

# GUJARAT TECHNOLOGICAL UNIVERSITY

## MECHANICAL ENGINEERING (19) PRODUCTION TECHNOLOGY SUBJECT CODE: 2161909 B.E. 6<sup>th</sup> SEMESTER

**Type of course:** Under Graduate

**Prerequisite:** Manufacturing Processes –I

**Rationale:** Students will be able to apply basics of metal machining processes very well. They can have enough knowledge of different forces acting while cutting with tool life and wear. They can interpret and utilize the economics of machining. Learns the technology of Gear and threads manufacturing which is grassroots knowledge of any manufacturing industries. They are able understand the usefulness of Jig & Fixtures, Presses & Press work, Types of Dies and various forces acting during cutting. They also understand non conventional machining processes its importance, application advantages and economy aspect in production technology.

### **Teaching and Examination Scheme:**

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

### **Content:**

Sr. No.	Topic	No. of Hours	%Weightage
1	<b>Metal Cutting:</b> Principles of metal cutting, classification of Metal cutting/machining processes: Orthogonal and oblique cutting, Effect of tool geometry and other cutting parameters, Mechanisms of formation of chips, types of chips formed, chip Breakers, concept of specific cutting pressure, The forces acting on the cutting tool and their measurement, Merchant's circle diagram, force dynamometer, force and velocity relationship, Tool wear, Factors causing wear, tool life, variables affecting tool life, economical cutting speed, machinability of metals.	10	25
2	<b>Thermal Aspects in Machining:</b> Sources of heat generation in machining and its effects, Temperature Measurement techniques in machining, types of cutting fluids, Functions of cutting fluid, Characteristics of cutting fluid, Application of cutting fluids, Economics of Metal Cutting Operations.	05	10
3	<b>Gear and Thread Manufacturing:</b> Different types of Threads manufacturing methods, and tools involved, Different gear forming and generating methods with their special features, Gears finishing processes.	05	10
4	<b>Jigs and Fixtures:</b> Definition, Differences between Jigs and Fixtures, Its usefulness in mass production, design principles, 3-2-1 location principle and its application to short and long cylinders, types of locators, concept of work piece control, geo metric control,	06	15

	dimensional control and mechanical control, Clamps, jig bushes, Jigs and fixtures for various machining operations.		
<b>5</b>	<b>Press Tool:</b> Classification of presses, Classification of dies, cutting actions in dies, clearance, cutting forces, Methods of reducing cutting forces, Minimum Diameter of Piercing Center of Pressure, Blanking, Piercing, Drawing, Bending and Progressive Die design, scrap reduction, strip layout.	<b>09</b>	<b>20</b>
<b>6</b>	<b>Non-conventional Machining:</b> EDM, IBM, ECM, ECG, CM, AJM, Wire cut EDM, USM, LBM process principle, process parameters and their applications. Process capabilities and their applications.	<b>10</b>	<b>20</b>

#### Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
<b>10</b>	<b>15</b>	<b>15</b>	<b>10</b>	<b>10</b>	<b>10</b>

**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. Metal Cutting principles, by M C Shaw, Oxford University press
2. Fundamentals of machining and machine tools, by Boothroyd - CRC publication
3. Production Technology - H.M.T. By HMT
4. Tool Design by Donaldson, Tata McGraw Hill Pub.
5. Metal cutting Principles by Trent McGraw Hill Pub
6. Workshop Technology Vol. II by Raghuvanshi, Dhanpat rai Pub
7. Production Technology by R.K. Jain, Khanna Pub

#### Course Outcome:

1. Students will be able to apply basics of metal machining processes very well with the detailed signature of tools.
2. Students able to understand different forces acting while metal cutting and can draw merchant circle diagram and also able to apply knowledge to economic metal cutting.
3. Students can able to grasp distinctive knowledge of gear forming and its generating methods.
4. Students are able to clutch its usefulness and design of such locating and fixing devises.
5. Learn in depth about press and press work
6. Gained elementary knowledge in Non-conventional machining and its application in industries.

#### List of Experiments:

1. Study of various types of cutting tools and measurement of tool geometry
2. To Understand the Effect of Chosen Parameters on the type of chip produced
3. Determination of chip-thickness ratio and shear plane Angle During Machining

4. Measurement of cutting forces in turning using Lathe Tool Dynamometer under various cutting conditions
5. To study the Temperature Measurement on chip tool interface
6. To study and understand the effect of a suitable cutting lubricant
7. Design a Jig and Fixture for given component
8. To study different press and design of punch and die, also exercise on strip layout and center of pressure
9. Study of Unconventional Manufacturing Process and simple exercise on metal removal rate.

**Design based Problems (DP)/Open Ended Problem:**

1. Force measurement
2. Design and manufacturing of jig and fixture
3. Design of punch and dies

**Major Equipment:**

1. Lathe and drill tool dynamometer
2. Press tool, with simple die and punches
3. Jigs and Fixtures
4. Unconventional machines

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

1. [www.nptel.ac.in/](http://www.nptel.ac.in/)

**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.