

Mechanics of Solids-1

Course Code CE-103	Credit Hours 2-1
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Course Description

This course is setup to introduce students with different types of stresses and strains. The students are thoroughly taught and trained to calculate and draw shear force and bending moment diagrams of various types of beams with different support conditions for static loads. Some initial techniques of analysis of structural elements are demonstrated with theoretical background and calculations.

Text Book:

1. ***Strength of materials*** by Pytel A. & F.L. Singer, Latest Edition

Reference Book:

1. Mechanics of Solids by Benham & Warnock, Latest Edition.
2. Mechanics of Materials by Egon P. Popov

Prerequisites:

Nil

ASSESSMENT SYSTEM FOR THEORY

	Without Project (%)	With Project/Complex Engineering Problems (%)
Quizzes	15	10-15
Assignments	10	5-10
Mid Terms	25	25
Project	-	5-10
End Semester Exam	50	45-50

ASSESSMENT SYSTEM FOR LAB

Lab Work/ Psychomotor Assessment/ Lab Reports	70%
Lab Project/ Open Ended Lab Report/ Assignment/ Quiz	10%
Final Assesment/ Viva	20%

Teaching Plan

Week No	Topics/Learning Outcomes
1-2	Introduction to different types of Stresses and Strains <ul style="list-style-type: none">• Normal stress and strain

	<ul style="list-style-type: none"> • Shear Stress and strain • Hooke's law • Poisson's ratio • Introduction to Internet of Things (IoT) applications in Strain measurements
3-5	Force and Moment diagrams of determinate structures <ul style="list-style-type: none"> • Shear force diagrams • Bending moment diagrams Relation between load, shear force and bending moment
6-8	Theory of bending stresses and shear stresses in beams <ul style="list-style-type: none"> • Bending equation derivation • Shear equation derivation • Example Numerical
9	Mid Semester Exam
10-12	Theory of torsion <ul style="list-style-type: none"> • Theory of torsion (Torsional equation) for solid and hollow circular shafts • Shearing stress distribution, angle of twist, strength and stiffness of shaft
13-15	Columns <ul style="list-style-type: none"> • Types of columns, (short, Intermediate and long), • Types of columns(Axially loaded short columns, (problems, pressures at the base of columns).
16-17	Introduction to virtual work Strain energy due to direct loads; shear force, bending moment and torque Stresses due to impact loads
17-18	End Semester Exam

Practical

Experiment No	Description
1	To perform impact test on metal specimens
2	To perform compression test on wooden samples: <ul style="list-style-type: none"> a) When load is applied parallel to grains. b) When load is applied perpendicular to grains
3	To determine modulus of elasticity of different materials

4	To perform the bending test on wooden beams
5	To find out modulus of rigidity of different materials
6	To determine the crippling load for struts of varying slenderness ratios and end fixing conditions
7	To determine the tensile strength of bar