

## 1/4 B.Tech FIRST SEMESTER

EE1T6

BASIC MECHANICAL ENGINEERING

Credits: 3

Lecture: 4 periods/week

Internal assessment: 30 marks

Tutorial: 1 period /week

Semester end examination: 70 marks

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**Objective :** The main objective of this subject is to provide knowledge about the different types of stresses and strains acting on the bodies and to identify when a body comes to failure and in finding the centroids & M.O.I for irregular bodies. The objective of the inclusion of the topic "Power transmission is to achieve a broad and indepth knowledge in power transmission and control with an emphasis on sustainable development related to power generation. The importance of IC engines, thermodynamic cycles, steam boilers and its accessories are also studied.

**Learning outcomes:**At the end of the course the students have:

- Gained fundamental knowledge about the basics of manufacturing methods.
- Understood the principle of operation of different I. C. engines.
- Knowledge to describe the performance of different types of refrigeration systems.
- Learned about gear nomenclature, and the simple calculations in transmission of Power.

### UNIT – I

**Simple stress and strains:** Elasticity and plasticity – Types of stresses & strains–Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain – Elastic Moduli & the relationship between them.

### UNIT – II

**Centroids:** Introduction, Determination of centroid for plane figures rectangle and circle, Centroids of composite plane figures for I section, L section & T section only.

### UNIT– III

**Moment of Inertia of Plane Figures:** Moment of Inertia of a plane figure with respect to an axis in its plane – Moment of inertia with respect to an axis perpendicular to the plane of the figure – Parallel axis theorem --- Moment of Inertia of I section, L section & T section only.

### UNIT– IV

**Power Transmission through Shafts:** Introduction, Torsion of Circular Shafts, Torsion equation, Hollow Circular Shafts, Torsional Rigidity, Power Transmitted by the Shaft and Transmission of power by circular shafts (Simple Problems).

### UNIT– V

**IC Engines:** Introduction , Main components of IC engines , working of 4-stroke petrol engine and diesel engine , working of 2- stroke petrol engine and diesel engine , difference between petrol and diesel engine , difference between 4- stroke and 2- stroke engines.

## **UNIT– VI**

**Thermodynamic Cycles:** Air Cycles – Otto cycle – Diesel cycle – Carnot cycle – Atkinson cycle – Ericsson cycle - Brayton cycle. Vapour power cycle – Rankine cycle. (Theoretical treatment only)

## **UNIT– VII**

**Steam Boilers:** Function, classification, working of Babcock and Wilcox boiler. Sub critical & Super critical boilers; Types of High Pressure Boilers- La Mont boiler- Benson boiler (Theoretical treatment only).

## **UNIT– VIII**

**Steam Boiler Mountings & Accessories:** Various boiler mountings: Water Level Indicator – Safety Valve – Pressure gauge – Steam stop valve – Feed check valve – Blow off cock – Man and mud holes.

**Boiler Accessories:** Air Preheater – Economizer – Superheater – Deareator.

## **TEXT BOOKS:**

1. Fundamentals of Mechanical Engineering / G.S.Sawheny- PHI.
2. An Integrated Course in Mechanical Engineering / R.K.Rajput /Birala Publications.
3. I.C. Engines / V. GANESAN- TMH.
4. Strength of Materials by R.K. Rajput, S.Chand & Company.
5. Thermal Engineering / R.K. Rajput / Lakshmi Publications.
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## **REFERENCES:**

1. Thermodynamics and Heat Engines / R. Yadav / Central Book Depot.
2. Strength of Materials by R.K.Bansal, Laxmi Publishers.
3. Strength of materials by Bhavikatti, Lakshmi publications.
4. Engineering Mechanics Statics and dynamics by A.K.Tayal, Umesh Publication, Delhi.
5. Fundamentals of I.C.Engines - P.W. Gill, J.H. Smith & Ziurys- IBH & Oxford pub.
6. Design of Machine Elements by Sharma & Purohit, PHI.
7. Engineering Mechanics by S.Timoshenko & D.H.Young, McGraw Hill International Edition.
8. Design of machine elements by Bhandari, Tata McGraw Hill book Co.(2007].