II YEAR-II Semester

ME4T1 MECHANICS OF SOLIDS-II Credits: 3

Lecture: 3 periods/week **Internal assessment: 30marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

Course Objectives:

- The student will compute beam deflections under transverse loads using various methods.
- The student will describe State of stress at a point and compute principal stresses under bi-axial loading conditions.
- The student will be able to analyze curved beams, thick cylinders and rotating discs for induced stresses, strains and deformations under static loads

Course Outcomes:

Upon completion of this course the student will be able to:

1. Determine the shear stresses and modulus of rigidity in shafts.
2. Calculate deflections of statically determinate and indeterminate beams.
3. Solve problems relating to bending of continuous and curved beams.
4. Analyze and evaluate critical buckling loads of columns under various boundary conditions
5. Evaluate stresses in thin and thick cylinders.

Pre-Requisites: Engineering Mechanics, Mechanics of Solids-I

UNIT – I
TORSION

Introduction, Torsion of Circular shafts, Transmission of power by circular shafts, Strain Energy in pure Shear and uniform Torsion for Statically determinate Members.

UNIT - II
DEFLECTIONS OF STATICALLY DETERMINATE AND INDETERMINATE BEAMS:

Introduction, Differential Equations of the Deflection Curve, determination of deflections for Simple beams, Fixed beams by Integration of the Bending Moment Equation, Moment Area Method and Macaulay's Method.

UNIT – III

CONTINUOUS BEAMS:

Clapeyron's theorem of three moments, Beams with constant moments of inertia.

CURVED BEAMS:

Stresses in Beams of small and large initial curvature, The Winkler-Bach theory, Stresses in Crane Hook and C-Clamp with Rectangular, Circular and Trapezoidal cross sections.

UNIT - IV

COLUMNS:

Buckling and Stability, Crippling load of Columns with Pinned ends, fixed-free, fixed-fixed and fixed-pinned effective length of a column, Limitations of Euler's Formula, Rankine's Formula, Columns with eccentric Axial Loads, Secant formula.

UNIT – V

THIN CYLINDERS AND THICK CYLINDERS

Thin Cylinders subjected to internal pressure, efficiency of boiler joints, changes in dimensions of cylinder when subjected to internal pressure, Spherical shell and Wire Wound Cylinders.

Thick Cylinders: Stresses in thick Cylindrical shell(Lame's theory), Radial Deflection, Stresses in Compound Cylinders.

Learning Resources

Text Books:

1. Mechanics of Materials, (2nd edition), by Stephen P. Timoshenko , James M. Gere, C B S Publishers, 2011.
2. Strength of Materials (2nd edition) by S.S. Rattan, Tata Mc-Graw Hill Private Limited, New Delhi, 2012.

Reference Books:

1. Mechanics of Materials, (7th edition) by James M. Gere, Cengage learning India,2010.
2. Mechanics of Materials, (1st edition) by Adarsh Swaroop, New Age International Pvt. Ltd, 2012 .
3. Strength of Materials (Mechanics of Solids), revised edition by R.K. Rajput S. Chand Publications.
4. Strength of Materials, (4th edition) by R. K. Bansal, revised, Laxmi Publishers, New Delhi.2010.
5. Abdul Mubeen, "Mechanics of Solids" 2nd Edition, Pearson Education, Noida, 2011