



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

STRENGTH OF MATERIALS LABORATORY								
III Semester: CE								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
ACED05	Core	L	T	P	C	CIA	SEE	Total
		0	0	2	1	40	60	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 45			Total Classes: 45			
Prerequisite: Nil								

I. COURSE OVERVIEW:

This course offers a comprehensive exploration of material behaviour through practical experiments. Students delve into the fundamental principles acquired in the classroom, gaining hands-on experience with a range of equipment. The course covers various testing methodologies, including tensile and compression testing to determine material strengths, flexural testing for bending behaviour, and torsional testing for shear properties. Impact tests assess material toughness, while experiments on deflection and fatigue provide insights into structural performance.

II. COURSE OBJECTIVES:

The students will try to learn:

- I. Different mechanical properties of different solid engineering materials used in civil engineering applications.
- II. Behavior of various material samples under different loads and equilibrium conditions.
- III. Characterization of materials subjected to tension, compression, shear, torsion, bending and impact.
- IV. Methods of analyzing material testing data for selection of construction materials

III. COURSE OUTCOMES:

At the end of the course students should be able to:

- CO 1 Analyze young's modulus of a mild steel bar for the calculation of tension using Universal testing machine.
- CO 2 Analyze the beams under point loads for computing shear force, bending moment, slope and deflection in designing structures
- CO 3 Determine the modulus of rigidity of a given shaft for calculating the angle of twist under torsional loading.
- CO 4 Analyze the impact strength of steel specimen using Izod and Charpy test for the characterization under suddenly applied load acting on a specimen.
- CO 5 Determine the compressive strength of concrete and grade of concrete for designing structures.
- CO 6 Analyze stiffness and modulus of rigidity of the spring wire for designing shock absorbers in aerospace and automobile industries

IV. COURSE CONTENT:

Week-1: DIRECT TENSION TEST

To determine the direct tension test for the given sample using universal testing machine.

Week -2: Bending Moment on Cantilever Beam

Determining the deflection of cantilever beam under the influence of external vertical concentrated force at the free end.

WEEK-3: Bending Moment on Simply supported Beam

Determining the deflection of cantilever beam under the influence of external vertical concentrated force at the free end.

Week -4: Torsion test

Determine the torsion test on mild steel or cast iron specimen.

Week -5: Brinell's hardness test

Determine the hardness test on mild steel, carbon steel, brass and aluminum specimens using Brinell's hardness tests.

Week -6: Rockwell's hardness test

Determine the hardness test on mild steel, carbon steel, brass and aluminum specimens using Rockwell's hardness tests.

Week -7: Spring test

Determine stiffness and modulus of rigidity of a spring wire.

Week -8: Compression test

Determine compression test on UTM for wooden and concrete blocks.

Week -9: Izod impact test

Determine the impact strength of steel specimen using Izod test.

Week -10: Charpy impact test

Determine the impact strength of steel specimen using Charpy test.

Week -11: Shear Test

Determine the shear strength of the specimens using Universal Testing Machine.

Week -12: Beam Deflections

To study the bending moment, shear force and deflection for the beams using Maxwell's reciprocal theorem.

Week -13: Strain Measurement

Determine strain measurement with the use of electrical resistance strain gauges.

Week-14: Deflection of Continuous Beam

Determine the deflections on a continuous beam.

V. TEXT BOOKS:

1. Hibbeler, R. C. *Mechanics of Materials*. East Rutherford, NJ: Pearson Prentice Hall, 6th edition, 2004.
2. Crandall, S. H., N. C. Dahl, and T. J. Lardner. *An Introduction to the Mechanics of Solids*. 2nd edition. New York, NY: McGraw Hill, 1979.
3. William Kendrick Hatt, "*Laboratory Manual of Testing Materials*", Andesite Press, 2017.

VI. REFERENCE BOOKS:

1. B. C. Punmia, Ashok K Jain and Arun K Jain, *Mechanics of Materials*, Laxmi Publications Pvt. Ltd., New Delhi, 12th edition, 2007.
2. R. Subramanian, *Strength of Materials*, Oxford University Press, 2nd edition, 2010.

VII. ELECTRONICS RESOURCES:

1. <https://www.labtesting.com/about/capabilities/metal-and-material-analysis/metallurgical-analysis/>
2. <https://archive.nptel.ac.in/courses/105/105/105105108/>
3. <https://nptel.ac.in/courses/112107146>

VIII. MATERIAL ONLINE:

1. Course template
2. Lab manual