

# GUJARAT TECHNOLOGICAL UNIVERSITY

## INDUSTRIAL ENGINEERING (15) & MECHANICAL ENGINEERING (19)

### MANUFACTURING PROCESSES -II

SUBJECT CODE: 2141908

B.E. 4<sup>th</sup> SEMESTER

**Type of course:** Under Graduate Level

**Prerequisite:** Manufacturing Processes – I.

**Rationale:**

The Manufacturing Processes-II course is to prepare students to understand different manufacturing processes like Casting, Welding, Forging, Sheet metal working, Plastic technology, Glass and Ceramic and super finishing operations with Process parameter. It also helps them to understand the advancement of Technology in manufacturing.

By educating in the area of manufacturing students will enable to seek employment in engineering upon graduation while, at the same time, provide a firm foundation for the pursuit of graduate studies in engineering.

**Teaching and Examination Scheme:**

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
				ESE (E)	PA (M)		PA (V)		PA (I)	
				PA	ALA	ESE	OEP			
3	0	2	5	70	20	10	20	10	20	150

**Content:**

Sr. No.	Content	Total Hrs	% Weightage
1	<b>Manufacturing Processes:</b> Basic Introduction, Importance of Manufacturing, Economics and Technological Definition, Classification and Selection of Manufacturing Processes.	02	05
2	<b>Metal Casting Processes:</b> Patterns, Types of patterns, allowances and material used for patterns, moulding materials, moulding sands, Moulding sands; properties and sand testing: Grain fineness, moisture content, clay content and permeability test. Core materials and core making. Moulding practices: Green, dry and loam sand moulding, pit and floor moulding; shell moulding; permanent moulding; carbon dioxide moulding. Metal casting: Melting furnaces: Rotary, Pit electric, Tilting and cupola. Review of casting processes, casting design considerations, capabilities and applications of casting processes; Gating and Rising design	12	25

	fundamentals, casting defects.		
<b>3</b>	<b>Metal Joining Processes:</b> Principle of welding, soldering, Brazing and adhesive bonding. Classification of welding and allied processes. Capabilities and applications; welding parameters, general concepts of weldability, welding metallurgy and weldment design, Gas welding and gas cutting, Arc welding, Power sources and consumables, Resistance welding: Spot, Projection and seam welding process, Atomic hydrogen, ultrasonic, Plasma and laser beam welding, Electron beam welding, and special welding processes e.g. TIG, MIG, friction and explosive welding, welding of C.I. and Al. Defects of welding and remedial actions. Numerical Calculation of Different process parameters of welding.	<b>12</b>	25
<b>4</b>	<b>Metal Shaping and Forming:</b> Metal working, Elastic and plastic deformation, Concept of strain hardening, Hot and cold working, Rolling, Principle and operations, Roll pass sequence, Forging, Forging operations, extrusion, Wire and tube drawing processes. Forging: Method of forging, Forging hammers and presses, Principle of forging tool design, Cold working processes: Shearing, Drawing Squeezing, Blanking, Piercing, deep drawing, Coining and embossing, Metal working defects, cold heading, Riveting, Thread rolling bending and forming operation. Numerical Calculation of Different process parameters of metal shaping and forming.	<b>12</b>	25
<b>5</b>	<b>Plastic, Ceramic and Glass Processing:</b> Classification of Plastics, Ingredients of Moulding compounds, General Properties of Plastics, Plastic part manufacturing processes such as compression moulding, Transfer moulding, Injection moulding, Extrusion moulding, Blow moulding, Calendaring, Thermoforming, slush moulding, laminating. Ceramic Structure, Properties, and Applications, Shaping Ceramics, Glasses Structure, Properties, and Applications, Forming and shaping of glass, Composite materials, Processing of metal matrix and ceramic matrix composites, Processing semiconductors.	<b>07</b>	20
	<b>Total Hours</b>	<b>45</b>	100%

#### Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
R Level	U Level	A Level	N Level	E Level
7	21	14	14	14

**Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate and above Levels (Revised Bloom's Taxonomy)**

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table

#### Reference Books:

1. Manufacturing Engineering And Technology By S. Kalpakjian, Pearson.
2. Manufacturing Processes, Kalpakjian, Pearson
3. Degarmon's Materials and Processes in Manufacturing, 11<sup>th</sup> Ed. Black, Ronald A Kohser, Wiley India
4. Manufacturing Processes and Systems, 9<sup>th</sup> Ed. Phillip F., Ostwald, Jairo Munoz, Wiley India

5. Production technology, by R.K. Jain, Khanna publishers.
6. Production Technology by P.C. Sharma S Chand & Co Ltd.
7. Manufacturing Technology Vol. II, By P.N. Rao, Tata McGraw Hill.
8. Welding Technology, by O. P. Khanna, Dhanpat Rai publishers.

### **Course Outcome:**

After learning the course the students should be able to:

1. The student will demonstrate the ability to think in core concept of their engineering application by studying various topics involved in branch specific applications.
2. The student will demonstrate the ability to use different processes and its process parameters to obtain qualitative solutions.
3. Students will understand the relevance and importance of the Different manufacturing techniques and real life application in industry.
4. Learn about different process parameter.

### **List of Experiments:**

#### **Following experiments are suggested for Laboratory work**

1. Basic understanding of Different Manufacturing Processes: concepts, application, advantage and future aspects
2. Hands on Exercise on Pattern Making
3. Performance on Metal Casting of Simple component
4. Performance on Welding of simple workpiece (Example Arc and Resistance Welding)
5. Exercise Problems on Welding
6. Exercise problems on Casting
7. Exercise problems on Sheet Metal Works
8. Demonstration on Plastic, Glass and Ceramic Processing ( Industrial Visit)

### **Important Note:**

**80 % From above suggested laboratory work should be covered and remaining 20 % is as per facility available at Department.**

### **Design based Problems (DP)/Open Ended Problem:**

All above performance are to be carried out in the laboratory and students will prepare experiments and note down reading and conclusion. The can prepare setup and perform on batch wise. At least 5 open ended problems are proposed for better understanding the subject and to apply real life application. The projects are listed below:

### **Major Equipment:**

1. Different patterns for Demonstration
2. Small Foundry, Welding and Sheet Metal Working Shop
3. Sand and Mold
4. Welding Machine (Arc/Resistance, TIG, MIG etc.)
5. Small rolling machine for demonstrating rolling (if possible otherwise may arrange for industrial visit)
6. Machine for Plastic processing (if possible otherwise may arrange for industrial visit)
7. Industrial Visit for Processing glass and ceramics

**List of Open Source Software/learning website:**

**1. <http://www.nptel.ac.in>**

**ACTIVE LEARNING ASSIGNMENTS:** Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.