

**ELEMENTS OF MECHANICAL ENGINEERING**  
**BE 1<sup>st</sup> SEMESTER (EC/CE/ CIVIL) / BE 2<sup>nd</sup> SEMESTER (ME/IT/EE/ AE) SUB CODE: CC104**

Teaching Scheme				Total Credit	Evaluation Scheme					
L	T	P	Total		Theory		IE	CIA	Pract./Viva	Total
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
4	0	2	6	5	3	70	30	20	30	150

**LEARNING OBJECTIVES:**

The educational objectives of this course are

- To present a problem oriented introductory knowledge of Elements of Mechanical Engineering
- To address the underlying concepts and methods behind mechanical engineering
- To know the fundamental concepts of energy; its sources and behavior; its Conversion, laws governing these processes and applications

**OUTLINE OF THE COURSE**

Sr. No.	Unit No.	Minimum No. of Hrs.
1	Unit :1	15
2	Unit:2	22
3	Unit:3	15
4	Unit:4	08

**Total Hours (Theory) : 60, Total Hours (Lab) : 30, Total Hours : 90**

**DETAILED SYLLABUS**

Unit No	Topics	Lectures (Hours)	Weightage (%)
1.	<b>Introduction:</b> Concept of Mass, Weight, Force, Pressure, Work, Power, Energy, Heat, Temperature, Specific Heat, Interchange of heat, Change of state, Mechanical equivalent of heat, Internal energy, Enthalpy, Entropy, Efficiency, Statement of zeroth law, First law and Second Law of Thermodynamics.	3	5
	<b>Properties of Gases:</b> Gas laws, Boyle's law, Charle's law, Combined gas law, Gas constant, Internal energy, Relation between $C_p$ and $C_v$ , Non flow process, Constant volume process, constant pressure process, Isothermal process, Polytropic process, Adiabatic process.	6	10
	<b>Fuels and Combustion:</b> Introduction, Classification, Solid fuels, Liquid Fuels, Gaseous fuels, LPG, CNG and biofuels, calorific values.	6	10
2.	<b>Heat Engines:</b> Thermal prime movers, Elementary heat engines, sources of heat, Working substances, Converting machines, Classification of heat engines, heat engine cycles, Carnot cycle, Rankine cycle, Otto cycle, Diesel cycle.	6	6
	<b>Power Producing Devices:</b> <b>Internal Combustion Engines :</b> Introduction, Classification, Engine details, Otto and Diesel four stroke cycle, Comparison of otto and diesel cycle, Indicated Power, Brake Power, Efficiencies (Elementary Numerical Treatment) <b>Turbines</b> Introduction and Working Principles of Steam turbines, Gas turbines, Hydraulic turbines (Elementary Treatment)	8	12
	<b>Power Absorbing Devices:</b> <b>Air Compressor:</b> Introduction, Uses of Compressed air, Reciprocating Compressors, Operation of a compressor, Work for Compression, power required, Reciprocating compressor efficiency, Multistage reciprocating compressor, Rotary compressors. <b>Pump:</b> Introduction, Classification of pump, Reciprocating pump, Rotary Positive Displacement pump, Centrifugal pump, axial flow pump, specific speed, Concept of priming and cavitations <b>Refrigeration and Air conditioning:</b> Introduction, Refrigerant, Types of refrigerators, Vapour compression refrigeration system, Window and Split air conditioners.	8	12

3.	<b>Power Transmission Methods and Devices:</b> Introduction to Power transmission, Belt, Rope, Chain and Gear drive. Types and functioning of clutches, brakes and Dynamometer	3	6
	<b>Speed control:</b> Introduction, Governors, I.C. engine governing, Flywheel,	2	3
	<b>Engineering Materials:</b> Introduction, classifications, ferrous metallic and non ferrous metallic materials, non metallic and other materials	3	5
	<b>Welding ,Brazing and Soldering:</b> Introduction of welding ,Brazing and Soldering , Comparison of welding ,brazing and soldering	2	3
	<b>Mechanical Working of Metals and Press Operations:</b> Hot and cold working of metals ,Mechanical working operations, Press working operations, A comparison between hot and cold working processes	3	5
	<b>Foundry Practice:</b> Introduction, Pattern, Moulding, Moulding materials, Cores, Casting methods	2	3
4.	<b>Steam and Steam Generator:</b> Introduction , Formation of steam, properties, use of steam tables, Mollier charts (Elementary Numerical Treatment), Introduction and classification of steam generators, cochran type, Lancashire boiler, bacock and Wilcox boiler, high pressure boiler, boiler details, boiler performance, functioning of different mountings and accessories, Types of calorimeter	6	18
	<b>Heat Transfer:</b> Introduction, Modes of heat transfer	2	7
<b>Total</b>		<b>60</b>	<b>100</b>

**INSTRUCTIONAL METHOD AND PEDAGOGY** (Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures, practicals and Tutorial which carries 05 Marks.
- At regular intervals assignments is given. In all, a student should submit all assignments of 05 marks each.
- Classroom participation and involvement in solving the problems in Tutorial rooms carries 05 Marks.
- Viva Voce will be conducted at the end of the semester of 05 Marks.
- One internal exam of 30 marks is conducted as a part of Mid semester evaluation.
- Experiments shall be performed in the laboratory related to course contents.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.

**STUDENTS LEARNING OUTCOME:**

On successful completion of the course

- The student can identify different areas of Mechanical Engineering. Can find the applications of all the areas in day to day life. Can identify the operations, working, construction, material etc. aspects of Mechanical devices, machines, mechanisms etc.

**TEXT BOOK:**

- Rayner Joel, 'Basic Engineering Thermodynamics', Longman, Scientific and Technical, ELBS.
- Elements of Mechanical Engineering by Dr. M.L.Mathur ,Prof F.S.Mehta ,Prof R.P.Tiwari, Jain brothers (New delhi)

**REFERENCE BOOKS:**

- Fundamental of Mechanical Engineering by G.S.Sawhney, Prentice Hall of India Publication New Delhi
- Thermal Engineering by R.K.Rajput , S.Chand Publication New Delhi
- J.P. Holman, 'Thermodynamics', Mc. Graw Hill Inc., 1990 or later edition.
- Introduction to Engineering Materials by B.K.Agrawal Tata Mcgrahill Publication, New Delhi
- Elements of Mechanical Engineering K.P.Roy and Prof. S.K. Hajra Chaudhary ,Media Promoters and Publishers Pvt.Ltd, Bombay

**Web Materials:** <http://www.wikipedia.org>

**LIST OF EXPERIMENTS:**

Sr. No.	Name of the Experiments
1	Demonstration & Study: Two stroke & Four-stroke cycle I.C Engine
2	Demonstration & Study: Performance Test of Reciprocating Air Compressor
3	Demonstration & Study: Different Types of Pumps
4	Demonstration & Study: Different Types of Boiler
5	Demonstration & Study: Boiler Mountings: Construction and Working
6	Demonstration & Study: Different Types of Calorimeter
7	Demonstration & Study: Vapor Compression cycle refrigeration and window type room air Conditioner
8	Demonstration & Study: Coupling, Clutch & Breaks
9	Demonstration & Study: Power Transmission System
10	Demonstration & Study: Boiler Accessories