MANUFACTURING PROCESSES

Course code	20ME3404	**Year**	II	**Semester**	II
Course category	Engineering Science	**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 and non-destructive testing methods.	**Understand, Communication**	**L2**	**1,2,3, 4,5**
CO2	Apply various casting, forming and metal joining processes with advantages, limitations, defects and applications.	**Apply, Communication**	**L3**	**1,2,3**
CO3	Apply suitable Non-destructive testing method to determine the defects in the given product.	**Apply, Modern Tool Usage Communication**	**L3**	**4**
CO4	Apply the methods of manufacturing plastics, ceramics and powder metallurgy products.	**Apply, Communication**	**L3**	**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	3	2	2						2			3	2
CO2	3	3	2	2						2			3	2
CO3	3	3		2	2					2			3	2
CO4	3	3	2	2						2			3	2

Syllabus

Unit	Contents	CO
I	**Introduction:** Importance and selection of manufacturing processes. **Casting Processes:** Introduction to casting, steps in casting process. **Pattern**: Types, materials and allowance. **Sand Molding**: Basic steps in mold preparation, materials used for mould, types of molds, cores. Principles and design of gating system. **Methods of Melting:** Crucible melting and cupola operation. **Special casting processes**: Shell casting, Investment casting, Die casting, Centrifugal casting, CO_2 Molding. Casting defects and remedies. Advantages and applications of casting.	**CO1, CO2**
II	**Metal Forming**: Introduction, hot and cold working of metals; **Rolling**: Principle, types of rolling mill and products, roll passes, forces in rolling and power requirements. **Extrusion**: Basic extrusion processes and its characteristics, wire drawing, tube drawing. **Forging**: Principle of forging. Tools and dies used in forging. **Types**: Smith forging, drop forging and rotary forging, forging defects. **Sheet metal forming**: Introduction, Blanking, Piercing, Bending, Stamping, Coining, Spinning and Stretch Forming. Clearance and shear as applied to Punching/Blanking operations.	**CO1, CO2**

III	**Metal Joining Processes:** Classification of welding processes, types of welds and welded joints, V-I characteristics, Arc Welding, Submerged Arc Welding, Gas Tungsten Arc Welding, Gas Metal Arc Welding, Electron Beam Welding, Laser Welding, Forge welding, Resistance welding, Friction welding, Explosive welding, Thermit welding and Plasma Arc welding. Heat affected zone in welding. **Welding defects**: causes and remedies. Soldering and brazing. Adhesive Bonding.	**CO1, CO2**
IV	**Non Destructive Testing:** Introduction to Non Destructive Testing, Industrial applications of Non destructive evaluation, Visual Optical testing, Dye penetrant testing, Magnetic particle testing, Eddy current testing, Ultrasonic testing, Acoustic emission testing, Radiography, Comparison and selection of NDT methods.	**CO1, CO3**
V	**Plastic Processing, Ceramics and Powder Metallurgy**: **Plastics**: Introduction to polymers, Processing of plastics, extrusion of plastics, transfer moulding, compression moulding, injection moulding, thermoforming, rotational moulding and blow moulding. **Ceramics**: Ceramic powder preparation; **Processing of ceramic parts**: Pressing, Casting, Sintering; **Secondary processing of** ceramics: Coatings and finishing. **Powder Metallurgy**: Manufacture of powders, steps involved in making a component using powder metallurgy.	**CO1, CO4**

Learning Resource
Text books:
1. P.N.Rao, Manufacturing Technology – Volume I, 5/e, McGraw-Hill Education, 2018. 2. S.Kalpakjain and S.R.Schmid, Manufacturing Engineering and Technology, 7/e, Pearson, 2018. 3. Ravi Prakash, "Non-Destructive Testing Techniques", 1st revised edition, New Age International Publishers, 2010
Reference books
1. Mikell. P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes and Systems, 4/e, John Wiley and Sons Inc, 2013. 2. P.C.Sharma, A Text book of Production Technology, 8/e, S Chand Publishing, 2014.
E-Resources & other digital Material:
1. https://nptel.ac.in/courses/112107145/ 2. https://www.nde-ed.org 3. https://nptel.ac.in/courses/113/106/113106070/