enable the creation of previously unimaginable structures.

3

Sustainable Production

The development of eco-friendly, recyclable materials and closed-loop manufacturing processes will drive a more sustainable industry.

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THANK YOU!