EC-105 **ELEMENTS OF MECHANICAL ENGINEERING** **L T P C**
4 1 - 3

COURSE OBJECTIVES:

1. To study various types of force systems. To teach students the basic principles of mechanics of rigid bodies and to analyze problems in a simple and logical manner, To teach students to draw free body diagrams and equilibrium methods in problem solving.
2. To understand the basic manufacturing process like casting, welding and their working process.
3. To impart the knowledge about different drive systems like belts, belt drives, gears and gear trains. To improve knowledge on basic conventional machining processes.
4. To understand the basic concepts of thermodynamics and working principles of 2 stroke and 4 stroke petrol and diesel engines.
5. To understand the working principles of different boilers and different mountings and accessories used for the safety operation of boilers and basics about refrigeration and air conditioning.

COURSE OUTCOMES:

After successful completion of the course, the students will be able to

1. determine a system of forces and couples applied to a rigid body into a single resultant force and couple.
2. classify the fabrication processes such as welding and casting.
3. estimate the power transimission in belt and gear drives and explain manufacturing process like foundry, welding, brazing, soldering, milling and drilling.
4. evaluate the efficiencies and performance of 2-stroke and 4-stroke IC Engines.
5. Describe working principles of Babcock and Wilcox boilers, different mountings and accessories used in the boilers, refrigerator and air conditioning.

UNIT I *Text Book - 1* **(13)**

Forces : Types of forces, Concurrent Forces, Resolution of coplanar Forces, Equilibrium of Coplanar forces, free body diagrams, Method of Moments.

Non Concurrent Forces in a Plane : Couple, equilibrium of parallel forces in a plane, resultant and equilibrium of general case of forces in a plane, plane trusses-method of joints.

UNIT II *Text Book - 2* **(13)**

Casting : Steps involved in Casting, Applications metal casting, Pattern- Materials, Types of patterns, pattern allowances, casting defects.

Fabrication processes : Classification; Welding - Classification of welding; Electric arc welding - Principle of arc, Arc welding equipment, Electrodes, Manual metal arc welding, TIG welding (working principles)

Introduction to Machine Tools : Construction and working of Lathe.

UNIT III *Text Book - 3* **(13)**

Power Transmission Methods and Devices : Belts : Belts, expression for the ratios of tensions on the slack and tight side, power transmitted, V-belts, chain drives.

Gears : Types of gears, Spur, helical, Bevel gears, nomenclature of gears, Gear manufacturing methods, (Simple problems on spur gears) gear trains- introduction.

UNIT IV *Text Book - 4* **(13)**

Basic concept of thermodynamics : Introduction, States, Work, Heat, Temperature, Zeroth law, laws of thermodynamics, Classification of heat engines, Description and thermal efficiency of Carnot cycle, Otto cycle and Diesel cycle.

Internal Combustion Engines : Introduction, Classification Engine details, four-stroke/ two-stroke cycle Petrol/Diesel engines, Indicated power, Brake Power, Efficiencies. (Simple Problems)

UNIT V *Text Book - 4* **(13)**

Steam Boilers : Introduction, Classification, Cochran, Babcock and Wilcox boiler, functioning of different mountings and accessories.

Refrigeration & Airconditioning : Introduction to refrigeration and air-conditioning, Coefficient of performance,Simple refrigeration vapour compression cycle,Domestic Refrigerator, Summer and winter Air conditioning.

LEARNING RESOURCES:

TEXT BOOK(s):

1. Engineering Mechanics - A.K. Tayal, Umesh Publications, 13th Edition, New Delhi.
2. Workshop Technology - Vol I and II - Hazaraj Chowdary
3. Elements of Mechanical Engineering, Mathur, and Mehta, Jain Brothers, Delhi (2005)
4. Treatise on Heat Engineering - V. P.Vasandhani & Kumar, Metropolitan Publishers

REFERENCE BOOK(s):

1. Applied Mechanics & Strength of Materials, R. S. Khurmi, 13thEdition, S. Chand & Co.(1977)
2. Basic Mechanical Engineering, T.J.Prabhu& Others, 1stEdition, ScitechPublishers(2010)

WEB RESOURCES:

http://nptel.ac.in/courses/