SOLID MECHANICS – II

Lectures / Tutorials : 4 / 1 Periods/Week Sessional marks : 40
Semester End Exam. : 3 Hours Semester End Exam. marks : 60
Credits : 4

Course objectives:

- To develop equations for transformation of plane stress.
- To study strain energy concept in uni-axial, pure bending and shear.
- To study the behaviour of columns subjected to different end conditions for different loadings.
- To know deflection of statically determinate beams by using relation of moment curvature, moment of area and conjugate beam method

Course outcomes:

- Able to understand and application to several number of stresses on a plane.
- Able to understand problems on columns.
- Becoming strong in applying mathematics to deflection of beams along with other methods of finding the deflections of beams.

UNIT-I

Compound stresses

Introduction; Superposition and its limitation; Superposition of normal stresses; Stresses in a dam-middle-third rule; Eccentrically loaded short columns; Core or kernel of a section; Superposition of shear stresses; Stresses in closely coiled helical springs; Deflection of closely coiled helical springs

UNIT -II

Analysis of Plane-Stress

Introduction; The basic problem; Equations for transformation of plane-stress; Principal planes and Principal stresses ; Maximum shear stresses ; Mohr's circle of stress ; Construction of Mohr's circle

Work and Strain Energy

Introduction; Elastic strain energy for uni-axial stress; elastic strain energy in pure bending; Strain energy of beams in shear; Strain energy of circular shafts in torsion; Work and strain energy method; Determination of displacements by work and strain energy method

UNIT-III

Failure Theories

Introduction; maximum normal stress theory; maximum shearing stress theory; maximum strain energy theory; maximum distortion energy theory; comparison of theories.

Buckling of columns

Introduction; Examples of instability; Criteria for stable equilibrium; Euler load for column with pinned ends; Euler loads for columns with different end restraints; Limitations of the Euler's formulae; Generalized Euler buckling load formulae; Eccentric loads and the secant formula

UNIT –IV

Deflection of statically determinate beams

Introduction; strain-curvature and Moment-Curvature relation; Governing differential equation for deflection of elastic beams; Solution of beam deflection problem by Direct integration; Introduction to

moment area method; Derivation of Moment area theorems; conjugate-beam method; slope and deflection of beams using moment area method.

NOTE

Two questions of 12 marks each will be given from each unit out of which one is to be answered. Twelve questions of one mark each will be given from entire syllabus which is a compulsory question.

TEXT BOOK

1. Mechanics of Materials by Pytel and Kiusalaas , Cengage Learning, 2003.

REFERENCES

1. Mechanics of materials by E.P. Popov , Prentice Hall of India, 1986.
2. Elements of strength of materials by S.P.Timoshenko and D.H.Young, Affiliated East-West Press Pvt.Ltd.,2005.

WEB REFERENCES:

http://nptel.iitm.ac.in/video.php?subjectId=105101084
http://www.engineeringcivil.com/theory/civil-engineering-notes-from-universities/