

GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Diploma Engineering				Branch	Mechatronics Engineering			
Semester	IV				Version	1.0.0.0			
Effective from Academic Year	2019-20				Effective for the batch Admitted in	June 2018			
Subject code	1ME2401		Subject Name		MACHINING PROCESSES				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	2	0	5	Theory	40	60	100
Hours	3	0	4	0	7	Practical	60	40	100

Pre-requisites:

Student must have knowledge of workshop practices, work shop tools, manufacturing processes like metal working, metal joining, metal casting, engineering drawing and production drawing. Students also have knowledge of limits, fits and tolerance.

Course Learning Outcomes:

The course content should be taught and implemented with an aim to develop different skills leading to the achievement of the following competencies and course learning outcomes:

After completions of this course, students will able to:

CO1.Understand mechanics of cutting. Describe various manufacturing processes and its application.

CO2.Classify and explain working of basic machine tools with kinematics.

CO3.Observe and conclude the effect of varying tool materials, cutting parameters and work piece materials.

CO4.Interpret and select tool and tool holder designation system. Identify the machine tool and select cutting parameters for given job.

CO5.Developing the skill of manufacturing. Ability to convert the engineering drawing in to production drawing. Make the job as per given manufacturing drawing.

Course Content

Name of UNIT	Unit Content	Unit Learning Outcomes	Marks	Hrs
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UNIT – 1			10	7
<p>Introduction and mechanics of cutting</p>	<p>1.1 Need, scope & importance of manufacturing processes in industries.</p>	<p>1a. Understand about mechanics of cutting.</p>		
	<p>1.2 Differentiate between forming and generating processes.</p>			
	<p>1.3 Mechanics of cutting action, orthogonal and oblique cutting (Without derivation).</p>			
	<p>1.4 Chip formation, types of chips.</p>			
	<p>1.5 Concept and definition of cutting speed, feed and depth of cut.</p>			
	<p>1.6 Functions and types of chip breakers.</p>			
<p>1.7 Cutting fluid- basic need, types, properties and its applications.</p>				

	1.8 Influence of cutting variables on surface finish, tool life, economy, and mass production.		
	1.9 Safety precautions in machine tools.		
		1b. Explain the effect of varying cutting parameters.	

UNIT – 2			15	10
<p>Basic machine tools-I</p>	<p>2.1 Define and classify basic machine tools.</p>	<p>2a. Explain classification, working principles, construction and operation of lathe and drilling machines.</p>		
	<p>2.2 Movements of tool, job, slides and work holding devices during cutting operation on various machine tools.</p>	<p>2b. Describe mechanism & motion transmission in lathe and drilling machines.</p>		
	<p>2.3 Lathe machine Types, working principle (using block diagram).</p>	<p>2c. Explain work holding devices for lathe and drilling machines.</p>		
	<p>2.4 All geared head stock center lathe.</p>			
	<p>1. Constructional features.</p>			
	<p>2.Kinematics- (drive, head-stock, feedbox, carriage, cross slide, top slide, swivel, apron, tailstock,) constructional sketch, working, and use.</p>			
	<p>3. Detailed specifications.</p>			

4. Operations performed.

5. Work holding devices constructional sketch, working and applications.

6. Lead screw and feed rod mechanisms.

7. Thread cutting setting-concept methods and simple numerical.

8. Accessories- types, constructional sketch, working and applications.

2.5 Metal removal rate (MRR) – concept and method to calculate on lathe.

2.6 Drilling machine Types, working principle (using block diagram).

2.7 Radial drilling machining.

1. Constructional features.

2. Kinematics (drive, spindle speeds, feed mechanism, radial movement, etc.)
constructional sketch, working, and use.

3. Detailed specifications.

4. Accessories- types, constructional sketch, working and applications.

5. Tool holding and setting methods.

6. Operations performed.

7. Work holding devices- constructional

sketch, working and applications.

