Basic Mechanical Engineering

COURSE EDUCATIONAL OBJECTIVES:

1. To study the basic concepts materials, machining, and scope of mechanical engineering.
2. To study the basic concepts in the field of thermal engineering.
3. To study the basic principles of power plants, mechanical transmission system and fundamentals of Robotics.

UNIT –1: INTRODUCTION TO MATERIALS & MANUFACTURING ENGINEERING (8)

Introduction to Mechanical Engineering: Role of mechanical engineering in industries and society – Technologies and scope in different sectors such as energy, manufacturing, design, automotive, aerospace, and marine. **Engineering Materials**: Introduction on metals-ferrous and non-ferrous, ceramics, composites, smart materials. **Manufacturing Processes:** Basic principles and applications of casting, forming, joining processes, and machining – Introduction to CNC machines, 3D printing, and smart manufacturing.

UNIT –2: INTRODUCTION TO THERMAL ENGINEERING (8)

Thermal Engineering: Working principle of boilers. **Refrigeration:** Refrigeration and air-conditioning cycles – Units of refrigeration – Refrigerants – Vapour-compression and absorption system. **Air Conditioning:** Terminology in air conditioning – Working principle of window, split, and central air conditioning system. **IC Engines:** Basic concepts on Otto cycle and Diesel cycle – Components of IC engines – SI/CI Engines – Working principle of two/four stroke petrol and diesel engines – Differences between petrol and diesel engines – Basic concepts on electric and hybrid vehicles.

UNIT –3: POWER PLANTS, MECHANICAL TRANSMISSION AND ROBOTICS (8)

Power Plants: Working principle of steam, diesel, hydro, gas turbine, and nuclear power plants. **Mechanical Power Transmission**: Belt drives, chain, rope drives, gear drives and their applications. **Introduction to Robotics**: Joints & links, configurations, and applications of robotics.

Text Book

1. Elements of Mechanical Engineering by K. R. Gopalakrishna, Sudhir Gopalakrishna, S. C. Sharma
2. Elements of Mechanical Engineering; Author: Kestoor Praveen, M. R. Ramesh
3. Basic Mechanical Engineering 1st Edition; by K. Venugopal, V. Prabhu Raja

Reference Book

1. Basic Mechanical Engineering (Be 204); Nag; Tata McGraw-Hill Education
2. Comprehensive Basic Mechanical Engineering; R.K. Rajput

QUESTION BANK

Q. No.	Questions	B T	PO Attainment
	UNIT –1: INTRODUCTION TO MATERIALS & MANUFACTURING ENGINEERING		
	PART-A (Two Marks Questions)		
1	List two core roles of a mechanical engineer.	U	PO1, PO2, PO3
2	Name two specific applications of mechanical engineering in the marine sector.	U	PO1, PO2, PO3
3	Give two examples of non-ferrous metals.	R	PO1, PO2, PO3
4	Define Composite Materials.	R	PO1, PO2, PO3
5	What is the main principle of a Casting Process?	U	PO1, PO2, PO3
6	Mention two different Joining Processes.	U	PO1, PO2, PO3
7	What does the acronym CNC stand for, and what is its primary function?	U	PO1, PO2, PO3
8	What is the key difference between machining and forming processes?	R	PO1, PO2, PO3
9	Define Smart Materials.	R	PO1, PO2, PO3
10	What is 3D Printing also known as?	R	PO1, PO2, PO3

Q. No.	Questions	B T	PO Attainment
	PART-B (Ten Marks Questions)		
1	Describe the role of mechanical engineers in industries and society.	U	PO1, PO2, PO3
2	Explain the technologies in manufacturing and energy sector.	U	PO1, PO2, PO3
3	Define engineering materials? Explain the differences between the ferrous and non-ferrous metals.	R	PO1, PO2, PO3
4	Define composite and briefly discuss the classification of composites and its applications.	R	PO1, PO2, PO3
5	Define 3D printing? Explain the steps involved in 3D printing process in detail.	U	PO1, PO2, PO3

Q. No.	Questions	B T	PO Attainment
	UNIT –2: INTRODUCTION TO THERMAL ENGINEERING		
	PART-A (Two Marks Questions)		
1	What is the primary function of a refrigerant?	U	PO1, PO2, PO3
2	Define the term "air conditioning."	U	PO1, PO2, PO3
3	What does 'SI Engine' stand for?	R	PO1, PO2, PO3
4	Name the two basic thermodynamic cycles associated with IC Engines.	R	PO1, PO2, PO3
5	What is the full form of CI Engines?	U	PO1, PO2, PO3
6	List four basic components of an IC Engine.	R	PO1, PO2, PO3
7	Define the process of compression in an IC engine.	U	PO1, PO2, PO3
8	What is the function of the evaporator in a refrigeration system?	R	PO1, PO2, PO3
9	Name the two primary types of AC units mentioned in the syllabus.	R	PO1, PO2, PO3
10	What is a hybrid vehicle?	R	PO1, PO2, PO3

Q. No.	Questions	B T	PO Attainment
	PART-B (Ten Marks Questions)		
1	Define boiler and explain any one type of fire tube boiler with neat sketch?	U	PO1, PO2, PO3
2	Explain the working of vapour compression refrigeration system with neat sketch?	U	PO1, PO2, PO3
3	Describe the classification of IC engines and explain the components of I C engine in detail.	R	PO1, PO2, PO3
4	Discuss the working of four stroke Petrol engine with neat sketch.	U	PO1, PO2, PO3
5	List the differences between two stroke and four stroke IC engines in detail.	U	PO1, PO2, PO3

Q. No.	Questions	B T	PO Attainment
	UNIT –3: POWER PLANTS, MECHANICAL TRANSMISSION AND ROBOTICS		
	PART-A (Two Marks Questions)		
1	Name the four types of power plants listed in the syllabus.	U	PO1, PO2, PO3
2	What is the primary function of a nuclear reactor?	U	PO1, PO2, PO3
3	List two common applications of belt drives.	R	PO1, PO2, PO3
4	Define a robot link.	R	PO1, PO2, PO3
5	What is the basic difference between a chain drive and a rope drive?	U	PO1, PO2, PO3
6	Define the term "gear drive."	R	PO1, PO2, PO3
7	Name one specific industrial application of robotics.	R	PO1, PO2, PO3
8	What is a robot joint?	R	PO1, PO2, PO3
9	What is the energy source in a hydro power plant?	R	PO1, PO2, PO3
10	List two components that make up a basic robot configuration	R	PO1, PO2, PO3

Q. No.	Questions	B T	PO Attainment
	PART-B (Ten Marks Questions)		
1	Discuss in detail about the working of hydro electric power plant with neat sketch?	U	PO1, PO2, PO3
2	Explain the working of Steam power plant with neat diagram?	U	PO1, PO2, PO3
3	Define robot illustrate different types of joints with sketches	R	PO1, PO2, PO3
4	Explain the various configurations of robot with neat sketches	U	PO1, PO2, PO3
5	Discuss about the different types of mechanical power transmission systems.	R	PO1, PO2, PO3