

MANUFACTURING PROCESSES

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|---------------------------------------|-------------------|--------------------------------|-------|----------------------|--------|
| Course Code | 23ME3401 | Year | II | Semester | II |
| Course Category | Professional Core | Offering Branch | ME | Course Type | Theory |
| Credits | 3 | L-T-P | 3-0-0 | Prerequisites | Nil |
| Continuous Internal Evaluation | 30 | Semester End Evaluation | 70 | Total Marks | 100 |

Course Objective: The objectives of the course are to

- Know the working principle of different metal casting processes and gating system.
- Classify the welding processes, working of different types of welding processes and welding defects.
- Know the nature of plastic deformation, cold and hot working process, working of a rolling mill and types, extrusion processes.
- Understand the principles of forging, tools and dies, working of forging processes.
- Know about processing of plastics.

Course Outcomes:

| COs | Statements | Blooms Level |
|------------|-----------------------------------------------------------------|---------------------|
| CO1 | Design the patterns and core boxes for metal casting processes | L3 |
| CO2 | Understand the different welding processes | L2 |
| CO3 | Demonstrate the different types of bulk forming processes | L3 |
| CO4 | Understand sheet metal forming processes | L2 |
| CO5 | Apply the processing and methods of manufacturing plastic parts | L3 |

UNIT- I

Casting: Steps involved in making a casting – Advantage of casting and its applications. Patterns and Pattern making – Types of patterns – Materials used for patterns, pattern allowances and their construction, Molding, different types of cores , Principles of Gating, Risers, casting design considerations. Methods of melting and types of furnaces, Solidification

of castings and casting defects- causes and remedies. Basic principles and applications of special casting processes - Centrifugal casting, Die casting, Investment casting and shell molding.

UNIT-II

Welding: Classification of welding processes, types of welded joints and their characteristics, Gas welding, Different types of flames and uses. Basic principles of Arc welding, power characteristics, Manual metal arc welding, submerged arc welding, TIG& MIG welding. Electro-slag welding.

Resistance welding, Friction welding, Friction stir welding, Forge welding, Explosive welding; Thermit welding, Plasma Arc welding, Laser welding, electron beam welding, Soldering & Brazing.

Heat affected zones in welding; pre & post heating, welding defects –causes and remedies.

UNIT-III

Bulk Forming: Plastic deformation in metals and alloys-recovery, recrystallization and grain growth.

Hot working and Cold working-Strain hardening and Annealing. Bulk forming processes: Forging-Types of Forging, forging defects and remedies; Rolling – fundamentals, types of rolling mills and products, Forces in rolling and power requirements. Extrusion and its characteristics. Types of extrusion, Impact extrusion, Hydrostatic extrusion; Wire drawing and Tube drawing.

UNIT- IV

Sheet metal forming-Blanking and piercing, Forces and power requirement in these operations, Deep drawing, Stretch forming, Bending, Spring back and its remedies, Coining, Spinning, Types of presses and press tools.

High energy rate forming processes: Principles of explosive forming, electromagnetic forming, Electro hydraulic forming, rubber pad forming, advantages and limitations.

UNIT -V

PROCESSING OF PLASTICS:

Introduction to polymers, Classification of Polymers: Plastics and Elastomers, Comparison of Thermo Plastics and Thermo setting Plastics, Moulding Techniques: Compression Moulding, Transfer Moulding, Injection Moulding, Blow Moulding and Extrusion of Plastics

Textbooks:

1. Kalpakjain S and Steven R Schmid, Manufacturing Processes for Engineering Materials, 5/e, Pearson Publications, 2007.
2. P.N. Rao, Manufacturing Technology -Vol I, 5/e, McGraw Hill Education, 2018.

Reference Books:

1. A.Ghosh & A.K.Malik, Manufacturing Science, East West Press Pvt. Ltd, 2010.
2. Lindberg and Roy, Processes and materials of manufacture, 4/e, Prentice Hall India Learning Private Limited, 1990.
3. R.K. Jain, Production Technology, Khanna Publishers, 2022.
4. Sharma P.C., A Text book of Production Technology, 8/e, S Chand Publishing, 2014.
5. H.S. Shaun, Manufacturing Processes, 1/e, Pearson Publishers, 2012.
6. WAJ Chapman , Workshop Technology, 5/e, CBS Publishers & Distributors Pvt.Ltd, 2001.
7. Hindustan Machine Tools, Production Technology, Tata McGraw Hill Publishers, 2017.
8. Ian Gibson, David W Rosen, Brent Stucker., Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, 2/e, Springer, 2015.

Online Learning Resources:

- <https://www.edx.org/learn/manufacturing/massachusetts-institute-of-technology-fundamentals-of-manufacturing-processes>
- https://onlinecourses.nptel.ac.in/noc21_me81/preview
- www.coursera.org/learn/introduction-to-additive-manufacturing-processessera
- <https://archive.nptel.ac.in/courses/112/103/112103263/>
- <https://elearn.nptel.ac.in/shop/nptel/principles-of-metal-forming-technology/?v=c86ee0d9d7ed>