GANPAT UNIVERSITY

FACULTY OF DIPLOMA ENGINEERING

Programme	Diploma in Mechanical/Mechatronics Engineering				
Semester	II		Version	1.0.0.0	
Effective from Academic Year	2025-26		Effective for the batch Admitted in		JULY 2025
Course code	1ME2101	Course Name	Manufacturing Processes-I		

I.TEACHING-LEARNING AND ASSESSMENT SCHEME

Course Type	Course Code	Learning Scheme						Assessment Scheme										
		Actual Contact Hrs./Week			SLH	NLH	Credits	Theory				Practical				Based on SL		Total Marks
		CL	TL	LL				FA-TH	SA-TH	TOTAL		FA-PR	SA-PR	TOTAL		SLA		
								MAX	MAX	MAX	MIN	MAX	MAX	MAX	MIN	MAX	MIN	
DSC	1ME2101	3	-	4	3	10	5	40	60	100	40	60	40	100	40	20	8	220

Abbreviation:	**CL-** Classroom Learning	**TL -** Tutorial Learning	**LL -** Laboratory Learning
	SLH - Self Learning Hours	**NLH -** Notional Learning Hours	**SLA -** Self Learning Assessment
	FA - Formative Assessment (Term work +Mid Sem Exam +Attendance)		**SA -** Summative Assessment

II. PRE-REQUISITES

Basic knowledge of Mechanical Workshop Practices.

III. INDUSTRY / EMPLOYER EXPECTED OUTCOMES

Operate and Maintain Mechanical Engineering Equipment for various Industrial/field applications using relevant knowledge and skills related to Mechanical Engineering.

IV. COURSE LEARNING OUTCOMES

At the end of the course, students will be able to achieve the following course learning outcomes:

CO1. Explain the principles and applications of manufacturing processes.

CO2. Select suitable manufacturing processes and parameters to produce components with desired quality and accuracy.

CO3. Analyse the influence of forming methods and parameters on material behaviour, product quality, and energy efficiency.

CO4. Apply casting principles to design moulds and select process variables for defects free casting.

CO5. Select appropriate metal joining process for various applications.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:

Name of Unit	Theory Learning outcomes (TLO's) aligned to CO's	Learning Content mapped with Theory Learning outcomes (TLO's) & CO's	Marks	Hours
UNIT – 1 Introduction to Manufacturing Processes	**TLO 1.1** Explain the basic manufacturing processes. **TLO 1.2** Describe various mechanical properties involved. **TLO 1.3** Explain residual stresses and recrystallisation temperature of metal. Their effect on metal behaviour.	**1.1** Nature, role and scope of manufacturing processes. **1.2** Mechanical properties of material. **1.3** Residual stresses its and recrystallisation temperature of metal	**06**	**03**
UNIT – 2 Metal working processes	**TLO 2.1** Compare the principles of hot and cold working Process. **TLO 2.2** Identify and explain various metal	**2.1** History of Metal working Processes **2.2** Concept, principles and differences of hot and cold working processes.	**17**	**13**

	forming processes. instruments. **TLO 2.3** Mechanical press.	**2.2** Classification of forming processes. Rolling, Forging, Spinning, Drawing, Extrusion, Swaging Spinning, Punching, Coining, Embossing. **i.** Types. **ii.** Working principle. **iii.** Equipment used and their specifications. **iv.** Major parts of equipment and their construction of materials and functions. **v.** Process parameters. **vi.** Applications. **2.3** Components and application of mechanical press.		
Unit-3 **Metal casting processes**	**TLO 3.1** Appreciate the need of casting process. **TLO 3.2** Pattern in Moulding process. **TLO 3.3** Interpret the standard colour coding on pattern as well as core. **TLO 3.4** Core used in mould making. **TLO 3.5** Casting furnaces. **TLO 3.6** Moulding processes including gating system design and various elements used in gating system. **TLO 3.7** Salvage techniques of casting **TLO 3.8** special casting processes. **TLO 3.9** Identify casting defects, their causes and suggest remedies.	**3.1** Basic concept of foundry process. and Types of foundries. **3.2** Pattern**:** **i.** Importance**.** **ii.** Types and materials of construction. **iii.** Allowances, their need and normal values. **3.3** Drawings and colour codes. Applications. **3.4** Cores**:** **i.** Need**.** **ii.** Types**.** **iii.** Making materials and its properties. **iv.** Testing methods. **v.** Sintering**.** **vi.** Applications**.** **3.5** Types, working and applications of furnaces. **3.6 (a)** Moulding sand: **i.** Sand properties. **ii.** Sand mixing. **iii.** Sand binders. **3.6 (b)** Gating System ,Moulding equipment, their major specifications and applications. **3.6 (c)** Types of mould, mould making, mould sintering and applications of mould. **3.7** Salvage (repairing) techniques of casting. **3.8** Casting processes: basic principle, working, process parameters and applications. **i.** Centrifugal. **ii.** Die**.** **iii.** Investment**.**	**20**	**16**

