



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Mechanical Engineering / Mechatronics Engineering

Subject Code: DI04000241

Subject Name : Manufacturing Engineering - II

W. e. f. Academic Year:	2025-26
Semester:	4 th
Category of the Course:	Professional Core Course

Prerequisite:	Students should have a fundamental understanding of basic engineering materials, including the properties and applications of ferrous and non-ferrous metals. Knowledge of primary manufacturing processes such as casting, welding and metal forming (forging, rolling, extrusion and drawing) is essential. prior workshop experience with machining tools, equipment and safety practices will help in effectively learning a manufacturing operation.
Rationale:	The subject Manufacturing Engineering – II is designed to equip students with in-depth knowledge and hands-on skills in various machining processes essential for modern manufacturing industries. It focuses on understanding the constructional features, working principles and operation of basic machine tools such as lathe, milling, drilling, shaping, and grinding machines. Through this course, students will learn to perform different machining operations, select suitable cutting parameters and apply the principles of cutting mechanics and kinematics to achieve precision and productivity. The subject also introduces conventional work-holding devices, cutting tools, tool holders, and automation aspects related to these machines. By developing competence in operating and optimizing machine tools, students gain the ability to produce high-quality components at optimum cost. Overall, this course lays a strong foundation for advanced manufacturing technologies and contributes to strengthening the nation's industrial base in alignment with the vision of “ Make in India. ”

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes
01	Recognize the fundamentals of basic machine tools, including cutting mechanics, cutting tools, cutting parameters, cutting fluids and safety.
02	Produce simple jobs on a lathe machine by selecting appropriate operations, tools and cutting parameters.
03	<i>Produce simple jobs on a milling machine by selecting suitable operations, cutters, work-holding devices and cutting parameters.</i>



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Mechanical Engineering / Mechatronics Engineering

Subject Code: DI04000241

Subject Name : Manufacturing Engineering - II

04	Perform drilling operations by selecting appropriate tools, work-holding devices and cutting parameters to produce holes on a given workpiece.
05	Produce simple jobs on a shaping machine by selecting appropriate tools and work-holding devices.
06	Select appropriate grinding processes, machines and grinding wheels to grind a simple workpiece.

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				ESE(E)	PA(M)	PA(I)	ESE(V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	<p>Introduction to Basic Machining Processes</p> <p>1.1 Metal Removal Processes:</p> <ul style="list-style-type: none"> i Definition and purpose of metal removal ii Types of metal removal processes iii Classification of basic machine tools. <p>1.2 Cutting Tools:</p> <ul style="list-style-type: none"> i Tool materials and their properties ii. Nomenclature (Signature) and geometry of a single-point cutting tool. <p>1.3 Theory of Metal Cutting:</p> <ul style="list-style-type: none"> i. Orthogonal and oblique cutting ii Chip formation mechanism, Types of chips. <p>1.4 Cutting Fluids:</p> <ul style="list-style-type: none"> i Functions of cutting fluids ii Types of cutting fluids, Essential properties of cutting fluids. <p>1.5 Cutting Parameters:</p>	07	15



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Mechanical Engineering / Mechatronics Engineering

Subject Code: DI04000241

Subject Name : Manufacturing Engineering - II

	<p>i. Concept and definitions of cutting speed, feed, depth of cut (D.O.C.), and material removal rate (MRR),</p> <p>ii. Effects of cutting parameters on surface finish, MRR and tool life.</p> <p>iii Calculations of RPM, MRR for given machining conditions</p> <p>1.6 Carbide Inserts:</p> <p>i. Concept and applications of carbide inserts</p> <p>ii. ISO designation system of carbide inserts.</p> <p>1.7 Safety:</p> <p>i. Safety precautions during machine tool operations.</p>		
2.	<p>Lathe Machine</p> <p>2.1 Lathe machine.</p> <p>i. Working principle (using block diagram).</p> <p>ii. Sample specifications.</p> <p>2.2 All geared head stock center lathe.</p> <p>i. Constructional features.</p> <p>ii. Kinematics, constructional sketch, working, and applications</p> <p>iii. Operations performed.</p> <p>iv. Work holding devices- (3-jaw chuck, 4-jaw chuck, collet chuck, face plate, centers, Rest, mandrel, Driving plate & dog).</p> <p>v. Thread cutting (Mechanism, setting, and selection of change gears.)</p> <p>vi. Tapper turning Methods (Swiveling compound rest, Form Tool, setting over the tailstock, taper turning attachment.)</p> <p>2.3 Selection of cutting parameters (RPM, feed, depth of cut) using recommended values for given workpiece–tool material combinations, followed by calculation of resulting output parameters (MRR).</p> <p>2.4 Calculation of cutting time for simple components.</p>	09	20
3.	<p>Milling Machine</p> <p>3.1 Milling machine.</p> <p>i. Working principle (using block diagram).</p> <p>ii. Horizontal and Vertical types milling machine</p> <p>3.2 Universal vertical milling machine.</p> <p>i. Construction.</p> <p>ii. Sample specifications</p> <p>iii. Operations performed.</p> <p>iv. Up milling and down milling</p>	08	18



