

MECHANICS OF SOLIDS LABORATORY

III Semester: AE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
AAEC05	Foundation	-	-	3	2	30	70	100
Contact Classes: Nil		Tutorial Classes: Nil		Practical Classes: 36		Total Classes: 36		

I. COURSE OVERVIEW:

Mechanics of solids laboratory enable the students to understand the basic concepts of Mechanics of Solids and apply them to practical problems in Aerospace applications. Mechanical tests are conducted as per standards (ASTM and IS) for identifying the properties of various materials such as Young's Modulus, Hardness, Toughness, stiffness subjected to various loading and support conditions.

II. OBJECTIVES:

The course should enable the students to:

- I Learn the basic knowledge on the mechanical behaviour of materials like aluminium, mild steel, and cast iron.
- II Adopt with the experimental methods to determine the mechanical properties of materials.
- III Illustrate the crippling behavior of different columns using Euler's and Rankine's theory.
- IV Determine the elastic constants of different materials by conducting experiments.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

- | | | |
|------|--|---------|
| CO 1 | Examine the Hardness of mild steel, carbon steel, brass and aluminium specimens using Brinell's and Rockwell's hardness test for characterization of materials used in engineering applications. | Analyze |
| CO 2 | Make use of stress and strains relations of mild steel materials for observing ultimate load using Universal testing machine for design of machine components. | Apply |
| CO 3 | Identify the modulus of rigidity of a given shaft and spring wire for designing aerospace and automobile structures under loading conditions. | Apply |
| CO 4 | Analyze the impact strength of steel using Izod and Charpy test for characterization under suddenly applied load. | Analyze |
| CO 5 | Identify the buckling load and crushing load of long and short columns for designing structures subjected to different loads and boundary conditions. | Apply |
| CO 6 | Choose the deflection equation of simply supported and cantilever beam for determining the young's modulus to predict the behaviour of the beam. | Apply |

IV. SYLLABUS:

LIST OF EXPERIMENTS

Week-1 | BRINELL HARDNESS TEST

Determination of Brinell number of a given test specimen.

Week-2 | ROCKWELL HARDNESS TEST

Determination of hardness number of different specimens such as steel, brass, copper and aluminum.

Week-3 | TENSION TEST

Study the behavior of mild steel and various materials under different loads.

To determine

- a) Tensile
- b) Yield strength
- c) Elongation

d) Young's modulus	
Week-4	TORSION TEST
Determine of Modulus of rigidity of various specimens.	
Week-5	IZOD IMPACT TEST
Determination the toughness of the materials like steel, copper, brass and other alloys using Izod test	
Week-6	CHARPY IMPACT TEST
Determine the toughness of the materials like steel, copper, brass and other alloys using Charpy test.	
Week-7	COMPRESSION TEST ON SHORT COLUMN
Determine the compressive stress on material.	
Week-8	COMPRESSION TEST ON LONG COLUMN
Determine Young's modulus of the given long column.	
Week-9	TESTING OF SPRINGS
Determine the stiffness of the spring and the Modulus of rigidity of wire material.	
Week-10	DEFLECTION TEST FOR SSB AND CANTILEVER BEAM
Determine the Young's modulus of the given material with the help of deflection of SSB and cantilever beam.	
Week-11	REVIEW - I
Spare session for additional repetitions and review.	
Week-12	REVIEW - II
Spare session for additional repetitions and review.	
Reference Books:	
<ol style="list-style-type: none"> 1. Gere, Timoshenko, "Mechanics of Materials", McGraw Hill, 3rd Edition, 1993. 2. R. S Kurmi, Gupta, "Strength of Materials", S. Chand, 24th Edition, 2005. 3. William Nash, "Strength of Materials", Tata McGraw Hill, 4th Edition, 2004. 	
Web References:	
<ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/112107147/ 2. https://vssut.ac.in/lecture_notes/lecture1423904647.pdf 3. https://web.mit.edu/emech/dontindex-build/ 	
Course Home Page:	

LIST OF EQUIPMENTS REQUIRED FOR A BATCH OF 36 STUDENTS:

S No	Details of Equipment	Quantity Required
1	Hardness Testing Machine	1
2	Universal Testing Machine	1
3	Impact Testing Machine	1
4	Compression testing machine	1
5	Spring testing machine	1
6	Torsion Test rig	1
7	Simply supported and cantilever beam	1