

MANUFACTURING PROCESSES

Course code	23ME3401	Year	II	Semester	II
Course category	Professional Core	Branch	ME	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Material Science and Metallurgy
Continuous Internal Evaluation:	30	Semester End Evaluation:	70	Total Marks:	100

Course Outcomes: At the end of the course students will be able to

CO	Statement	Skill	Blooms Level	Units
CO1	Understand the basic principles of manufacturing processes.	Understand, Communication	L2	1,2,3, 4,5
CO2	Illustrate casting and special casting processes with applications.	Apply, Communication	L3	1
CO3	Choose various welding processes and interpret welding defects.	Apply, Communication	L3	2
CO4	Illustrate the bulk and sheet metal forming processes.	Apply, Communication	L3	3,4
CO5	Summarize the Additive manufacturing processes.	Understand, Communication	L2	5

Contribution of Course outcomes towards the achievement of program outcomes & Strength of correlations (High :3, Medium:2, Low:1)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1						2			3	2
CO2	3	2	1	1						2			3	2
CO3	3	2	1	1						2			3	2
CO4	3	2	1	1						2			3	2
CO5	3	2	1	1	2					2			3	2

Unit	Contents	CO
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.	CO1, CO2
II	Welding: Classification of welding processes, types of welded joints and their characteristics, Gas welding, Different types of flames and uses, Oxy – Acetylene Gas cutting. 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, Explosion welding; Thermit welding, Plasma Arc welding, Laser Beam welding, Electron Beam welding, Soldering & Brazing. Heat affected zones in welding; pre & post heating, welding defects –causes and remedies.	CO1, CO3
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, Extrusion and its characteristics. Types of extrusion, Impact extrusion, Hydrostatic extrusion; Wire drawing and Tube drawing.	CO1, CO4
IV	Sheet metal Forming -Blanking and piercing, 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.	CO1, CO4
V	Additive manufacturing - Steps in Additive Manufacturing (AM), Classification of AM processes, Advantages of AM, and types of materials for AM, VAT photopolymerization AM Processes, Extrusion - Based AM Processes, Powder Bed Fusion AM Processes, Direct Energy Deposition AM Processes, Post Processing of AM Parts, Applications	CO1, CO5

Learning Resource
Text books:

1. P.N. Rao, Manufacturing Technology Vol1, 5th Edition, McGraw Hill, 2022
2. Lindberg and Roy, Processes and materials of manufacture, 4/e, Prentice Hall India Learning Private Limited, 1990.
3. Ian Gibson, David W Rosen, Brent Stucker., Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, 2/e, Springer, 2015.

Reference books

1. A.Ghosh & A.K.Malik, Manufacturing Science, East West Press Pvt. Ltd, 2010.
2. Sharma P.C., A Text book of Production Technology, 8/e, S Chand Publishing, 2014.
3. H.S. Shaun, Manufacturing Processes, 1/e, Pearson Publishers, 2012.
4. WAJ Chapman , Workshop Technology, 5/e, CBS Publishers & Distributors Pvt.Ltd, 2001.
5. Hindustan Machine Tools, Production Technology, Tata McGraw Hill Publishers, 2017.

E-Resources & other digital Material:

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