

Branch Name:	Mechanical Engineering
Program Code:	ET402
Course Title:	Manufacturing Processes
Course Code:	2ET4020402
Pre-requisite Course:	Basic Manufacturing Engineering

Course Objectives:

1. Provide knowledge of different types of machining operations.
2. For conversion into finished products large number of industrial parts has to undergo various machining operations. Appropriate selection and usage of machine tool, work holding devices, cutting tools and process parameters plays very crucial role in obtaining good quality product at optimum cost.
3. This course will make student familiar with fundamentals of cutting mechanics, kinematics, constructional features and selection criterion for various basic machine tools and automates with some basic exposure to conventional work holding devices and cutting tools and tool holders used on the same machines.
4. The course content should be taught and implemented with the aim to develop different types of skills so that students are able to make a part/component as per given specification using appropriate machine tools, work holding devices, cutting tool & tool holder by employing Optimum process parameters and safe working procedures.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	4	5	60	40	40	60	200

Course Contents:

Unit No	Topic	Total Hours	Weightage (%)
1	Introduction to Metal Removal Processes • Explain mechanics of cutting • Differentiate between forming and generating method • Mechanics of cutting action, orthogonal and oblique cutting • Explain the effect of varying cutting parameters • Chip formation, types of chips • Concept and definition of cutting speed, feed and depth of cut • Cutting fluid- basic need, types, properties and its applications • Safety precautions in machine tools	04	10
	Cutting tools and tool holders • Various cutting tool materials, their compositions and properties • Interpret carbide insert and tool holder designation system • General cutting parameters for various cutting tool materials (HSS and Carbide) and work piece materials. (low carbon steel, high carbon steel, stainless steel, gunmetal, cast iron and aluminum) • Explain tool angles of cutting tools and their importance		
2		08	20

	• Various cutting tools (with tool geometry, nomenclature, tool materials, sketch/drawing of each, ISO/BIS standards) • Explain factors affecting tool life.		
3	Basic machine tools-I Lathe and Drilling • Define and classify basic machine tools. • Movements of tool, job, slides and work holding devices during cutting operation on various machine tools • Explain classification, working principles, construction and operation of lathe and drilling machines. • Lathe machine. i. Types. ii. Working principle (using block diagram). • Specification of Lathe, operation performed on Lathe. • Work holding devices constructional sketch, working and applications. (3 jaw chuck, 4 jaw chuck, face plate, centers) • Metal removal rate (MRR) – concept and method to calculate on lathe. • Drilling machine. i. Types. ii. Working principle (using block diagram) • Radial drilling machining. i. Constructional features. ii. Kinematics (drive, spindle speeds, feed mechanism, radial movement, etc.) constructional sketch, working, and use. iii. Detailed specifications. iv. Accessories- types, constructional sketch, working and applications. v. Tool holding and setting methods. vi. Operations performed. vii. Work holding devices constructional sketch, working and applications. • Metal removal rate (MRR) –method to calculate on drilling machine	10	24
4	Basic machine tools-II Milling Machine • Explain classification, working principles, construction and operation of milling machine. • Milling machine. i. Types. ii. Working principle (using block diagram) • Plain horizontal milling machining. i. Constructional features. ii. Kinematics (drive, spindle speeds, feed mechanism, table movement, etc.) constructional sketch, working, and use. iii. Detailed specifications. iv. Operations performed. • Milling cutters-types and applications • Up milling and down milling- concept, advantages, disadvantages and applications • Indexing-dividing head- constructional sketch, working, and use • Simple, differential and compound indexing methods with simple numerical • Metal removal rate (MRR) – concept and method to calculate on milling	07	16
5	Basic machine tools-III Shaping Machine, Slotting machine, Planning Machine. • Explain types, working principles, construction and operations of shaping, slotting and planning machines. • Shaping machine. i. Types. ii. Working principle (using block diagram). iii. Constructional features and detailed specifications. iv. Quick return mechanisms kinematic sketch, working and advantages. v. Operations performed. vi. Work holding devices constructional sketch, working and applications. • Slotting machine. i. Types. ii. Working principle (using block diagram). iii. Constructional features and detailed specifications. iv. Operations	07	16

	performed. v. Work holding devices constructional sketch, working and applications. Planning machine. i. Types. ii. Working principle (using block diagram). iii. Constructional features and detailed specifications of double column planner iv. Operations performed. v. Work holding devices constructional sketch, working and applications.		
6	Automats - Explain classification, working principles, construction and operation of capstan lathe, turret lathe. - Capstan and turret lathe: i. Constructional features and working principle. ii. Functions and applications. iii. Difference between capstan and turret lathe. iv. Preparation of tool layout. v. Merits and demerits. vi. Turret lathe in comparison with basic centre lathe. vii. Work holding devices. - Single spindle Automats: - Need. - Constructional features. - Working principle and applications. - Collets-constructional features and applications. - Introduction to multi spindle automates and special purpose automates.	06	14

List of Practical/Experiments:

- To prepare the cutting edge by grinding a single point cutting tool as per the tool geometry.
- Effect of various cutting parameter:
Demonstrate type of chips, surface finishes and tool life for varying cutting parameters for same work piece material and tool material. Tabulate the observations.
- Effect of Varying Work Piece Materials:
Demonstrate type of chips, surface finishes and tool life for varying work piece material with same cutting parameters. Tabulate the observations.
- Study about lathe machine and prepare a composite job with different machining operations on it.
- Study about milling machine and prepare a job on it with up milling and down milling.
- Study about capstan and turret lathe and prepare a tool layout.
- Industrial Visit: Visit A Nearby Machine Shop and Prepare A Two Page Report Comprises Of List Of Machine Tools Including Automates, Its Technical Specification, Machining Parameters For Various Operations Being Performed, Cutting Tools And Work Holding Devices Used, Observation Of Skill And Safety Criteria.

Reference Books:

- Production Technology, R.K. Jain and S.C. Gupta, Khanna publication
- Workshop Technology I & II, Raghuvanshi, Dhanpat Rai and Sons
- Elements of Workshop Technology Volume No. II Machine Tools, Hajra Choudhary, Bose S. K., Roy Nirjhar, Media promoters and publishers pvt. Limited
- Production Technology, HMT, Tata Mcgraw-Hill Publishing Co.

List of Open-Source Software/learning website:

- <http://nptel.iitm.ac.in/video.php?subjectId=112105126>
- <http://www.youtube.com/watch?v=H0AyVUfl8-k&list=PLEFE7D1579523C45D>
- <http://www.youtube.com/watch?v=81Fdif5e85c>
- <http://www.youtube.com/watch?v=fGqc9mZS0YI>
- <http://www.youtube.com/watch?v=Mn9jpqI8rao>
- <http://www.youtube.com/watch?v=8SuoH5aL1SY>

Course Learning Outcomes (CLO):

1. Provide knowledge of different types of machining operations.
2. Know about the metal removal process, machine tools and their applications.
3. Understand machining operations on lathe, drilling, shaping, planning, and milling machine and their Parameters.
4. Understand about capstan, turret lathe and different kind of cutting tools.
5. Metal removal rate and its applications.
6. Cutting tool types tool life.

Mapping of CLO with PO and PSO

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	H												M		M	
CLO2	M															
CLO3	M	L				L		M	H				M		M	
CLO4	M	L				L		M	H				M		M	
CLO5	M	L				L		M	H				M		M	
CLO6		M		M	L							M				

H: High, M: Medium, L: Low