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Mechanical Engineering / Mechatronics Engineering

Subject Code: DI04000241

Subject Name : Manufacturing Engineering - II

	<p>3.3 Milling cutters-types and applications. Tool Geometry of milling cutter.</p> <p>3.4 Work holding devices</p> <p>3.5 Cutter holding devices</p> <p>3.6 Simple indexing method with simple numerical.</p> <p>3.7 Selection of cutting parameters (RPM, feed, depth of cut) using recommended values for given workpiece–tool material combinations, followed by calculation of resulting output parameters (MRR).</p> <p>3.8 Calculation of cutting time for simple components.</p>		
	<p>Drilling Machine and Boring machine</p> <p>4.1 Drilling machine.</p> <p style="padding-left: 20px;">i. Working principle and Constructional features (using block diagram).</p> <p style="padding-left: 20px;">ii. Common types with applications</p> <p style="padding-left: 20px;">iii. Sample specifications of pillar drilling.</p> <p>4.2 Operations performed on drilling machine.</p> <p>4.3 Reaming operation: Purpose and importance, reaming tools</p> <p>4.4 Work holding devices and Tool holding Devices</p> <p>4.5 Radial drilling machining</p> <p style="padding-left: 20px;">i. Sample specifications.</p> <p style="padding-left: 20px;">ii. Constructional features, working and applications.</p> <p>4.6 Twist Drill Geometry.</p> <p>4.7 Selection of cutting parameters (RPM and feed) using recommended values for given workpiece–tool material combinations, followed by calculation of resulting output parameters (MRR)</p> <p>4.8 Calculation of drilling time for simple components.</p> <p>4.9 Boring Machine</p> <p style="padding-left: 20px;">i. Working principle (using block diagram).</p> <p style="padding-left: 20px;">ii Operations and applications.</p>	07	15
5	<p>Shaping & Planning machine</p> <p>5.1 Shaping machine</p> <p style="padding-left: 20px;">i. Working principle (using block diagram) and construction.</p> <p style="padding-left: 20px;">ii. Sample specifications.</p> <p style="padding-left: 20px;">iii. Quick return mechanisms- sketch, working and comparison.</p> <p style="padding-left: 20px;">iv. Operations performed on shaping machine.</p> <p style="padding-left: 20px;">v. Shaper tools</p>	6	14



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Mechanical Engineering / Mechatronics Engineering

Subject Code: DI04000241

Subject Name : Manufacturing Engineering - II

	vi. Work holding devices 5.2 Planning machine. i. Working principle (using block diagram) and construction of standard planning machine 5.3 Difference between shaping and planning.		
6	Grinding processes 6.1 Grinding Processes i. Cylindrical grinding ii. Surface grinding iii. Centerless grinding 6.2 Grinding Machines i. Classification of grinding machines ii. Construction and working of: • Surface grinding machine • Cylindrical grinding machine • Centreless grinding machine • Tool & cutter grinding machine iii. Sample specifications of surface and cylindrical grinding machines 6.3 Honing, Lapping and Super finishing i. Working principles ii. Difference between honing, lapping, and super finishing 6.4 Grinding Wheel i. Abrasive grains ii. Bonding materials iii. Grinding wheel nomenclature iv. Selection and applications of grinding wheels 6.5 Terms Associated With Grinding Wheel i. Loading, glazing, trueing, dressing ii. Balancing and mounting of grinding wheel.	08	18
	Total	45	100

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	22	28	00	00	00



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Mechanical Engineering / Mechatronics Engineering

Subject Code: DI04000241

Subject Name : Manufacturing Engineering - II

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

Sr. No	Title of Book	Author	Publication with place, year and ISBN
1	Machining and Machine Tools	A.B. Chattopadhyay	Wiley
2	Fundamentals of Machining Processes	Hassan Abdel-Gawad El-Hofy	CRC Press ISBN-13978-0849372889
3	Workshop Technology I & II	Raghuwanshi	Dhanpat Rai and Company(P) Limited
4	Production Technology (Manufacturing Process)	Dr. P C Sharma	S Chand
5	All about Machine Tools	HEINRICH GERLING	New Age International Private Limited
6	Production Technology	R. K. Jain and S. C. Gupta	Khanna Publishers
7	Elements of Workshop Technology Volume No. II Machine Tools	Hajra Choudhary, Bose S. K., Roy Nirjhar	Media promotors and publishers pvt. Limited
8	Production Technology	HMT	Tata Mcgraw-Hill Publishing Co.
9	Workshop technology Part I	Dr. W. A. J. CHAPMAN	2011 by Routledge

Open source software and website:

