INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

MECHANICS OF SOLIDS AND FLUID DYNAMICS LABORATORY								
III Semester: AE								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
AAED05	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	-	2	1	40	60	100
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 45**				**Total Classes: 45**		
Prerequisite: **Mechanics of solids, Fluid Dynamics**								

I. COURSE OVERVIEW:

The MOS and Fluid Dynamics laboratory is designed to explore the properties of materials and fluids to reinforce the theoretical concepts learned in Mechanics of solids and Fluid dynamics. The part of the Mechanics of Solids lab is to demonstrate the basic principles in the area of characterization of materials through a series of experiments. In this lab the experiments are performed to measure the properties of the materials such as impact strength, tensile strength, compressive strength, hardness, ductility etc, which are needed in selection proper materials for design of aircraft components. This lab also used in project works for testing of various materials like composite materials, ferrous and nonferrous alloys, etc. The later part aims is to provide fundamental knowledge of basic measurements and devices utilized in fluid dynamic applications. It serves as an introductory course, deals with flow behavior, fluid forces various flow measurement devices, pumps and turbines and their performance characteristics. This course is the pre-requisite for aerodynamics which is needed for measurement of lift, drag, moment, boundary layer and thrust measurements.

II. COURSE OBJECTIVES:

The students will try to learn:

I. The characterization of materials using appropriate codes and standards for selection of aircraft materials.
II. The behavior and failure modes using deflection of beams and columns for choosing the safety factor for engineering applications.
III. Application of Bernoulli's theorem in measurement of rate of discharge in pumps.
IV. The flow measurement and performance of pumps and turbines under various speeds.

III. COURSE OUTCOMES:

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

CO1 Compare the hardness of ferrous and non-ferrous materials using hardness testing machines for identifying suitable industrial applications.
CO2 Make use of deflections of beams and columns under various conditions for estimating critical loads.
CO3 Utilize the impact test, spring test and torsion test for choosing suitable materials of aircraft parts.
CO4 Demonstrate the validation of Bernoulli's theorem for incompressible, steady, continuous flow in order for regulating discharges in pipes.
CO5 Examine the performance characteristics of pumps and jet on vanes, for their efficient design in aerospace applications

CO6 Identify the performance characteristics of turbines under various operating conditions for specific applications.

IV. COURSE CONTENT:

Week-1 HARDNESS TEST (BRINELL AND ROCKWELL)

Determination of Brinell number of a given test specimen.

Week-2 TENSION TEST

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

a) Tensile
b) Yield strength
c) Elongation
d) Young's modulus

Week-3 TORSION TEST

Determine of Modulus of rigidity of various specimens.

Week-4 IMPACT TEST (IZOD AND CHARPY)

Determination the toughness of the materials like steel, copper, brass and other alloys using Izod test

Week-5 COMPRESSION TEST ON SHORT AND LONG COLUMN

Determine the stress on material.

Week-6 TESTING OF SPRINGS

Determine the stiffness of the spring and the Modulus of rigidity of wire material.

Week-7 DEFLECTION TEST FOR CCANTILEVER SIMPLE SUPPORTED BEAM

Determine the Young's modulus of the given material with the help of deflection of beams.

Week-8 BERNOULLI'S THEOREM

Verification of Bernoulli's theorem

Week-9 IMPACT OF JET ON VANES

Study Impact of jet on Vanes.

Week-10 CENTRIFUGALPUMP

Performance test on centrifugal pump.

Week-11 RECIPROCATING PUMPS

Performance test on reciprocating pumps.

Week-12 PELTON WHEEL TURBINE

Performance test on piston wheel turbine.

Week-13 KAPLAN TURBINE

Performance test on Kaplan turbine

Week-14 FLOW THROUGH NOTCH

Flow through V and Rectangular Notches.

V. TEXT BOOKS:

1. Gere, Timoshenko, “Mechanics of Materials”, McGraw Hill, 3rd edition, 1993.

VI. REFERENCE BOOKS:

1. R. S Kurmi, Gupta, “Strength of Materials”, S. Chand, 24th edition, 2005.
2. William Nash, “Strength of Materials”, Tata McGraw Hill, 4th edition, 2004.

VII. ELECTRONICS RESOURCES:

1. https://nptel.ac.in/courses/112107147/
2. https://vssut.ac.in/lecture_notes/lecture1423904647.pdf
3. https://web.mit.edu/emech/dontindex-build/

VIII. MATERIALS ONLINE

1. Course template
2. Lab manual