		iv. Shell moulding. **3.9** Casting defects -types, causes, effects and remedies.		
UNIT – 4 **Metal joining processes**	**TLO 4.1** Appreciate the need of joining process to reduce cost and time. **TLO 4.2** Welding Processes**.** **TLO 4.3** Welding Defects and its remedies. **TLO 4.4** Explain Soldering and Brazing in details.	**4.1** Need of joining process to reduce cost and time. Introduction and classification of welding processes. **4.2** Welding: working principle, setup sketch, specifications of equipment and consumables, functions of each element, process parameters for various materials, applications and safety precautions for: **i**. Gas welding (Oxy-acetylene, Air-acetylene, oxy-hydrogen and LPG (Liquid Petroleum Gas)- oxygen. **ii**. Arc welding (Carbon arc, metal arc, MIG (Metal Inert Gas), TIG (Tungsten Inert Gas), flux coated arc and submerged arc). **iii.** Resistance welding (butt, spot, seam, projection and percussion). **4.3** Welding defects -types, causes, effects and remedies. **4.4** Working principle, setup sketch, specifications of equipment, tools and consumables, functions of each element, process parameters for various materials, applications and safety precautions for: **i.** Soldering. **ii.** Brazing.	**17**	**13**

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL			
Sr. No.	**Practical/Laboratory Learning Outcome (LLO)**	**Practical Titles**	**Relevant COs**
1	**LLO 1.1** Understand the Principles of Hot Forging. **LLO 1.2** Identify Tools and Equipment Used in Hot Smithy. **LLO 1.3** Develop Basic Forging Skills. **LLO 1.4** Apply Safety Practices.	Prepare a job using hot forging/hot smithy process.	CO1, CO2, CO3
2	**LLO 2.1** Understand the Spinning Process. **LLO 2.2** Identify Tools, Equipment, and Machines Used in Spinning.	Demonstration of spinning process with	CO1, CO2, CO3

	LLO 2.3 Observe Industrial Applications of Spinning. **LLO 2.4** Develop Practical Knowledge of Job Preparation. **LLO 2.5** Apply Safety Precautions in Spinning.	preparation of a job through industrial visit.	
3	**LLO 3.1** Understand industrial environment **LLO 3.2** Relate theory with practice **LLO 3.3** Identify tools, machines, and processes **LLO 3.4** Observe quality and safety practices **LLO 3.5** Enhance professional skills **LLO 3.6** Analyse and report learning	Industrial Visit	CO1, CO2,
4	**LLO 4.1** Understand the fundamentals of pattern making. **LLO 4.2** Interpret engineering drawings for casting. **LLO 4.3** Develop skills in pattern drawing. **LLO 4.4** Fabricate the pattern and core. **LLO 4.5** Apply safety practices in pattern and core making.	Prepare a pattern drawing, pattern and core from the given component/drawing.	CO1, CO2,CO4
5	**LLO 5.1** Understand the fundamentals of moulding. **LLO 5.2** Identify and use moulding tools. **LLO 5.3** Prepare a mould using pattern and core. **LLO 5.4** Apply safety practices in moulding operations. **LLO 5.5** Inspect and evaluate the prepared mould. **LLO 5.6** Develop hands-on skills and teamwork. **LLO 5.7** Correlate theory with practice.	Prepare a mould using prepared pattern, core and moulding sand.	CO1, CO2,CO4
6	**LLO 6.1** Understand the casting process flow. **LLO 6.2** Demonstrate knowledge of metal melting. **LLO 6.3** Understand casting solidification and cooling. **LLO 6.4** Demonstrate casting finishing operations. **LLO 6.5** Apply safety measures in foundry practice. **LLO 6.6** Analyse and evaluate casting quality.	Demonstration of metal melting, metal pouring, metal casting and casting finishing.	CO1, CO2,CO4
7	**LLO 7.1** Understand the fundamentals of arc welding. **LLO 7.2** Identify welding tools, equipment, and consumables. **LLO 7.3** Develop hands-on welding skills. **LLO 7.4** Apply safety practices in welding. **LLO 7.5** Inspect and evaluate weld quality. **LLO 7.6** Enhance practical and professional skills. **LLO 7.7** Bridge theory with practice.	Prepare a job containing using arc welding.	CO1, CO2,CO5
8	**LLO 8.1** Understand the principles of gas welding and cutting. **LLO 8.2** Identify tools, equipment, and accessories. **LLO 8.3** Develop gas welding and cutting skills. **LLO 8.4** Apply safety precautions in gas welding and cutting. **LLO 8.5** Enhance practical and professional skills.	Prepare a job using gas cutting and gas welding.	CO1, CO2,CO5
9	**LLO 9.1** Understand the Principles of Resistance Welding. **LLO 9.2** Identify Tools, Machines, and Accessories. **LLO 9.3** Develop Spot Welding Skills. **LLO 9.4** Inspect and Evaluate Welded Joints. **LLO 9.15** Enhance Practical and Professional Skills.	Prepare a job using spot/seam resistance welding.	CO1, CO2,CO5
10	**LLO 9.1** Understand the Fundamentals of Brazing. **LLO 9.2** Identify Tools, Equipment, and Materials. **LLO 93** Develop Brazing Skills. **LLO 9.4** Apply Safety Practices in Brazing. **LLO 9.5** Inspect and Evaluate Brazed Joints.	Prepare a job using brazing process.	CO1, CO2,CO5

