STRENGTH OF MATERIALS LABORATORY

IV Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACEB11	Core	-	-	2	1	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 24				Total Classes: 24		

I. COURSE OVERVIEW:

The Civil Engineers are required to design structures like residential, public and commercial buildings etc. The loads coming onto these structures, along with the self-weight, have to be safely transmitted. A structural engineer must be able to design a structure in such a way that none of its members fail during load transfer process. This foundational laboratory course in civil is to comprehend and study the mechanical behavior of engineering materials such as tensile strength, rigidity modulus, hardness, impact strength and compressive strength through a set of experimentations. The students shall verifythe experimental results through analytical calculations.

II. OBJECTIVES:

The course should enable the students to:

I	The different mechanical properties of different solid engineering materials used in civil engineering applications.
II	The behavior of various material samples under different loads and equilibriumconditions
III	The characterization of materials subjected to tension, compression, shear, torsion,bending and impact.
IV	The analyzation of material testing data for selection of construction materials

III. COURSE OUTCOMES:

After successful completion 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	Analyze
CO 2	**Analyze** the beams under point loads for computing shear force,bending moment, slope and deflection in designing structures	Analyze
CO 3	**Determine** the modulus of rigidity of a given shaft for calculating the angle of twist under tensional loading.	Evaluate
CO 4	**Analyze** the impact strength of steel specimen using Izod and Charpy test for the characterization under suddenly applied loadacting on a specimen.	Analyze
CO 5	**Determine** the compressive strength of concrete and grade of concrete for designing structures.	Analyze
CO 6	**Analyze** stiffness and modulus of rigidity of the spring wire for designing shock absorbers in aerospace and automobile industries.	Evaluate

IV. SYLLABUS:

LIST OF EXPERIMENTS

Week – 1	**DIRECT TENSION TEST**
Direct Tension test: To evaluate the tensile strength, the elastic limits and the young 's modulus of a mild steel bar in tension using the universal testing machine.	
Week – 2	**BENDING TEST ON CANTILEVER BEAM**
(a) To evaluate the deflections of the beam made of wood. (b) To evaluate the deflections of the beam made of steel.	
Week – 3	**BENDING TEST ON SIMPLY SUPPORTED BEAM**

(a) To evaluate the deflections of the beam made of wood. (b) To evaluate the deflections of the beam made of steel.	
Week – 4	**TORSION TEST**
To conduct torsion test on mild steel or cast iron specimen to determine modulus of rigidity.	
Week – 5	**HARDNESS TEST**
To conduct hardness test on mild steel, carbon steel, brass and aluminum specimens using Brinell's Hardness Test. Rockwell's Hardness Test.	
Week - 6	**SPRING TEST**
To determine the stiffness and modulus of rigidity of a spring wire.	
Week - 7	**COMPRESSION TEST**
To perform compression test on UTM for Wooden block. Concrete block.	
Week - 8	**IMPACT TEST**
To evaluate the impact strength of steel specimen using Izod test. Charpy Test.	
Week - 9	**SHEAR TEST**
To evaluate the shear strength of the given specimens using universal testing machine.	
Week - 10	**BEAM DEFLECTIONS**
To verify the Maxwell's reciprocal theorem for beam deflections.	
Week - 11	**STRAIN MEASUREMENT**
Use of electrical resistance strain gauges	
Week - 12	**DEFLECTION OF CONTINUOUS BEAM**
To evaluate deflections on a continuous beam.	

Reference Books:

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

Web References:

1. https://home.iitm.ac.in/kramesh/Strength%20of%20Materials%20Laboratory%20Manual.pdf
2. http://www.atri.edu.in/images/pdf/departments/SOM%20LAB%20MANUAL.pdf
3. https://www.iitg.ac.in/mech/lab_sml.php