



# GUJARAT TECHNOLOGICAL UNIVERSITY

**Bachelor of Engineering**

**Subject Code: 3152007**

**Semester – V**

**Subject Name: Manufacturing Technology**

**Type of course:** Engineering

**Prerequisite:** Zeal to learn the subject

**Rationale:** This subject is useful to understand the manufacturing requirements of industrial shop floor. Aspects of conventional and unconventional manufacturing are covered in this course to help students understand the concepts of processing mechanics and energy requirements.

**Teaching and Examination Scheme:**

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
4	0	2	5	70	30	30	20	150

**Content:**

Sr. No.	Content	Total Hrs
1	<b>Metal Cutting Principles:</b> Classification of the manufacturing processes, Cutting parameters, Single point cutting tool geometry and tool signature, Tool materials, Types of cutting fluids and functions, Orthogonal and Oblique cutting, Cutting force analysis and Power required for machining, Smoothness and accuracy of machined surfaces.	7
2	<b>Turning and Allied Operations:</b> Type of lathe, Constructional details of an engine lathe, Speed and feed drives for lathe, Work holding devices and auxiliaries, Operations performed on engine lathe, Taper turning on lathe, Thread cutting on lathe using Chasing dial and making an appropriate gear train, Cutting time calculations, Alignment tests on lathe, Capstan and turret lathe and their tooling holding devices.	9
3	<b>Production of Holes and Flat Surfaces:</b> Types of operations such as Drilling, Boring, Reaming, Tapping, Countersinking, Counter boring and spot facing, etc., Types of Drilling machines and tooling, Drilling time calculation, Deep hole drilling, Boring and jig boring operations, Alignment tests on pillar type drilling machine. Shaping and planning operations: Machines and tooling requirements, Speed mechanism and feed mechanism, study of cutting parameters.	7
4	<b>Milling and Abrasive based Operations:</b> General purpose, Types of milling machines, Cutting parameter, Up milling and Down	9



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	milling, Types of Milling cutters and their geometry, milling operations and setups, Milling machine attachments and associated operations, Indexing: Direct, simple, angular and differential, Helical milling: set up and requirements. Types of abrasives, Grinding wheels characteristics and selection, Types of grinding machines: Surface grinder, Center type Cylindrical grinder, Center-less grinder, Universal grinder, Gear grinder, etc., Lapping, Honing, Super finishing, Polishing and Buffing operations	
5	<b>Metal Forming Processes:</b> Plasticity of metals; hot and cold working processes; Forward and Backward extrusion; Forging, Bending and Wire drawing operations; Sheet metal forming work: Bending, Punching, Piercing, Blanking, Ironing, Drawing, Deep drawing, Reverse Redrawing; concept of die design for cutting and drawing.	6
6	<b>Metal Joining and Foundry Practice:</b> Patterns, types of patterns, pattern allowances; molding sand; sand properties and testing; 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, centrifugal casting, die casting. Basic requirements of welding process, classification of welding process; 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).	9
7	<b>Non-Traditional Manufacturing Methods:</b> EDM, AJM / AWJM, ECM, USM and LBM process principles, equipment and process parameters.	5

### Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
25	25	20	10	10	10

**Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create 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. J S Campbell, Principles of a Manufacturing Materials & Process, TMH Edition.
2. W.A.J.CHAPMAN, Workshop Technology Volume I, II, II, CBS Publish



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3. S.K.Hajra Choudhary, Workshop Technology Volume II, Media Promoters and Publishers.
4. Haslehurst, Manufacturing Technology, ELBS
5. Manufacturing Technology - Foundry, Forming & Welding, P N Rao, Tata Mc Graw Hill
6. Welding Processes & Technology, Parmar R S, Khanna Publishers
7. Non-Traditional Machining, Marcel Dekker and Benedict G F
8. Principle of Metal Casting, Addison Wesley, Flinn R A
9. Principles of Engineering Production, Lissaman and Martin, ELBS

**Course Outcomes:** After learning the course the students should be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Become familiar with the actual manufacturing technology and practices adopted on shop floor through hands on experimentation.	25
CO-2	Decide the appropriate production process for the given product from the number of options available based on familiarity with manufacturing and production fundamentals.	25
CO-3	Understand the principles of machining in various conventional and unconventional machining processes.	25
CO-4	Justify the requirements of metal joining, foundry and forming processes.	25

### List of Experiments:

1. Study of Machine tools and its tooling requirements. (Lathe, Shaper, Slotter, Grinding, Milling, Drilling)
2. Group job on lathe (No. of turns = 02)
3. Group job on grinding machine
4. Group job on milling machine
5. Group job on Capstan lathe
6. Machine tool Alignment
7. To find GFN, clay content & moisture content.
8. Effect of clay content on green compressive strength, permeability and hardness of molding sand.
9. To study the effect of process variables of EDM on MRR and surface finish.
10. Effect of varying arc welding process variables on resultant bead parameters using bead on plate test - submerged arc welding (SAW) or MMAW or SMAW.



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11. Pipe bending, metal spinning and press work.

**Major Equipment:** Machine tools / instruments / equipments mentioned below are useful.

1. Engine lathes
2. Milling machines
3. Grinding machines
4. Drilling machines
5. Shaper / Slotter machines
6. Capstan and turret lathe
7. Laboratory oven, Universal sand strength tester, Mechanical Sieve Shaker
8. Permeability tester, Sand rammer, Hardness tester
9. SMAW, SAW, TIG, Gas welding set up
10. Pipe bender, Spinning set up, Press work
11. EDM or any other non-conventional machining set up/machine

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

NPTEL