2.8 Metal removal rate (MRR) –method to calculate on drilling machine.

<p>Unit – III</p>	<p>3.1 Milling machine Types, working principle (using block diagram).</p>	<p>3a. Explain classification, working principles, construction and operation of milling machine.</p>	<p>10</p>	<p>8</p>
<p>Basic machine tools- II</p>				
	<p>3.2 Plain horizontal milling machining Constructional features, Kinematics (drive, spindle speeds, feed mechanism, table movement, etc.) constructional sketch, working, and use, Detailed specifications, Operations performed.</p>	<p>3b Describe mechanism & motion transmission in milling machine.</p>		
	<p>3.3 Milling cutters-types and applications.</p>	<p>3c. Select appropriate milling cutter for required milling operations.</p>		
	<p>3.4 Up milling and down milling- concept, advantages, disadvantages and applications.</p>	<p>3d. Calculate number of revolutions of indexing head for given requirements using appropriate indexing method.</p>		
	<p>3.5 Indexing-dividing head- constructional sketch, working, and use.</p>			
	<p>3.6 Simple, differential and compound indexing methods with simple numerical.</p>			
	<p>3.7 Work holding devices- constructional</p>			

	<p>sketch, working and applications.</p> <hr/> <p>3.8 Metal removal rate (MRR) – concept and method to calculate on milling.</p>			
Unit – IV	<p>4.1 Shaping machine Types, Working principle (using block diagram), Constructional features and detailed specifications, Quick return mechanisms- kinematic sketch, working and advantages, Operations performed, Work holding devices- constructional sketch, working and applications.</p> <hr/> <p>4.2 Slotting machine Types, Working principle (using block diagram), Constructional features and detailed specifications, Operations performed, Work holding devices- constructional sketch, working and applications.</p> <hr/> <p>4.3 Planning machine Types, Working principle (using block diagram), Constructional features and detailed specifications of double column planner, Operations performed, Work holding devices- constructional sketch, working and applications.</p>	<p>4a.Explain types, working principles, construction and operations of shaping, slotting and planning machines.</p> <hr/> <p>4b. Describe mechanisms & motion transmission in shaping, slotting and planning machines.</p>	10	8
Basic machine tools-III				

<p>Unit – V</p>	<p>5.1 Various cutting tool materials, their compositions and properties.</p>		<p>10</p>	<p>8</p>
<p>Cutting tools and tool holders</p>		<p>5a. Select cutting tool material for given work piece material and machining operation.</p>		
	<p>5.2 Carbide inserts:</p>			
	<p>1. Designation method for turning, milling and drilling (As per ISO).</p>	<p>5b. Interpret carbide insert and tool holder designation system.</p>		
	<p>2. Need.</p>	<p>5c. Suggest suitable carbide inserts and tool holder for specified operation.</p>		
	<p>3. Benefits.</p>	<p>5d. Explain tool angles of cutting tools and their importance.</p>		
	<p>5.3 Tool holders for carbide inserts:</p>	<p>5e. Explain factors affecting tool life.</p>		
	<p>1. Designation method for turning, milling and drilling (As per ISO).</p>			
	<p>2. Need.</p>			

3. Benefits.

5.4 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).

5.5 Cutting tool angles and their functions.

5.6 Various cutting tools (with tool geometry, nomenclature, tool materials, sketch/drawing of each, ISO/BIS standards) used for various operations on lathe, milling and drilling machines.

1. Single point cutting tool.

2. Plain milling cutter.

3. Twist drill.

	5.7 Tool life, tool wear and machinability, factors affecting them.			
Unit – VI	6.1 Capstan and turret lathe 1. Constructional features and working principle.	6a. Explain classification, working principles, construction and operation of capstan lathe, turret lathe and automats.	5	4
Automats	2. Functions and applications.			
	3. Difference between capstan and turret lathe.			
	4. Merits and demerits.			
	5. Turret lathe in comparison with basic centre lathe.			
	6. Work holding devices.			

	<p>6.2 Single spindle Automats Need, Constructional features, Working principle and applications.</p>			
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List of Practical:		
The practical should be carried out in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate course learning outcomes.		
No.	Unit	Name of Practical
1	UNIT – I	To study about machining motion of different machine tool and also study about cutting parameter of machine tool.
2	UNIT – I	Demonstrate type of chips and study about method of machining and types of cutting.

