

# GUJARAT TECHNOLOGICAL UNIVERSITY

## AUTOMOBILE ENGINEERING (02) /MECHANICAL ENGINEERING (19)

MANUFACTURING PROCESSES – I

**SUBJECT CODE: 2131903**

B.E. 3<sup>RD</sup> SEMESTER

**Type of Course:** Engineering

**Prerequisite:** Zeal to learn the subject

**Rationale:** Manufacturing processes related to machining are included in this subject. All conventional machines are included in this course to understand the basic concepts in machining science.

**Teaching and Examination Scheme:**

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

**Content:**

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	Basic Machine Tools and Metal Cutting Principles: Machine tools classification, working and auxiliary motions in machine tools, Primary cutting motions in machines tools, Cutting tool geometry and tool signature, cutting forces and power requirement in machining	4	8%
2.	Metal Cutting Lathes: Engine Lathes, construction all arrangement and principal units of engine lathes, type and size range of engine lathes, Operations carried on engine lathe , attachment extending the processing capacities of engine lathes, Types of lathe machines, Capstan and Turret lathes, Taper turning on lathe, Thread cutting on lathe using gear train and chasing dial, Alignment tests of lathes.	11	22%
3	Drilling Machines: Purpose and field of application of drilling machines, Types of drilling machines, Drilling and allied operation: drilling, boring, reaming, tapping, counter sinking, counter boring, spot facing; deep hole drilling, alignment tests of drilling machine.	6	12%
4.	Boring Machine: Purpose and filed of application, Horizontal boring machines, Precision boring machines.	3	6%
5.	Milling Machines: Purpose and types of milling machines, general purpose milling machines, different types of milling operations, milling cutters, attachments extending the processing capabilities of general	11	22%

	purpose milling machines, Indexing, Helical milling operation and its set up, Alignment tests of milling machine.		
6.	Planers, Shapers and Slotters: Classification of planers, Shapers and Slotters, Attachments extending the processing capacities of planers, Shapers and Slotters, machine and tooling requirements	6	12%
7.	Sawing and Broaching Machines: Metal sawing classification: reciprocating sawing machines, circular sawing machines, band sawing machines, Types of broaching machines, advantage and limitations of broaching.	3	6%
8.	Grinding Machines and Abrasives: Classification of grinding machines, cylindrical grinders, internal grinders, Surface grinders, tool and cutter grinders, center less grinders, Types of grinding wheels, wheel characteristics and wheel selection.	6	12%

### Reference Books:

1. Workshop Technology Vol. I, II & III, WAJ Chapman.
2. Workshop Technology Vol. II, Hajra & Choudhari.
3. Manufacturing Processes, O.P. Khanna.
4. Production Technology, R. K. Jain.
5. Processes and Materials of Manufacture; Lindberg Roy A.; Prentice-Hall India.
6. Principles of Manufacturing Materials and Process, J S Campbell.

### Course Outcomes:

At the end of this course students will be able to:

1. Understand the basic concept of machining operations.
2. Analyze any conventional machining processes.
3. Generate the sequence of machining operation to produce the end product.
4. Judge the limitations and scope of machines to perform variety of operations.

### List of Practical:

1. Study of Machine Tools (Lathe, Shaper, Slotter, Planner) – study the types of cutting tools available and relative motions between cutting tool and work piece on each machine tool. Also derive capacity and capability of respective machine tools from machine specifications and number of available attachments to perform variety of operations.
2. Study of Machine Tools (Grinding, Milling, Drilling) – study the types of cutting tools available and relative motions between cutting tool and work piece on each machine tool. Also derive capacity and capability of respective machine tools from machine specifications and number of available attachments to perform variety of operations.
3. Job making on lathe machine
4. Job making on shaper / slotter machine
5. Job making on milling machine
6. Job making on Drilling machine
7. Job making on Grinding machine
8. Alignment test on lathe machine / any other machine

Students will be performing the actual machining operation on respective machines in groups or individually with the help or guidance of Lab technician.

**Open Ended Problem:**

1. Develop a simplest possible Tool Dynamometer to determine the force the tool exerts on the work piece in a lathe.
2. Develop a machine to make holes in very soft material.
3. A precise hole is to be drilled in a rod of circular cross section at a specified distance from the end of the rod. Thousands of such parts are required. Develop a jig or fixture to ensure that all the pieces are identical.
4. Develop a machine to make corrugated metal sheet.
5. Gold of very thin gage is to be used to cover the body of a Rolls Royce car. Design a process/machine to make such a thin gage and demonstrate using any easily available material
6. Students may be asked to provide a design set up for machining any component / product on any of the conventional machine studied in this course. Moreover, a detailed sketch of each of the operations in a proper sequence on a specific machine or different machine may also be derived by student to conclude an appropriate design.

**Major Equipments:**

All conventional machine tools such lathe, milling, shaper, slotter, drilling machine, grinder, etc.

**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.