



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

HYDRAULICS AND HYDRAULIC MACHINERY LABORATORY								
IV Semester: CE								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
ACEE16	Core	0	0	2	1	40	60	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 36			Total Classes: 36			
Prerequisite:								

I. COURSE OVERVIEW:

The Fluid mechanics and Hydraulic Machinery Laboratory course is an indispensable supplement to theoretical knowledge. The course delves into the intricacies of fluid dynamics, offering a comprehensive study of hydraulic systems, theoretical principles and practical applications. It engages in in-depth analyses of hydraulic components, pumps, valves, and actuators, enhancing their proficiency in the design and optimization of hydraulic machinery. This course will focus on the behaviour of fluid under various conditions, providing hands-on experience in the fluid mechanics laboratory to explore principles such as flow dynamics, viscosity.

II. COURSE OBJECTIVES:

The students will try to learn:

- I. The fundamental knowledge of fluid properties and behavior under static and dynamic conditions of closed conduit and open channels.
- II. The operating principle of various turbo machinery and analyze their performance characteristics under various operating conditions.
- III. Vital principles of traffic studies and to implement traffic regulation and control measures.
- IV. The measurement of flow rate through various internal and external fluid flow systems

III. COURSE OUTCOMES:

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

- CO 1 Outline the concept of calibrating orifice and venturi meter to minimize uncertainty in the discharge coefficient.
- CO 2 Analyze the basic concepts of flow through the pipes and their losses for determining fluid pressure and head.
- CO 3 Measure the discharge through various notches to determine the flow of fluids in different hydraulic structures.
- CO 4 Examine the flow patterns in different flow conditions for determining the velocities, pressures and acceleration in a moving liquid.
- CO 5 Interpret the law of conservation of energy, Bernoulli's theorem for estimating total energy of various geometrical cross-section of a pipe.
- CO 6 Compare the performance characteristics of various turbines in different operating conditions for enhancing efficiency and output under specific applications.

IV. COURSE CONTENT:

EXERCISE – 1: INTRODUCTION TO FLUID MECHANICS AND HYDRAULIC MACHINES LAB

Introduction to fluid mechanics and hydraulic machinery laboratory.

EXERCISE – 2: VENTURIMETER & ORFICEMETER

Determination of Co-efficient of discharge through Venturi meter and Orifice meter

EXERCISE – 3: BERNOULLI'S EQUATION FOR HORIZONTAL AND INCLINED PIPE

To verify Bernoulli's equation of horizontal and inclined pipes.

EXERCISE – 4: FRICTION FACTOR OF CIRCULAR AND NON-CIRCULAR PIPES

To determine the friction factor of circular and non – circular pipes.

EXERCISE – 5: HEAD LOSS DUE TO MINOR LOSSES IN A PIPE

To determine the head losses in a pipe due to sudden contraction and sudden expansion.

EXERCISE – 6: RECTANGULAR, TRIANGULAR AND TRAPEZOIDAL NOTCH

Determine the Co-efficient of discharge through rectangular, triangular and trapezoidal notches.

EXERCISE – 7: MPACT OF JET ON VANES (FLAT, CURVED VANES)

Determine the Co-efficient of impact due to jet on flat, curved vanes.

EXERCISE – 8: PELTON TURBINE

Determine the efficiency of Pelton Wheel turbine

EXERCISE – 9: REACTION TURBINE

Determine the efficiency of either Francis or Kaplan turbine.

EXERCISE – 10: PERFORMANCE OF PELTON TURBINE

Determine the kinetic energy of water at high heads into mechanical power, generating efficient and sustainable electricity in mountainous regions.

EXERCISE – 11 SINGLE STAGE CENTRIFUGAL PUMP

Determine the maximum efficiency of multi stage centrifugal pump

EXERCISE 12: PERFORMANCE OF SINGLE STAGE CENTRIFUGAL PUMP

Determination of the maximum efficiency of multi stage centrifugal pump

EXERCISE – 13: MULTI STAGE CENTRIFUGAL PUMP

Determine the maximum efficiency of single stage centrifugal pump

EXERCISE – 14: SINGLE ACTING RECIPROCATING PUMP

To determine the maximum efficiency of single acting reciprocating pump

V. TEXTBOOKS:

1. C.S.P. Ojha, R. Berndtsson and P. N. Chadramouli, 'Fluid Mechanics and Machinery', Oxford University Press, 2010.
2. P M Modi and S M Seth, 'