

Basic Mechanical Engineering

Table of Contents

1. Introduction to Mechanical Engineering

- Definition and scope of mechanical engineering
- Engineering materials and their properties
- Units, dimensions and basic engineering concepts

2. Engineering Mechanics

- Forces and moments
- Equilibrium of bodies
- Friction
- Centre of gravity and centroid
- Simple machines

3. Strength of Materials

- Stress and strain
- Elasticity and Hooke's law
- Shear force and bending moment
- Torsion
- Bending stresses

4. Theory of Machines

- Mechanisms and machine elements
- Velocity and acceleration of mechanisms
- Gears and gear trains
- Flywheels and governors
- Balancing of machines

5. Engineering Materials

- Ferrous and non-ferrous metals
- Steels and cast irons
- Alloys
- Polymers, ceramics and composites
- Material selection

6. Manufacturing Processes

- Casting
- Forging and rolling
- Welding and soldering

- Machining processes
- Lathe, drilling and milling operations

7. Thermodynamics

- Basic concepts and laws of thermodynamics
- Properties of gases and vapours
- Heat and work
- First and second laws of thermodynamics
- Thermodynamic cycles

8. Heat Engines and Power Plants

- Internal combustion engines
- Steam engines and turbines
- Gas turbines
- Boilers
- Basic power plant systems

9. Fluid Mechanics

- Properties of fluids
- Fluid pressure and measurement
- Fluid flow
- Bernoulli's equation
- Pumps and turbines

10. Heat Transfer

- Conduction
- Convection
- Radiation
- Heat exchangers
- Basic thermal applications

11. Refrigeration and Air Conditioning

- Principles of refrigeration
- Refrigeration cycles
- Refrigerants
- Air-conditioning systems
- Applications

12. Mechanical Power Transmission

- Belts and pulleys
- Chains and sprockets
- Gears

- Shafts and couplings
- Bearings

13. Hydraulic and Pneumatic Systems

- Hydraulic principles
- Pumps and actuators
- Hydraulic circuits
- Pneumatic systems
- Industrial applications

14. Engineering Drawing and Design Basics

- Technical drawing principles
- Orthographic and sectional views
- Machine components
- Design considerations
- Introduction to CAD

15. Maintenance and Industrial Safety

- Preventive and corrective maintenance
- Failure and wear
- Lubrication
- Workshop safety
- Environmental considerations

Pertinent summary: Basic Mechanical Engineering provides an introduction to the fundamental principles of mechanical engineering, including engineering mechanics, strength of materials, machines, manufacturing, thermodynamics, fluid mechanics, heat transfer, power transmission, and basic mechanical systems.