

Gautam Buddha University, Greater Noida

School of Engineering (Mechanical Engineering)

Degree	Course Name	Course Code	Marks:100
Integrated B. Tech. + M. Tech. / M.B.A.	Mechanics of Material - I	ME 209	SM+MT+ET 25+25+50
Semester	Credits	L-T-P	Exam.
III	4	3-1-0	3 Hours

Unit - I

Axial Stress and Strain: Concept of stress and strain; Hooke's law; Stress-strain diagram of ductile and brittle material; Statically determinate and indeterminate problems; Compound and composite bars; Problems involving temperature changes.

Shear Stresses: Shear Stresses in Beams; Shear stress formula for beams; Shear stress distribution in beams; Stresses in thin spherical shells; Thin cylinders; Symmetrically loaded plates with different loading conditions.

(08 Hours)

Unit - II

Theory of Pure Bending: Derivation of flexural formula for straight beams; Bending stress calculation for beams of simple and built up section.

Strain Energy and Theories of Failures: Introduction; Strain energy; Shear Strain energy; Stresses due to various types of loading; Theories of Failures; Graphical representation of theories of failures.

(08 Hours)

Unit - III

Shear Force and Bending Moment Diagrams: Types of load on beam; Classification of beams; Shear force and bending moment diagrams: Simply supported; Overhang and cantilever beams subjected to any combination of point loads; Uniformly distributed and varying load and moment; Relationship between load; Shear force and bending moment.

(08 Hours)

Unit - IV

Deflection of Beams: Governing differential equation for deflection of straight beams having constant flexural rigidity; Double integration and Macaulay's methods for slopes and deflection.

Columns: Introduction; Euler's theory; Equivalent length; Limitations of Euler's formula; Rankine's formula; Extension of Euler's formula to pin-ended columns and columns with other end conditions. **(08 Hours)**

Unit - V

Torsion of Circular Shafts: Basic assumptions; Torsion formula; Power transmission by shafts; Deformation and stress concentration in circular shafts; Design of transmission (solid and hollow) shafts based on strength and stiffness;

Springs: Introduction to close-coiled helical springs; Springs in series and parallel; Open-coiled helical spring. **(07 Hours)**

Unit - VI

Analysis of Plane Stress and Strains: Transformation equations for plane stress and plane strain; Mohr's stress circle; Relation between elastic constants; Strain measurements; Strain rosettes. **(06 Hours)**

Recommended Books:

1. Mechanics of Materials; Ferdinand P. Beer; E. Russel Johnston; John F. Dewolf; David F. Mazurek; Tata McGraw Hill.
2. Strength of Materials; S. Timoshenko; Van Nostrand; New York.
3. Introduction to Solid Mechanics; Egor P. Popov; Prentice Hall.
4. Advanced Mechanics of Solids; I. S. Srinath; Tata McGraw Hill.
5. Strength of Materials; S. S. Rattan; Tata McGraw Hill.
6. Fundamentals of Solid Mechanics; M. L. Ghambhir; Prentice Hall India.
7. Introduction to Solid Mechanics; Irving H. Shames; Prentice Hall India.
8. Strength of Materials; R. Subramanian; Oxford Higher Education.
9. Strength of Materials; S. Ramamurtham.
10. Solid Mechanics; S. M. A. Kazimi; Tata McGraw Hill.