

## **SME CAM-F Study Guide**

### **1. Introduction to Additive Manufacturing (AM)**

Definition: Additive manufacturing builds parts by adding material layer by layer.

Difference from Traditional Manufacturing: Subtractive (removing material) vs. Additive.

Benefits of AM:

- Complex geometries
- Lightweight structures
- Customization
- Tool-less manufacturing

### **2. AM Process Categories (7 ASTM Categories)**

1. Material Extrusion (e.g., FDM/FFF)
2. Vat Photopolymerization (e.g., SLA, DLP)
3. Powder Bed Fusion (e.g., SLS, SLM, EBM)
4. Binder Jetting
5. Material Jetting
6. Sheet Lamination
7. Directed Energy Deposition (DED)

For each, know:

- How it works
- Materials used
- Common applications
- Advantages/limitations

### **3. Materials Used in AM**

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Polymers: PLA, ABS, Nylon, PETG

Metals: Stainless Steel, Titanium, Aluminum

Composites: Carbon fiber-infused, Kevlar

Ceramics & Others

Understand:

- Material properties
- Suitability for processes
- Post-processing requirements

### **4. Design for Additive Manufacturing (DfAM)**

Key Concepts:

- Topology optimization
- Lattice structures
- Part consolidation

Design Considerations:

- Orientation
- Support structures
- Overhangs
- Tolerances and shrinkage

### **5. Applications of AM**

Industries: Aerospace, Automotive, Medical, Dental, Architecture, Consumer Goods

Use Cases:

- Prototyping

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- Tooling
- End-use parts
- Custom implants

### 6. Post-Processing

Purpose: Improve surface finish, mechanical properties, accuracy

Examples:

- Support removal
- Heat treatment
- Sanding, polishing
- Coating, painting

### 7. AM Equipment and Safety

Printer Types (Desktop vs. Industrial)

Maintenance Basics

Safety Protocols:

- PPE usage
- Ventilation
- Handling powders and resins

### 8. Standards & Terminology

ASTM & ISO standards for AM

Common terms:

- Slicer
- Infill

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- Raft
- Bridging
- Layer height