GANPAT UNIVERSITY

FACULTY OF DIPLOMA ENGINEERING

Programme	Diploma in Mechanical/ Electrical/ Petrochemical/ Chemical Engineering		
Semester	I	Version	1.0.0.0
Effective from Academic Year	2025-26	Effective for the batch Admitted in	July 2025
Course code	1ES1103	Course Name	Elements of Mechanical Engineering

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	1ES1103	2	-	2	0	4	2	40	60	100	40	30	20	50	20	-	-	150

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

Zeal to learn the subject.

III. INDUSTRY / EMPLOYER EXPECTED OUTCOMES

To aware about basic mechanical engineering and its applications.

IV. COURSE LEARNING OUTCOMES

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

CO1 Identify mechanical related basic components and their uses and describe the type of power transmission, different types of couplings, and general safety norms.

CO2. Explain different welding and gas cutting operations.

CO3. Explain working of boilers and prime movers.

CO4. Explain different fluid properties, construction working and applications of centrifugal and reciprocating pumps.

CO5. Select proper material handling equipment for a given situation.

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 Basic Mechanical Tools &its applications	**TLO 1.1** Identify various basic mechanical components used in mechanical systems. Explain functions and applications. **TLO 1.2** Classify different types of pipes and fittings with their use. Describe hand tools and their usage. **TLO 1.3** Concept of basic power tools and its application. **TLO 1.4** Basic mechanical properties and concept of industry 4.0.	**1.1** Basic mechanical components: bolts, nuts, washers, bearings, rivets, o'-rings, shafts, axles – types, uses, applications in real mechanical assemblies. **1.2** Types of pipes and pipe fittings – elbows, tees, reducers, unions, valves etc. and their applications. Hand tools – pliers, hammers, screwdrivers, chisels, hacksaws. **1.3** Power tools concepts-applications, its advantages, and disadvantages. **1.4** Basic mechanical properties of materials. Concept of industry 4.0.	**08**	**04**

Unit-2 Power Transmission & Safety	**TLO 2.1** Define power transmission and its role in mechanical systems. Explain importance of power transmission. **TLO 2.2** Describe different power transmission modes. Compare various transmission systems based on application. **TLO 2.3** Classify belts and explain their uses. Explain concept of gear trains and couplings. **TLO 2.4** Identify potential hazards in power transmission systems. Apply safety practices to prevent accidents.	**2.1** Introduction to power transmission – concept, need, and importance in mechanical systems. **2.2** Modes of power transmission: Belt drive, Rope drive, Chain drive, Gear drive – principle, function, and working. **2.3** Types of belts, gear train-concept, and applications of couplings in power transmission. **2.4** Common causes of accidents in power transmission systems. Preventive measures, safety precautions, safety norms in mechanical industries/shop floors.	**14**	**07**
Unit-3 Processes on Material	**TLO 3.1** Define welding and its types. Describe working principle of arc and gas welding with equipment. **TLO 3.2** Identify different applications of welding. Apply safety norms while working with welding processes. **TLO 3.3** Differentiate between welding, brazing, and soldering. Describe gas cutting process with setup and safety. **TLO 3.4** Explain casting process and foundry terminology. Identify steps and output of casting process. **TLO 3.5** Define basic metal forming and cutting operations. Explain practical relevance and usage. **TLO 3.6** Identify basic machine tools and their parts. Describe working and operations performed on machine tools.	**3.1** Definition of welding, classification, welding equipment, and working principles of arc and gas welding. **3.2** Types of work carried out by welding – fabrication, repair etc. Safety precautions in arc and gas welding. **3.3** Definition and comparison of brazing and soldering, concept of gas cutting, gas cutting equipment and safety. **3.4** Basic concept of foundry – pattern making, moulding, casting, and finishing, and applications. **3.5** Metal forming operations – bending, shearing, punching its applications. **3.6** Introduction to basic machine tools: hacksaw, lathe, drilling, milling – working principle, parts, and operations like turning, facing, drilling, slotting etc.	**14**	**07**
Unit-4 Steam Generation and Prime Movers	**TLO 4.1** Explain the process of steam formation and different types of steam. **TLO 4.2** Define boiler and its principle. Describe types and working of different boilers.	**4.1** Introduction to steam generation process, phase transformation of water to steam, properties of steam – wet, dry, superheated steam. **4.2** Definition and theory of boilers, classification, and working of common boilers (e.g., Cochran, Babcock & Wilcox).	**10**	**05**

