MME205:MECHANICS OF SOLIDS

Programme: B. Tech **Year: Second** **Semester: Fourth**
Course: Core **Credits: 3** **Hours: 40**

Course Overview and Context: This course introduces fundamental concepts of deformable bodies. It serves as a bridge between mechanics of rigid bodies and structural analysis. It introduces the behavior of structural members, both qualitatively and quantitatively, under different types of external loadings.

Prerequisites Courses:NIL

Text Books:

1. Engineering Mechanics of Solids by Popov, Egor P, 2nd edition
2. James M. Gere, Stephen Timoshenko, “Mechanics of materials". 2nd Edition.
3. "Mechanics of Materials", Dr. B.C. Punmia, Arun Kr. Jain

Reference books:

1. Beer, Johnston & Dewolf," Mechanics Of Materials", Tata McGraw-Hill Education
2. Mechanics of materials by J. M. Gere. 6th edition

Course Outcomes(COs):

	The Outcomes of this Course are Student will be
CO1	Understand the concepts of stress and strain at a point as well as the stress-strain relationships for homogenous, isotropic materials
CO2	Calculate the stresses and strains in axially-loaded members, circular torsion members, and members subject to flexural loadings.
CO3	Determine the stresses and strains in members subjected to combined loading and apply the theories of failure for static loading.
CO4	Determine the deflections and rotations produced by the three fundamental types of loads: axial, torsional, and flexural.
CO5	Analyze slender, long columns subjected to axial loads.

Course Topics:

S. No.	**Contents**	**Hours**

1	**Tension, Compression, and Shear:** Introduction to Mechanics of Materials Normal Stress and Strain, Mechanical Properties of Materials, Elasticity, Plasticity and Creep, Linear Elasticity, Hooke's Law and Poisson's Ratio, Shear Stress and Strain	**3**
2	**Axially Loaded Members:** Changes in Lengths of Axially Loaded Members, Changes in Lengths Under Nonuniform Conditions, Thermal Effects, Stresses on Inclined Sections, Strain Energy	**3**
3	**Torsion:** Torsional Deformations of a Circular Bar, Circular Bars of Linearly Elastic Materials, Nonuniform Torsion, Stresses and Strains in Pure Shear, Relationship Between Moduli of Elasticity E and G, Transmission of Power by Circular Shafts, Statically Indeterminate Torsional Members, Strain Energy in Torsion and Pure Shear, Thin-Walled Tubes	**4**
4	**Shear Forces and Bending Moments:** Types of Beams, Loads, and Reactions, Shear Forces and Bending Moments, Relationships Between Loads, Shear Forces and Bending Moments, Shear-Force and Bending-Moment Diagrams	**3**
5	**Stresses in Beams:** Pure Bending and Nonuniform Bending, Curvature of a Beam, Longitudinal Strains in Beams, Normal Stresses in Beams, Nonprismatic Beams, Shear Stresses in Beams	**4**
6	**Analysis of Stress and Strain:** Plane Stress, Principal Stresses and Maximum Shear Stresses, Mohr's Circle for Plane Stress, Hooke's Law for Plane Stress, Triaxial Stress, Plane Strain	**5**
7	**Applications of Plane Stress:** Spherical Pressure Vessels, Cylindrical Pressure Vessels, Maximum Stresses in Beams, Combined Loadings	**6**
8	**Deflections of Beams:** Differential Equations of the Deflection Curve, Deflections by Integration of the Bending-Moment, Equation, Deflections by Integration of the Shear-Force and Load, Equations, Method of Superposition, Moment-Area Method, Nonprismatic Beams, Strain Energy of Bending	**6**

9	**Columns:** Buckling and Stability, Columns with Pinned Ends, Columns with Other Support Conditions, Columns with Eccentric Axial Loads, The Secant Formula for Columns, Elastic and Inelastic Column Behavior, Inelastic Buckling	**6**

Evaluation Methods:

Item	**Weightage**
Mid-term	30
End-term	50
Teacher's assessment (Assignment/quiz/tutorial etc)	20

Prepared By:
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