

**CC152: ELEMENTS OF MECHANICAL ENGINEERING**  
**CREDITS = 6 (L=4, T=0, P=2)**

**Course Objective:**

To Study the fundamentals of mechanical systems and appreciate significance of mechanical engineering in different fields of engineering.

**Teaching and Assessment Scheme:**

| Teaching Scheme |   |   | Credits | Assessment Scheme |     |           |    | Total Marks |
|-----------------|---|---|---------|-------------------|-----|-----------|----|-------------|
| L               | T | P |         | Theory            |     | Practical |    |             |
|                 |   |   | ESE     | CE                | ESE | CE        |    |             |
| 4               | 0 | 2 | 6       | 70                | 30  | 30        | 20 | 150         |

**Course Contents:**

| Unit No. | Topics   | Teaching Hours |
|----------|--|----------------|
| 1        | <p><b><u>Introduction:</u></b></p> <p>Concept of Force, Pressure, Energy, Work, Power, System, Heat, Temperature, Specific heat capacity, Change of state, Path, Process, Cycle, Internal energy, Enthalpy, Laws of thermodynamics.</p> <p><b><u>Energy conversion:</u></b></p> <p>Energy conversion: Fuels &amp; Calorific Values, Thermal, Nuclear, Hydro and Solar power plants.</p>  | 08             |
| 2        | <p><b><u>Properties of gases:</u></b></p> <p>Gas laws, Boyle's law, Charle's law, Combined gas law, Gas constant, Relation between Cp and Cv, Various non-flow processes like constant volume process, constant pressure process, Isothermal process, Adiabatic process, Poly-tropic process.</p> <p><b><u>Properties of Steam:</u></b></p> <p>Steam formation, Types of Steam, Enthalpy, Specific volume, Internal energy and dryness fraction of steam, use of Steam tables, steam calorimeters</p> <p><b><u>Steam Boilers:</u></b></p> <p>Types and classification, Boiler mountings and accessories.</p> | 13             |

| Unit No.     | Topics  | Teaching Hours |
|--------------|---|----------------|
| 3            | <p><b><u>Internal Combustion Engines:</u></b></p> <p>Introduction, Classification, Engine details, four-stroke/ two-stroke cycle Petrol/Diesel engines, Indicated power, Brake Power,</p> <p><b><u>Air Compressors:</u></b></p> <p>Types and operation of Reciprocating and Rotary air compressors, significance of Multistaging.</p> | 09             |
| 4            | <p><b><u>Pumps:</u></b></p> <p>Types and operation of Reciprocating, Rotary and Centrifugal pumps, Priming.</p> <p><b><u>Refrigeration &amp; Air Conditioning:</u></b></p> <p>Refrigerant, Vapor compression refrigeration system, Domestic Refrigerator, Window and split air conditioners.</p>                                      | 07             |
| 5            | <p><b><u>Transmission of Motion and Power:</u></b></p> <p>Shaft and axle, Belt drive, Chain drive, Friction drive, Gear drive, bearings.</p> <p><b><u>Couplings, Clutches and Brakes:</u></b></p> <p>Construction and applications of Couplings, Clutches.</p>  | 08             |
| <b>TOTAL</b> |   | <b>45</b>      |

**List of References:**

1. T. S. Rajan, "Basic Mechanical Engineering", New Age International Publication.
2. Dr. D.S. Kumar, "Thermal Science and Engineering", S.K. Kataria & sons, Publication New Delhi.
3. Basant Agrawal and C.M.Agrawal, "Basics of Mechanical Engineering", Wiley India Pvt. Ltd. Publication.
4. *Fundamental of Mechanical Engineering* by G.S. Sawhney, PHI Publication New Delhi
5. *Thermal-Engineering*-Mahesh M Rathore, Tata McGraw Hill Publication.

**Course Outcomes (COs):**

At the end of this course students will be able to ...

1. Use the concepts of units, systems (open, closed systems and control volumes) and its boundaries, properties, state, process, cycle, quasi-static process in context of energy conversion.
2. Assess thermodynamic properties of gases and steam, and apply it to systems of relevance.
3. Interpret the fundamentals of I C engine and air compressors.
4. Interpret the fundamentals of pumps, refrigerators and air-conditioners.
5. Identify the transmission systems and its components.