

GUJARAT TECHNOLOGICAL UNIVERSITY
MECHATRONICS ENGINEERING (20)

SUBJECT NAME: MANUFACTURING TECHNOLOGY II
SUBJECT CODE: 2172003
B.E. 7th SEMESTER

Type of course: Engineering Science

Prerequisite: N.A.

Rationale: This subject is useful to understand the manufacturing aspects of mechanical product. The various conventional and non-conventional processes are studied in detail with applications. The quality checks as used for manufactured product are also part of studies.

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

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment; OEP-Open Ended problem; AL-Active learning;

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	METAL FORMING PROCESSES: Plasticity of metals; hot and cold working processes; forward and reverse extrusion process and its parameters; sheet metal forming work: Bending, Punching, Piercing, Blanking, Ironing, Drawing, Deep drawing, Reverse Redrawing; concept of die design for cutting and drawing.	09	23
2	FOUNDRY PRACTICE: Patterns, types of patterns, advantages and limitation; pattern allowances; molding sand; sand properties and testing; defects in casting; properties of liquid metal (density, fluidity, viscosity, specific heat etc) and its effect; casting design consideration; different types of gates, gating design; advantages and disadvantages of gating system; riser, riser design; location of riser; casting defects, special casting methods-investment casting,	09	23

	centrifugal casting, die casting.		
3	WELDING PROCESSES: Basic requirements of welding process, classification of welding process; joining rate; static volt-ampere characteristics of welding arc; arc initiation and maintenance methods; welding process parameters and its effect - type of current, electrode polarity, current, voltage and welding speed; power source characteristics; arc welding processes such as MMAW, SMAW, SAW, TIG, MIG; Types of Resistance welding processes; functions of electrode coating (flux); applications of welding processes.	09	23
4	JIG AND FIXTURES: Location principle; location analysis; work piece control: equilibrium theory, geometric control, mechanical control, dimensional control, tolerance stacking, alternate / redundant locators; location hardware; clamping and tool guiding elements; general design consideration for jigs and fixtures; location system for various tooling used in workshop.	07	18
5	NON-TRADITIONAL MANUFACTURING METHODS: EDM, AJM, ECM, USM and LBM process principles, equipment and process parameters.	05	13
6	MEASURING AND GAUGING: Concept of direct and indirect measurement; surface finish measurement, limit gauging, Taylors gauging principle, Gauging of taper angle, angle measurement using Sine Bar and slip gauges.	04	

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
Remembrance	Understanding	Application	Analyze	Evaluate
R Level	U Level	A Level	N Level	E Level
40	20	15	15	10

Legends: R : Remembrance ; U = Understanding; A = Application 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 Technology - Foundry, Forming & Welding P N Rao Tata Mc Graw Hill
- 2 Welding Processes & Technology Parmar R S Khanna Publishers
- 3 Non-Traditional Machining Marcel Dekker Benedict G F
- 4 Principle of Metal Casting Addison Wesley Flinn R A
- 5 Principles of Engineering Production, Lissaman and Martin, ELBS

Course Outcome:

After learning the course the students should be able to:

1. Acquire the basic knowledge of all manufacturing processes used on shop floor of any industry.
2. Decide the appropriate production process for any product upon the number of options available to optimize production process.
3. Apply quality checks and assess the better product using the concept of measuring and gauging.
4. Design and analyze a work / tool holding device to satisfy the requirement of motion control and mechanical deformation.

List of Experiments:

- 1 To find GFN, clay content & moisture content.
- 2 Effect of clay content on green compressive strength, permeability and hardness of molding sand.
- 3 Effect of moisture content on green compressive strength, permeability and hardness of molding sand
- 4 Analysis of measuring and gauging instruments
- 5 Analysis of 3-2-1 location principle
- 6 To study the effect of process variables of EDM on MRR and surface finish
- 7 Effect of varying arc welding process variables on resultant bead parameters using bead on plate test-shielded metal arc welding
- 8 Effect of varying arc welding process variables on resultant bead parameters using bead on plate test-submerged arc welding
- 9 Effect of varying arc welding process variables on resultant bead parameters using bead on plate test-gas tungsten arc welding
- 10 Study and performance of oxyacetylene gas cutting process and resistance spot welding process.

11 Pipe bending, metal spinning and press work.

Design based Problems (DP)/Open Ended Problem:

Student may be given a task to exhibit their knowledge of the course studied during the academic year.

Major Equipment:

1. Laboratory oven, Universal sand strength tester, Mechanical Sieve Shaker
2. Permeability tester, Sand rammer, Hardness tester
3. SMAW, SAW, TIG, Gas welding set up
4. Pipe bender, Spinning set up, Press work
5. EDM or any other non-conventional machining set up/machine
6. Jigs and fixtures samples

List of Open Source Software/learning website:

The website of NPTEL may be utilized for additional learning.

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.