25ME101: Basics of Mechanical Engineering

w. e. f. Academic Year:	**2025-26**
Semester:	**1/2**
Category of the Course:	**Engineering Science**
Prerequisite:	NIL
Rationale:	Knowledge of basic principles of Mechanical Engineering is required in various fields of engineering.

Course Outcomes:

After Completion of the Course, Student will able to:

	Course Outcome (CO)	**RBT Level (Cognitive Domain)**
CO1	Explain fundamental thermodynamic concepts and various energy sources along with their environmental impacts	Understand
CO2	Apply gas laws and thermodynamic processes to evaluate the behavior of ideal gases	Apply
CO3	Analyze properties of steam and describe the working of steam boilers and their components	Understand, Analyze
CO4	Compare different heat engine and internal combustion engine cycles based on efficiency and operation	Understand, Analyze
CO5	Demonstrate the working principles of refrigeration systems, air conditioners, compressors, and pumps	Understand Apply
CO6	Identify and describe components of mechanical power transmission systems and their applications	Understand Apply

Teaching and Evaluation Scheme:

Teaching Scheme					**Examination Scheme**				
L	**T**	**P**	**C**	**Hrs/Week**	**IE**	**Theory**	**CIA**	**Practical**	**Total Marks**
2	-	2	3	6	40	60	30	20	150

IE: Internal Evaluation Theory: Theory Exam (End Semester)

CIA: Continuous Internal Assessment Practical: Practical Exam (End Semester)

Detailed Syllabus:

Topic		**Hrs.**	**% of Weightage**
UNIT: 1	**Fundamentals of Thermodynamics and Energy Sources**	**04**	**15**
Basic Terminology and Energy: Prime movers and its types, Concept of Force, Pressure, Energy, Work, Power, System, Heat, Temperature, Specific heat capacity, Process, Cycle, Internal energy, Enthalpy, Statements of Zeroth law and First law **Applications of Energy sources** like Fossil fuels, Nuclear fuels,			

Hydrogen fuel, Hydraulic energy, Solar, Wind, and Bio-fuels, Environmental issues like Global warming and Ozone.			
UNIT: 2	**Behavior of Gases and Thermodynamic Processes**	**05**	**17**
Gas Laws: Boyle's law, Charles's law, Gay-Lussac's law, Avogadro's law, Combined gas law **Gas Properties**: Gas constant, Relationship between Cp and Cv **Thermodynamic Processes**: Constant volume, Constant pressure, Isothermal, Adiabatic, Polytropic			
UNIT: 3	**Properties of Steam and Boilers**	**04**	**15**
Steam Properties: Steam formation, Types of steam (wet, dry, superheated), Steam properties ,Use of steam tables **Steam Boilers**: Introduction, Classification, Cochran, Lancashire, Babcock and Wilcox boilers, Functions' of Boiler mountings and accessories			
UNIT: 4	**Heat Engines and Internal Combustion Engines**	**06**	**18**
Heat Engines: Components of heat engine, Classification of heat engine, Carnot, Rankine, Otto, Diesel cycles, Thermal efficiency **IC Engines**: Introduction, Classification, Engine components, Four-stroke and two-stroke Petrol/Diesel engines, Indicated power, Brake power, Mechanical and thermal efficiencies			
UNIT: 5	**Refrigeration, Air Conditioning, Compressors and Pumps**	**07**	**20**
Refrigeration Systems: Application of refrigeration, Refrigerants, Vapor compression systems, Domestic refrigerator **Air Conditioning**: Principle of air continuing, Window and split air conditioners **Air Compressors**: uses of compressed air, classification, working of reciprocating compressor, centrifugal compressor **Pumps**: Centrifugal and reciprocating pumps, Applications			
UNIT: 6	**Power Transmission and Mechanical Components**	**04**	**15**
Shafts and Axles **Drives**: Belt, Chain, Gear – Arrangement and Applications **Clutches**: Disc, Centrifugal **Brakes**: Block, Shoe, Disc			
		30	

List of Practical:

Topic	Hrs
To demonstrate and understand the construction and working of various types of boilers.	04
To Demonstrate & understand the construction and working of four stroke petrol and diesel engines.	02
To Demonstrate & understand the construction and working of Two stroke petrol and diesel engines.	02
To demonstrate and understand construction and working of reciprocating air compressor.	02

To demonstrate and understand the vapor compression refrigeration system.	02
To understand the construction, and working of window type AC and Split AC.	04
To understand the construction, working and application of clutches, and brakes.	02
To understand different arrangement and application of various power transmission drives.	02
Tutorials	05
Assignment	05
	30

Reference Books:

1. Elements of Mechanical Engineering by N M Bhatt and J R Mehta, Mahajan Publishing House
2. Basic Mechanical Engineering by Dr. R K Shukla, Tech-Neo Publication.
3. Basic Mechanical Engineering by Pravin Kumar, Pearson Education
4. Fundamental of Mechanical Engineering by G.S. Sawhney, PHI Publication New Delhi
5. Elements of Mechanical Engineering by Sadhu Singh, S. Chand Publication

Course Outcomes Mapping:

CO No.	Course Outcome (CO)	POs/ PSOs Mapped	Cognitive Level (RBT)	Knowledge Category	Class Sessions (Lecture)
CO1	Explain fundamental thermodynamic concepts and various energy sources along with their environmental impacts	PO1, PO2, PO7, PSO1	Understand	Conceptual	4
CO2	Apply gas laws and thermodynamic processes to evaluate the behavior of ideal gases	PO1, PO2, PO4, PSO1	Apply	Conceptual	5
CO3	Analyze properties of steam and describe the working of steam boilers and their components	PO1, PO2, PO4, PSO1	Understand, Analyze	Conceptual, Procedural	4
CO4	Compare different heat engine and internal combustion engine cycles based on efficiency and operation	PO1, PO2, PO3, PO4, PSO1	Understand, Analyze	Conceptual, Procedural	6
CO5	Demonstrate the working principles of refrigeration systems, air conditioners, compressors, and pumps	PO1, PO2, PO3, PO5, PO7, PSO1	Understand Apply	Conceptual, Procedural	7

CO6	Identify and describe components of mechanical power transmission systems and their applications	PO1, , PO2, PO3, PO5, PSO1, PSO2	Understand Apply	Conceptual, Procedural	4

Mapping of COs with POs & PSOs:

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3					2						3	
CO2	3	3		3									3	
CO3	3	3		3									3	
CO4	3	3	3	3									3	
CO5	3	3	3		2		2						3	
CO6	3	3	3		2								3	2

3: High, 2: Medium, 1: Low