VII. SUGGESTED MICRO PROJECT / ASSIGNMENTS / ACTIVITIES FOR SELF LEARNING / SKILL DEVELOPMENT (SELF LEARNING)

- Collect an Information about various IS standards regarding manufacturing processes.
- Find out various Metal casting materials from different resources like books and websites.
- Collect information about use of fluid dynamics in metal casting.
- Collect information about weldability of different material.
- Collect basic information on different shape and size of raw material used in rolling processes.
- Justify need of safety regulations in industries.
- Prepare a list of machine tools used in industries during visit.

Mini projects

- Collect specification of machine tools during industrial visit.
- Prepare a report on industrial visit as per practical instructions.
- Prepare a model of any one heat exchanger with the help of suitable material.

VIII. LIST OF INSTRUMENTS / EQUIPMENT / TRAINER BOARD

1	Forging shop
2	Foundry.
3	Pattern making shop.
4	Welding shop with Arc welding, Gas welding, Brazing, resistance welding facilities
5	Workshop safety equipment and tools.
6	Fitting shop

IX. LIST OF REFERENCE BOOKS

Sr.No.	Title	Author	Publication
1	Workshop Technology I & II	J. A. Schey	Tata MacGraw Hill Education
2	Workshop Technology I & II	Raghuwanshi	Dhanpat Rai and Sons
3	Workshop Technology I, II &	W. A. J. Chapman	Arnold
4	Manufacturing Processes	M. L. Begman	Wiley India
5	Production Technology	R.K. Jain and S.C. Gupta	Khanna publication
6	Manufacturing Technology:Vol.1	P.N.Rao	MacGraw Hill Education

X. LINK OF LEARNING WEB RESOURCE

1	https://nptel.ac.in/courses/112107089/
2	https://nptel.ac.in/courses/112106153/
3	nptel.ac.in/courses/112107144
4	https://nptel.ac.in/courses/112108150

XI. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE

Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	Introduction to Manufacturing Processes	CO1	3	2	2	2	06
2	Metal working processes	CO1, CO2	13	0	5	12	17
3	Metal casting processes	CO3,CO4,CO5	16	0	6	14	20
4	Metal joining processes	CO2	13	0	5	12	17
		Grand Total	45	2	18	40	60

XII. COs AND POs AND PSOs MAPPING										
Course outcome (Cos)	**Programme Outcomes (POs)**							**Programme Specific Outcomes (PSOs)**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	1	2	1	2	3	2	1
CO2	3	3	3	2	3	2	3	3	3	2
CO3	3	3	3	2	2	2	2	3	2	2
CO4	3	2	2	2	2	1	2	3	2	2
CO5	3	3	3	2	3	2	2	3	3	2
Legends: - *3- High* *2-Moderate/Medium* *1-Slight/Low* *0-None*										