MANUFACTURING PROCESSES

Course Code	19ME3404	**Year**	II	**Semester**	II
Course Category	Program Core	**Branch**	ME	**Course Type**	Theory
Credits	3	**L – T – P**	3 – 0 – 0	**Prerequisites**	19ME3303-Material Science and Engineering
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes		**Levels**
After successful completion of the course, the student will be able to		
CO1	Illustrate the casting processes with their features and applications.	L1
CO2	Explain various metal forming techniques.	L2
CO3	Appraise suitable welding process for the given application.	L3
CO4	Apply suitable Non-Destructive Testing method.	L3
CO5	Discuss the various techniques for processing of plastics, ceramics and powders.	L3

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

Syllabus		
Unit No.	**Contents**	**Mapped COs**
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
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.	CO2

	SHEET METAL FORMING: Introduction, Blanking, Piercing, Bending, Stamping, Coining, Spinning and Stretch Forming. Clearance and shear as applied to Punching/Blanking operations.	
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	CO3
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.	CO4
V	**PLASTIC PROCESSING, CERAMICS AND POWDER METALLURGY**: **Plastics**: Introduction to polymers, Processing of plastics, extrusion of plastics, transfer molding, compression molding, injection molding, thermoforming, rotational molding and blow molding. **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.	CO5

Learning Recourse(s)

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/