

GUJARAT TECHNOLOGICAL UNIVERSITY

PRODUCTION ENGINEERING

TOOL ENGINEERING

SUBJECT CODE: 2152507

B.E. 5th SEMESTER

Type of course: Fundamental

Prerequisite: Basics of Machine Tools

Rationale: The course is designed to give fundamental knowledge of cutting tool and forces.

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.	Wodule Weightage
1	Introduction: Tool design practice, procedure of tool design, process planning and tool design.	02	03
2	Mechanics of Machining: Place of machine in production , classification of material removal processes, orthogonal and oblique cutting, merchant's circle diagram-force and velocity relationship, types of cutting tool mechanics, their characteristics and selection criteria, mechanics of metal cutting- effect of tool-geometry and other cutting parameters, mechanisms of formation of chips-types of chips formed, concept of specific cutting pressure , types of tool wear, Factors causing wear, tool life, variables affecting tool life, economical cutting speed, machinability of metals, economics of machining.	16	22
3	Thermal Aspects in Machining: 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.	06	09
4	Design of Single Point Cutting Tools: Tool geometry for single point cutting tool, tool signature , Design of single point cutting tools such as solid tools , tipped tools, coated tipped	06	09

	tools, throw away type tools and diamond tools.		
5	Design of Multipoint Tools: Design of milling cutters, gear milling cutters, hobs gear shaping tools, broaches, drills, reamers, taps & dies for thread cutting, boring tools, flat form tools, circular form tools. Standard tool holders & standard tooling and their design for turrets and automates.	06	12
6	Cutting Tool Materials: Types of cutting tool materials, their selection and Applications.	06	09
7	Design of Press Tools: Introduction to press tools and related terminology, effect of clearances, theory of deformation, stages of cutting operation, center of pressure, strap strip layout, die and punch design, design of simple, compound and progressive dies, methods of mounting punches and dies, design of drawing dies, bend allowances, bending and forming dies, Dies for die-casting and forging operations.	10	17
8	Jigs and Fixture: Essential requirements of jigs & fixtures, economics of jigs and fixtures, principles of location and clamping, location and clamping devices, types of drill bushes, types of jigs and fixtures- such as fixtures for milling, welding, heat treatment, grinding, assembly and inspection processes; standardization in jigs and fixtures, principle of work holders, common work holders for production like vises, chucks, arbors, mandrels & collets.	12	19

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
7	21	14	14	14	--

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. A text book of PRODUCTION ENGINEERING by Dr. P.C. Sharma S.Chand & Company Ltd.
2. Production Engineering Sciences by P.C.Pandey & C.K.Singh, Standard Publishers.
3. Tool Engineering and Design by G.R. Nagpal.
4. Manufacturing Science by Ghosh & Mallik, East West Press, New Delhi.
5. Manufacturing Processes for Engineering Materials by Kalpakjian S, Pearson Publication.
6. Fundamental of Metal Machining and Machine Tools by Geoffrey Boothroyd.
7. Jig & Fixtures by P.H.JOSHI, Tata McGrawhill.
8. Jigs & Fixtures by Grant, Tata McGrawhill.

Course Outcome:

1. To understand basics of mechanics of machining.
2. To understand about thermal aspects in machining.

3. To design a single, multiple point cutting and press tool.
4. To understand fundamentals of jigs and fixtures.

List of Experiments:

1. To study about tool design, its procedure and process planning.
2. To study about mechanics of machining.
3. To study about thermal aspects in machining.
4. To understand about the design of single point cutting tool.
5. To understand about design of multipoint tools.
6. To study types of cutting tool materials.
7. To design press tools.
8. To study jigs and fixtures.

Design based Problems (DP)/Open Ended Problem:

1. Design & Draw assembly & detailed drawing of Jigs & Fixture of the given component.
2. Design & Draw assembly & detailed drawing of Press Tool of the given component.
3. Design & Draw Single Point & Multi points cutting Tools.

Major Equipments:

1. Lathe tool Dynamometer
2. Jigs and Fixtures

List of Open Source Software/learning website:

1. <http://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.