AMITY UNIVERSITY
UTTAR PRADESH

Course Title: MECHANICS OF SOLIDS

Credit Units: 02

Course Level: UG

Course Code: MAE202

L	T	P/S	SW/FW	TOTAL CREDIT UNITS
2	0	-	-	02

Course Objectives: The objective of this course is to make the students understand the concept of stress and strain in different types of structure/machine under different loading conditions. The course also covers the simple and compound stresses due to forces, stresses and deflection in beams due to bending, torsion in circular section, strain energy, different theories of failure, stress in thin cylinder thick cylinder and spheres due to external and internal pressure.

Pre-requisites: Basic Concepts of Physics and Mathematics (especially Trigonometry, Geometry and Calculus), Engineering Mechanics**.**

Course Contents/Syllabus:

	Weightage (%)
Module I: Simple stresses and strains	**15%**
Descriptors/Topics **1.** Concept of stress and strain; Hooke's law, Young's modulus, Poisson ratio. **2.** Stress at a point, stress and strains in bars subjected to axial loading. **3.** Modulus of elasticity, stress produced in compound bars subject to axial loading. Temperature stress and strain calculations due to applications of axial loads. **4.** Variation of temperature in single and compound walls.	
Module II: Compound stress and strains	**15%**
Descriptors/Topics 1. The two dimensional system; stress at a point on a plane, principal stresses and principal planes. 2. Mohr's circle of stress. Graphical and Analytical methods for stresses on oblique section of body. **3.** Shear force and bending moment diagrams for cantilever, simply supported and overhanging beams.	
Module III: Bending Stress	**15%**
Descriptors/Topics 1. Theory of bending stresses in beams due to bending. 2. Assumptions in the simple bending theory. **3.** Derivation of formula: its application to beams of rectangular, circular and channel sections.	
Module IV: Torsion	**10%**
Descriptors/Topics 1. Derivation of torsion equation and its assumptions. 2. Applications of the equation of the hollow and solid circular shafts torsional rigidity.	
Module V: Thin cylinders and spheres	**15%**

1. Derivation of formulae and calculation of hoop stress. 2. longitudinal stress in a cylinder and sphere subjected to internal pressure.	
Module VI: Columns and struts	**15%**
1. Columns and failure of columns, Euler's formulas.. 2. Johnson's empirical formula for axially loaded columns and their applications.	
Module VII: Slope and deflection	**15%**
1. Relationship between moment, slope and deflection, Macaulay's method. 2. Use of all these methods to calculate slope and deflection for the following: a) Cantilevers b) Simply supported beams with or without overhang c) Under concentrated loads, uniformly distributed loads or combination of concentrated and uniformly distributed load	

Student Learning Outcomes:

On completion of the course the student will be able to:

1. Model and analyse the behaviour of structural and machine components subjected to various loading and support conditions based on principles of equilibrium and material constitutional relationships.
2. Understand and apply the concept of stress and strain to analyse and design structural members and machine parts under axial load, shear load, bending moment and torsional moment.
3. Solve practical problems through evaluating the relationship between stress and strain.
4. Analysis of composite beams and shafts
5. Determine the deflections and deformations of loaded flexural members.
6. Analyse a structural member and machine part when loaded beyond elastic limit (inelastic and plastic cases).

Pedagogy for Course Delivery:

The course pedagogy will include lectures, numerical practice, seminars and presentations. It also includes discussion on real life problems related to design of mechanical components which includes all types of stresses.

Assessment/ Examination Scheme:

Theory L/T (%)	**Lab/Practical/Studio (%)**	**Total**
100%	**0%**	**100%**

Theory Assessment (L&T):

	Continuous Assessment/Internal Assessment				End Term Examination
Components (Drop down	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

Text & References:

Text Books:

- Jindal U.C., "Strength of Materials", Galgotia Publication, New Delhi, 1998.
- Ryder G.H., "Strength of Materials", Macmillan, Delhi, 2003.
- R.K. Bansal, "Strength of Materials", Laxmi Publication, New Delhi, 2001.

Reference Books:

- Sadhu Singh, "Strength of Materials", Khanna Publishers, New Delhi, 2000.
- Timoshenko S.P., "Elements of Strength of Materials", East-West affiliated, New Delhi, 2000.
- Hibbler R.C., "Mechanics of Materials", Prentice Hall, New Delhi, 1994.
- Popov Eger P., "Engg. Mechanics of solids", Prentice Hall, New Delhi, 1998.
- Fenner, Roger. T, "Mechanics of Solids", U.K. B.C. Publication, New Delhi, 1990.
- Srinath L.S. et.al., "Strength of Materials", McMillan, New Delhi,2001

Any other Study Material:

- Lab Manual