- i. <http://nptel.iitm.ac.in/video.php?subjectId=112105126>
- ii. <http://nptel.iitm.ac.in/courses/Webcoursecontents/IIT%20Kharagpur/Manuf%20Proc%20II/pdf/LM-01.pdf>
- iii. <http://www.youtube.com/watch?v=H0AyVUfl8-k&list=PLEFE7D1579523C45D>
- iv. <http://www.youtube.com/watch?v=FFzRIop5bpg&list=PL843C2A830C65E2EE>
- v. <http://www.youtube.com/watch?v=81Fdif5e85c>
- vi. http://www.youtube.com/watch?v=A0dTvf_Q8BA&list=PL2C105C94D2955C8B
- vii. <http://www.youtube.com/watch?v=tDc019Gm8D4&list=PL3AFB507B668AF162>



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Mechanical Engineering / Mechatronics Engineering

Subject Code: DI04000241

Subject Name : Manufacturing Engineering - II

- viii. <http://www.youtube.com/watch?v=THVgkBnjLq0>
ix. <http://www.youtube.com/watch?v=6VpCBk7FahI>
x. <http://www.youtube.com/watch?v=7wC1u4WOV1o>
xi. <http://www.youtube.com/watch?v=VDIoUZuTunI>
xii. <http://www.youtube.com/watch?v=Mn9jppI8rao>
xiii. <http://www.youtube.com/watch?v=8SuoH5aL1SY>
xiv. http://www.youtube.com/watch?v=xxNZSQML_ZA
xv. <http://www.youtube.com/watch?v=XXUHZxweBcw&list=PLD07DE61CB871A0CB>
xvi. <https://nptel.ac.in/courses/110106146>
xvii. <https://www.youtube.com/watch?v=gcWj4OcteTk>
xviii. <https://nptel.ac.in/courses/112103250>
xix. <https://www.youtube.com/watch?v=IXYZLxNd-a8>
xx. <https://www.youtube.com/watch?v=GNLQ81WOytU>

Suggested Course Practical List:

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1	Machining Process Parameters Evaluation: Determine cutting parameters for machining, calculate MRR for given conditions, and observe the effect of cutting parameters on chip formation and surface finish.	1	04
2	Turning Job: Prepare a simple turning job on a center lathe with standard turning operations. Prepare a report including: a. Job drawing b. Operation sequence c. Selection and calculation of cutting parameters & cutting time. d. List of cutting tools required e. Specifications of the machine used.	2	08
3	Milling Job. A. Produce a simple rectangular/prismatic component using milling operations (face, slot, side milling, end milling, etc.) on a milling machine. Prepare a report including: a. Job drawing, b. Operation sequence,	3	06



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Mechanical Engineering / Mechatronics Engineering

Subject Code: DI04000241

Subject Name : Manufacturing Engineering - II

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
	c. Selection and calculation of cutting parameters, d. List of cutters and tools required, e. Machine specifications. B. Demonstrate simple indexing using an indexing head on milling machine.		
4	Shaping machine job Produce a flat surface on a shaping machine using proper work-holding and tool selection. Prepare a report including: a. Job drawing, b. Operation sequence, c. Selection and calculation of cutting parameters, d. List of tools used, e. Machine specifications.	4	06
5	Drilling job Perform drilling and reaming operations on a given workpiece using a pillar drilling machine. Prepare a report including: a. Job drawing, b. Operation sequence including marking and punching, c. Selection and calculation of cutting parameters, d. List of tools required, e. Machine specifications.	5	04
6	Grinding job Perform surface and/or cylindrical grinding on a workpiece to obtain the required surface finish. Prepare a report including: a. Job drawing, b. Operation sequence, c. Selection of grinding wheel and cutting parameters, d. List of tools and work-holding devices, e. Machine specifications.	6	02
Total			30



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Mechanical Engineering / Mechatronics Engineering

Subject Code: DI04000241

Subject Name : Manufacturing Engineering - II

List of Laboratory/Learning Resources Required:

These major equipment with broad specifications for the PrOs is a guide to procure them by the administrators to user in uniformity of practical in all institutions across the state.

Sr. No.	Equipment Name with Broad Specifications	PrO. No.
1.	Hacksaw machine.	1 to 6
2.	Lathe with standard and special accessories.	1&2
3.	Milling machines-Vertical /horizontal with standard accessories and indexing/dividing head.	3
4.	Column drilling or Radial Drilling machine	5
5.	Shaper machine.	4
6.	Tool and cutter grinder	1 to 5
7.	HSS cutting tools and their tool holders	1 to 5
8.	Carbide inserts and their tool holders	1
9.	Drill bit and their tool holder	5
10.	Surface grinding machine	6
11.	Cylindrical grinding machine	6

Suggested Activities for Students:

Other than the classroom and laboratory learning, following are the suggested student-related **co-curricular** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should perform following activities in group and prepare reports of about 5 pages for each activity. They should also collect/record physical evidences for their (student's) portfolio which may be useful for their placement interviews:

- Select two industrial components (approved by teacher) and list various machine tools and operations used to produce these components.
- Prepare a list of surrounded items which are prepared by machining processes.
- Collect/download at least four different machine tool catalogues and make report of that with price.
- List various machine tools (min. 5 machine) currently using in market for different operation to perform.
- Identify the process used for re-sharpening different types of tools and prepare report for minimum 3 tools

* * * * *