GUJARAT TECHNOLOGICAL UNIVERSITY

INDUSTRIAL ENGINEERING
METAL CUTTING & ADVANCED MANUFACTURING PROCESSES
SUBJECT CODE: 2161504
B.E. 6th SEMESTER

Type of course: Core

Prerequisite: None

Rationale: The course focuses on the details of metal cutting theory, cutting tool materials and tool geometry, advanced machining and advanced manufacturing processes.

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)	
					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:-** Theory of metal cutting, Different methods of cutting, Types of chips, Cutting parameters, chip thickness ratio, Chip reduction co-efficient, Cutting and power, specific pressure and power in machining operations, Merchant's circle diagram, Mach inability, Cutting fluids	**20**	30
2	**Tools:** Tool materials, Tool geometry, Tool wear and tool life economical cutting speeds, jigs and fixtures – types, general principles of design and advantages, Tool room functions and organization.	**14**	24
3	**Advanced machining:** Introduction to CAD, CAM, and CIM, Numerical controlled (NC), Computerized numerical controlled (CNC), and Direct Numerical controlled (DNC) machines	**10**	16
4	**Advanced manufacturing processes:** Electro-Chemical Machining (ECM), Electro Discharge Machining (EDM), Wire-cut Electro Discharge machining, Electro Chemical Grinding (ECG), Ultrasonic machining, Abrasive Jet Machining, Electron Beam Machining, Plasma Arc machining, Explosive forming, Electromagnetic forming, Hydro forming, high velocity forming, Spark erosion	**20**	30

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
35	35	10	10	5	5

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. Workshop Technology by W.A.J. Chapman
2. Machine tool engineering by G.R. Nagpal, Khanna Publishers
3. Elements of workshop technology part-II by H.S.Chaudhary
4. A text book of production engineering by Pandey and sigh
5. New Technology by A. Bhattacharya
6. Production Technology by H.M.T.
7. Metal cutting by Sen and Bhattacharya
8. Principles of Machine tools by Sen and Bhattacharya.

Course Outcome:

After learning the course the students should be able to:

1. Understand mechanism of chip formation in different machining condition.
2. Estimate the tool life for different tool materials.
3. Select the appropriate tool material and design for the given cutting conditions.
4. Understand the principles and applications of various modern machining and manufacturing processes.

List of Experiments:

1. Need for conventional machining.
2. To study type of energy sources & mechanism.
3. To study EDM
4. To study ECM
5. To study USM
6. To study high velocity forming process.
7. To study NC-CNC M/c.
8. To study Jigs & fixtures.
9. Study of tool materials.
10. To study geometry of single point cutting tool.
11. To study effect of cutting variables & types of chip formation.
12. To study effect of cutting variables on tool work interface temperature.
13. To observe effect of cutting variable on chip thickness ratio & shear plane angle during machining.

Design based Problems (DP)/Open Ended Problem:

Design of single point cutting tool for given machining condition.

List of Open Source Software/learning website: 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.