	TLO 4.3 Distinguish between mountings and accessories. Explain types and their working applications. **TLO 4.4** Describe boiler safety norms and practices. Identify boiler faults and their remedies. **TLO 4.5** Define and classify prime movers. Describe working of steam and gas turbines. Identify faults and remedies.	**4.3** Boiler accessories and mountings-types and applications. **4.4** Regulations and safety requirements of boiler. Common troubles, and remedies of boiler. **4.5** Prime movers – definition, classification, and working. Steam turbine – working principle. Gas turbines – types, working, applications.		
Unit-5 Hydraulic and Pneumatic Devices	**TLO 5.1** Define fluid and describe types of fluid flow. Explain basic fluid properties and their significance in systems. **TLO 5.2** Explain types and working principles of pumps. Identify components and their function. Troubleshoot pump issues. **TLO 5.3** Describe working and classification of water turbines. Identify operational issues and solutions in turbines. **TLO 5.4** Define air compressor and explain its operation. State applications in mechanical and industrial use.	**5.1** Define fluid, concept of fluid flow and its various types, general properties of fluids. **5.2** Introduction of pump, working principle and its types. Working principal of centrifugal and reciprocating pumps, main parts of pumps and their functions, common troubles, and remedies of pumps. **5.3** Working principle of water turbines, types and applications, common troubles, and remedies of water turbine. **5.4** Introduction of air compressor, working principle and its application.	**08**	**04**
Unit-6 Material Handling	**TLO 6.1** Understand the concept and importance of material handling in industries. **TLO 6.2** Classify different material handling systems (manual, semi-automated, automated). **TLO 6.3** Explain the working and applications of hoisting and conveying equipment. **TLO 6.4** Describe the working and uses of earth-moving and construction machinery. **TLO 6.5** Analyse and apply appropriate selection criteria for choosing material handling equipment.	**6.1** Introduction and need of material handling. **6.2** Types of material handling systems. **6.3** Hoisting and conveying equipment. **6.4** Earth moving and construction machinery. **6.5** Criteria for selection of material handling equipment.	**06**	**03**

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL			
Sr. No.	**Practical/Laboratory Learning Outcome (LLO)**	**Practical Titles**	**Relevant COs**
1	**LLO 1.1** Demonstrate understanding of different power transmission methods such as belt, chain, rope, and gear drives.	To study about power transmission systems.	CO1
2	**LLO 2.1** Identify arc and gas welding equipment with adherence to safety practices.	To study about gas and arc welding.	CO2
3	**LLO 3.1** Explain the working of steam boilers and identify different types used in mechanical systems.	To study about steam boilers.	CO3
4	**LLO 4.1** Identify and describe the function of various boiler mountings and accessories.	To study about boiler mountings and accessories.	CO3
5	**LLO 5.1** Describe the working principles of water turbines.	To study about water turbines.	CO4
6	**LLO 6.1** Identify common faults in pumps and suggest appropriate remedies.	To study about finding faults, reasons, and remedies of various types of pumps.	CO4
7	**LLO 7.1** Classify different material handling equipment and explain their working principles and applications.	To study about material handling equipment.	CO5

VII. LIST OF INSTRUMENTS / EQUIPMENT / TRAINER BOARD	
1	Models of belt drive, chain drive, rope drive, and gear drive.
2	Setup of arc and gas welding.
3	Cut section/models of boilers.
4	Cut section/models of boiler mountings and accessories.
5	Setup of water turbine.

VIII. LIST OF REFERENCE BOOKS			
Sr. No.	**Title**	**Author**	**Publication**
1	Theory of Machines	R.S.Khurmi and J.K.Gupta	S. Chand Publication
2	Hydraulic Machines	Jagdishlal	Metropolitan Book Co. Pvt. Ltd., New Delhi
3	Elements of Workshop Technology	Hazara Chaudhary	Media Promoters & Publishers Pvt. Ltd., Mumbai
4	Pumps Operation and Maintenance	Tyler and Hicks	McGraw-Hill Education
5	Material Handling Equipment	M. Rudenko	MIR Publishers, Moscow
6	Element of Mechanical Engineering	Pravin Kumar	Pearson Education
7	Elements of Mechanical Engineering	N. M. Bhatt and J. R. Mehta	Mahajan Publishing House
8	Fundamental of Mechanical Engineering	G. S. Sawhney	PHI Publication, New Delhi
9	Elements of Mechanical Engineering	Sadhu Singh	S. Chand Publication

IX. LINK OF LEARNING WEB RESOURCE	
1	https://nptel.ac.in/
2	http://www.vlab.co.in/
3	http://engggraphics.wordpress.com/2012/04/10/an-advance-tamil-new-year-gift/ 4.
4	http://en.wikipedia.org/wiki/Boiler

X. 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 Basic Mechanical Tools & its applications	CO1	04	04	04	00	08
2	Power Transmission & Safety	CO1	07	07	07	00	14
3	Processes on Material	CO2	07	07	07	00	14
4	Steam Generation and Prime Movers	CO3	05	05	05	00	10
5	Hydraulic and Pneumatic Devices	CO4	04	04	04	00	08
6	Material Handling	CO5	03	03	03	00	06
		Grand Total	30	30	30	00	60

XI. 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	2	2	1	2	1	1	2	2	3
CO2	3	2	2	2	2	1	1	3	3	2
CO3	3	2	1	2	2	1	1	3	3	2
CO4	3	3	2	3	1	1	1	3	3	2
CO5	3	2	3	2	2	2	1	2	2	3

Legends: - *3- High 2-Moderate/Medium 1-Slight/Low 0-None*