

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME54b – MANUFACTURING METHODS IN PRECISION ENGINEERING

(Professional Elective – I)

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Course Objectives: The objectives of the course are to make the students learn about

- Familiarize with surface treatments and their industrial applications.
- Explain powder metal production sintering techniques for metal powders, glass, ceramics and plastics.
- Explain wafer preparation, optical lithography including current best practice and perceived limits and equipment required for micro-device packaging processes.
- Demonstrate plastics processing.
- Train different liquefied, solidified and particulate methods for different MMC, CMC, Polymer matrix composites.

UNIT – I

10 Hrs

Surface treatment: Scope, Cleaners, Methods of cleaning, Surface coating types, and ceramic and organic methods of coating, economics of coating. Electro forming, Chemical vapour deposition, thermal spraying, Ion implantation, diffusion coating, Diamond coating and cladding

Learning Outcomes:

At the end of this unit, the student will be able to

- Identify the phenomenon related to different surface modification by physical and chemical treatments: L2
- Develop the basics of CVD (Chemical Vapour Deposition) and PVD (Physical Vapour Deposition) technologies for surface coating deposition, description of thermal spraying technology for surface coating applications. L2
- Explain properties and characteristics of different surface coatings and their applications. L3

UNIT – II

10 Hrs


Processing of Powder metals, Glass and Superconductors: Introduction, production of metal powders, compaction of metal powders, sintering, secondary and finishing operations, design considerations for powder metallurgy, Process capabilities, economics of powder metallurgy, forming and shaping of Glass, techniques for strengthening and treating Glass, design considerations for Glass, processing of superconductors.

Processing of ceramics: Applications, characteristics, classification .Processing of particulate ceramics, Powder preparations, consolidation, Drying, sintering, Hot compaction, Area of application, finishing of ceramics.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain powder metallurgy and ceramics applications. L2
- Demonstrate processing of powders and sintering techniques. L2
- Outline mechanism of sintering properties and characteristics of powder metals, glass and superconductors. L3


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UNIT – III**10 Hrs**

Fabrication of Microelectronic devices: Crystal growth and wafer preparation, Film Deposition oxidation, lithography, bonding and packaging, reliability and yield, Printed Circuit boards, computer aided design in microelectronics, surface mount technology, Integrated circuit economics. E-Manufacturing, nanotechnology, and micro machining, High speed Machining.

Learning Outcomes:

At the end of this unit, the student will be able to

- Illustrate wafer preparation, optical lithography. L1
- Explain the basic packaging and its levels, different IC chip mounting and interconnect methods. L2
- Summarize mechanisms like E-Manufacturing, nanotechnology, and micromachining, high speed machining. L3

UNIT – IV**10 Hrs**

Processing Of Plastics, injection and blow moulding, calendaring, thermo forming, compression moulding, transfer moulding, High energy rate forming methods Rapid manufacturing: - Introduction - concepts of rapid manufacturing, information flow for rapid prototyping, classification of rapid prototyping process, stereo holography fused deposition modeling, selective laser sintering, Applications of rapid prototyping process.

Learning Outcomes:

At the end of this unit, the student will be able to

- Build basic knowledge of manufacturing of plastics. L1
- Explain the rapid prototyping methods in plastic processing. L2

UNIT – V**08 Hrs**

Processing of Composites: Composite Layers, Particulate and fiber reinforced composites, Elastomers, Reinforced plastics, MMC, CMC, Polymer matrix composites.

Learning Outcomes:

At the end of this unit, the student will be able to

- Use of fibre-reinforced composites in engineering applications. L1
- Summarize the use of composite materials, micromechanics of layered composites. L2
- Explain different liquefied, solidified and particulate methods for MMC, CMC, Polymer matrix composites. L3

Text Books:

1. Schmid and Kalpakjin, Manufacturing Engineering and Technology, 7/e, Pearson Education India, 2001
2. P.N. Rao, Manufacturing Technology, Foundry forming and welding, Vol I, 2/e, Tata McGraw-Hill, 2001
3. Rafiq Noorani, Rapid Prototyping Principles and Applications, Illustrated edition, Wiley, 2006

Reference Books:

1. R.K. Jain, Production Technology, 17/e, Khanna Publishers, 2012
2. Roy A. Lindberg, Process and materials of manufacturing, 2/e, Allyn and Bacon, 1978.

Course Outcomes:

At the end of this Course the student will be able to

- Classify different surface treatment methods. L2
- Explain processing of powder metals, glass and super conductors. L2
- Develop fabrication of microelectronic devices. L2
- Process plastics and composites. L2

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