3	UNIT – V	Study and demonstrate about single point cutting tool (SPCT) and multipoint cutting tool with nomenclature. Also grind single point cutting tool.
4	UNIT – II	<p>Turning Job:</p> <p>Prepare a job on centre lathe as per the given drawing. (Including facing, plain turning, taper turning, knurling, threading, grooving, chamfering operation on lathe machine etc.).</p>
5	UNIT – IV	<p>Shaping and Drilling Job:</p> <p>Prepare a job having plain and inclined surfaces on shaping machine with minimum two holes as per given drawing.</p>
6	UNIT – III	<p>Milling Job:</p> <p>Prepare a job using milling operations including use of indexing head on milling machine as per given drawing.</p>
7	UNIT-VI	Demonstrate turret and capstan lathe.
8	ALL	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.
9	ALL	<p>Mini Project and Presentation:</p> <p>For a given product different for each student prepare complete report in suggested format including selection of raw material type & section, sequence of various manufacturing operations, selection of machine, machining parameters, work holding device, tool holder, etc. For each machining operation. Each student will also present the outcome.</p>

1	Lathe Machine
2	Milling Machine
3	Surface Grinding Machine, Bench Grinding Machine
4	Radial Drilling Machine
5	Shaping Machine
6	Slotting machine
7	Turret lathe

8	Indexing head
9	Work holding devices for all machines.

List of Reference Books			
No	Title of Reference Books	Authors	Publication
1	Workshop Technology Vol-I, Vol-II.	Hazra Choudhary	Media promoters and publishers pvt. Limited.
2	Workshop Technology I & II.	Raghuwanshi	Dhanpat Rai and Company (P) Limited.
3	Manufacturing Processes.	M. L. Begman	John Wiley and Son

4	Production Technology.	HMT	Tata McGraw-Hill Publishing Co.
5	Production Technology.	O.P.Khanna	Dhanpat Rai and Sons.

Link of Learning Web Resource	
1	http://nptel.iitm.ac.in/video.php?subjectId=112105126
2	http://nptel.iitm.ac.in/courses/Webcoursecontents/IIT%20Kharagpur/Manuf%20Proc%20II/pdf/LM-01.pdf
3	http://www.youtube.com/watch?v=HOAyVUfl8-k&list=PLEFE7D1579523C45D
4	http://www.youtube.com/watch?v=FFzRlop5bpg&list=PL843C2A830C65E2EE
5	http://www.youtube.com/watch?v=81Fdif5e85c
6	http://www.youtube.com/watch?v=A0dTvf_Q8BA&list=PL2C105C94D2955C8B
7	http://www.youtube.com/watch?v=tDc0l9Gm8D4&list=PL3AFB507B668AF162
8	http://www.youtube.com/watch?v=THVgkBnjLq0

CO'S AND PO'S MAPPING

PO'S/CO'S		CO1	CO2	CO3	CO4	CO5
PO1	Proficiently applies concepts, theories and techniques of the relevant natural, physical sciences and knowledge in mathematics.	SLI	MED	NONE	SLI	SLI
PO2	Use basic principles of statics, dynamics, fluid mechanics, and engineering materials, strength of materials engineering standards and manufacturing processes to aid in the design, characterization, and analysis and troubleshooting of mechanical system.	SLI	MED	SUB	MED	MED
PO3	Apply their engineering knowledge, critical thinking and problem solving skills in professional engineering practice or in non engineering fields, such as law, medicine or business.	MED	MED	SUB	MED	SUB
PO4	Continue their intellectual development, through, for example, graduate education or professional development courses.	SLI	MED	MED	SLI	MED
PO5	Use of appropriate computer languages, modern tool and application software that pertain to Mechanical engineering technology systems.	SLI	MED	MED	MED	MED
PO6	Ability to identify problems, conducts experiments, gather data, analyze data and produce results.	SLI	MED	MED	MED	SUB
PO7	Retain the intellectual curiosity that motivates lifelong learning and allows for a flexible response to the rapidly evolving challenges of the 21st century	NONE	MED	MED	MED	MED

PO8	Design a system component or process to meet desired need within realistic constraints, such as economic, environmental and social.	SLI	MED	MED	SLI	MED
PO9	Values the need for, and demonstrates, ethical conduct and professional accountability.	SLI	SLI	SLI	SLI	NONE
PO10	Demonstrates effective communication to professional and wider audiences.	SLI	SLI	SLI	SLI	SLI
PO11	Appreciates entrepreneurial approaches to engineering practice.	SLI	MED	MED	SUB	SUB
PO12	Apply commitment to quality, timeliness, and continuous improvement.	SLI	MED	SLI	SLI	MED