GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3142509
Semester – IV
Subject Name: Manufacturing Technology -I

Type of course:

Prerequisite: Nil

Rationale:
Manufacturing Technology –I related to Metal cutting Machine tools and different processes are included in this subject. All conventional machines are included in this course to understand the basic concepts in machining science. It also provides knowledge of safety precaution while performing operations on machine tools.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	**Metal Cutting Principles and Machine Tools:** Machine tools classification, working and auxiliary motions in machine tools, Primary cutting motions in machines tools, Elements of Metal cutting, Orthogonal and Oblique cutting, Classification of tools and tool Materials. Systems of Cutting- Tool Nomenclature: British Maximum Rake System, ASA system, German System. International Standards: Tool in hand and tool in Use systems, Setting system, Mathematical relationship between tool and Working systems, Calculation of Tool Angles and Working Angles. Chip formation: Types of chip and effect of cutting parameter, Chip thickness and Shear Plane angle measurement, Velocity relationship. Chip control and chip breakers, Concept of different forces in metal cutting: Merchant circle diagram, Stress and Strain in chip, Work done in Cutting, Power calculation in cutting. Concept of Tool life, Tool Wear, cutting fluid, Machinability and Economics of metal cutting.	**12**
2	**Metal Cutting Lathes:** The Lathe and its working Principle, Types, Different Parts of Lathe, Lathe Accessories and Attachments, Change of speed and Speed ratios. Feed Mechanism and change gears, Apron and Apron Mechanism. Specifications of Lathe. Different Operations on Lathe, Threading, Boring, Reaming knurling, Grooving, Parting off and form turning on lathe. Chip disposal devices. Estimating machining time calculations. Turret and Capstan lathes as compared with a centre lathe. Main parts of Turret and capstan lathe and classification. Primary and secondary motions, common tools, attachments and feeding mechanism. Safety Precautions associated in Lathe.	**10**

3	**Shapers, Slotters and Planers:** Classification of Shapers, Slotters, and Planer Machine, Attachments extending the processing capacities of Shapers, Slotters, and Planer, Different Parts and Tooling requirements. Working Principle and Mechanism, Machining time calculations. Safety Precautions associated with Shapers, Slotters, and Planer Machine.	**04**
4	**Drilling, Reaming and Boring Machines:** Drilling Machine: Purpose and field of application of drilling machines, Classifications of Drills, Twist drill, Twist drill parts and terminology. Types of drilling machines, Specifications of Drilling machines. Driving Mechanism of Drill. Drilling and allied operation, Estimating of machining time, Drill Grinding, Reaming: Reamer terminology, Types of reamer, reaming operations. Boring Machine: Purpose and filed of application, Classification Boring Machines, Operations performed on Boring machines. Safety Precautions associated with Drilling, Reaming and Boring machines.	**04**
5	**Milling Machines:** Working Principles, Purpose and types of Milling machines, Size and specifications of Milling machines. Types of Milling machines, Different types of milling operations, milling cutters and attachments extending the processing capabilities. Cutting Speed and Feed. Estimating machining time. Indexing or Dividing heads, Helical and spiral milling operation and its set up. Safety Precautions associated with Milling machine.	**06**
6	**Sawing and Broaching Machines:** Metal sawing classification, Blade specification, Machine Size and specification. Cutting speed, Blade failure and their preventions. Types of broaching machines, Broach constructions and elements of broach. Method of broaching. Tooth load on broach, Broaching speed and machining time calculation. Advantage and limitations of broaching. Safety Precautions associated with Sawing and Broaching machine.	**03**
7	**Abrasives and Grinding Machines:** Common form of abrasive tools, Grinding wheels and wheel material. Abrasive and bond material, symbolic representation of bonds. Grain and Grit, Grade, structure, common wheel shapes. Method of specifying grinding wheels, Loading, glazing, trueing and Dressing of grinding wheels, Classification of grinding machines, Grinding operations. Centreless grinders: Through feed, Infeed and End feed grinding. Special grinding machines, Size and specifications of grinding machines. Method of grinding, Sharpening of tools. Speed, feed and depth of cut in grinding, Machining time calculations. Safety Precautions associated with Grinding.	**06**
8	**Installation and Testing of Machine Tools:** Foundations for the machine tools, different types of machine foundations: Block, Box, Wall, Frame types. Factor effecting the type and size of foundation. Transportation and Erection: Types of Lifting and transporting equipment: pulley blocks, slinging, levelling and aligning. Machine tool testing: Alignment and practical test, Acceptance tests, site for testing, degree of accuracy, measuring equipment. Common geometrical tests, mode of tolerances and understanding of test charts.	**04 (Lab Teaching)**
	Total Hours	**45+4***

***to be covered in laboratory**

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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
20	**30**	**30**	**20**	**0**	**0**

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. Fundamentals of Machining and Machine tools, by Geoffery Boothroyd and Wniston. Taylore & Francis Publication
2. A Text book of Production Engineering, by P C Sharma, S Chand Publication.
3. Workshop technology (Manufacturing Processes) by S K Garg, University science press.
4. Processes and Materials of Manufacture; Lindberg Roy A.; Prentice-Hall India.
5. Principles of Manufacturing Materials and Process, J S Campbell.

Course Outcomes:

Students will be able to

Sr. No.	CO statement	Marks % weightage
CO-1	Interpret basics of cutting tools and metal cutting mechanism.	30
CO-2	Make use of their skill in manufacturing of workshop job by using different machine tools.	30
CO-3	Illustrating different cutting parameters and calculation of machining time for different metal cutting operations.	30
CO-4	Evaluate Monitoring and testing of machine tools for better performance.	10

Term Work:
The term work shall be based on the topics mentioned above.

List of Experiments:

1. Demonstration on Chip formation, Shear plane angle measurement.
2. Workshop Practices on Job making on lathe machine.
3. Demonstration of job making on shaper/slotter, Milling, Drilling and Grinding machine.
4. Demonstration on Force Measurement on Lathe.
5. Assignments for Machining time calculation for different machining operations.
6. Alignment test on lathe machine / any other machine

Major Equipment:

1. Lathe Machine and lathe attachment
2. Lathe dynamometer
3. Shaper/Slotter/Planner machine or Industrial visit
4. Milling and Milling attachment
5. Grinding machine
6. Semi Automatic Machine

List of Open Source Software/learning website:

1. NPTEL
2. Machining Process videos