

GUJARAT TECHNOLOGICAL UNIVERSITY

MECHATRONICS ENGINEERING (20)

MANUFACTURING TECHNOLOGY – I

SUBJECT CODE: 2152007

B.E. 5th SEMESTER

Type of course: Engineering Science

Prerequisite: N.A.

Rationale: Subject is useful to understand the machining requirements of industrial shop floor. Aspects of conventional machining are covered in this course to help students understand the concepts of cutting mechanics and energy requirements. Various conventional machining processes are covered to create the understanding.

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)		
				PA	ALA	ESE	OEP			
4	0	2	6	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Metal Cutting Principles: 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.	10	20
2	Turning and Allied Operations: 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, Choice of operations and their sequencing, Special purpose and production lathe, Cutting time calculations, Alignment tests on lathe, Capstan and turret lathe and their tooling holding devices.	12	24
3	Drilling and Allied Operations: Types of operations such as Drilling, Boring, Reaming, Tapping, Countersinking, Counter boring and spot facing, etc., Drilling machines, Drill geometry, Machine and tooling requirements, Metal removal rate and power required for drilling, Drilling time calculation, Estimation of drilling force and torque, Deep hole drilling, Production, Boring and jig boring operations, Alignment tests on pillar type drilling machine.	5	10
4	Production of Flat Surfaces: Shaping and planing operations: Machines and tooling requirements, Speed mechanism and feed mechanism, study of cutting parameters,	5	10

	Metal removal rate and power required for cutting, Alignment tests on shaper.		
5	Milling Operations: General purpose, Production and special purpose milling machines, Cutting parameter, Metal removal rate and cutting time calculations, Plane and form milling operations, Types of Milling cutters and their geometry, Production/Special milling operations and setups, Milling machine attachments and associated operations, Indexing: Direct, simple, and differential, Helical milling: set up and requirements, Alignment tests on milling machine.	11	22
6	Abrasive Machining Processes: Types of abrasives, Grinding operation, cutting parameters, Grinding wheels characteristics and selection, Types of grinding machines: Surface grinder, Cylindrical grinder, Center less grinder, Universal grinder, Gear grinder, etc., Lapping, Honing, Super finishing, Polishing and Buffing operations.	5	10
7	Sawing and Broaching Operations: Operating parameters, Machining requirements, Saw tooth and broach geometry, Applications.	2	4

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
40	20	15	15	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. W.A.J.CHAPMAN, Workshop Technology Volume I, II, II, CBS Publish
2. S.K.Hajra Choudhary, Workshop Technology Volume II, Media Promoters and Publishers.
3. Dr.R.P.Arora & Prof.B.K.Ragunath, Manufacturing Processes – I (First Edition), Atul Prakashan.
4. J S Campbell, Principles of a Manufacturing Materials & Process, TMH Edition.
5. Haslehurst, Manufacturing Technology, ELBS

Course Outcome:

After learning the course the students should be able to:

1. Become familiar with the machining manufacture and production fundamentals.
2. Become familiar with the actual manufacturing technology and standards adopted on shop floor through hands on experimentation.
3. Decide and graphically represent the sequence of machining operations, which are most appropriate from the functionality point of view.
4. Learn the concepts of machining manufacture, which are important to minimize the production cost and production time along with the significant improvement in the quality of end product.

List of Experiments:

1. Study of Machine tools. (Lathe, Shaper, Slotter)
2. Study of Machine tools (Grinding, Milling, Drilling)
3. Group job on lathe (No. of turns = 02)
4. Group job on grinding machine.
5. Group job on milling machine.
6. Study of tooling requirements.
7. Group job on Boring (No. of turns = 02).
8. Group job on Capstan lathe.
9. Machine tool Alignment.
10. Helical Gear Cutting on Milling.

Design based Problems (DP)/Open Ended Problem:

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

Major Equipment:

All kinds of conventional machine tools 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

List of Open Source Software/learning website:

The website of NPTL 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.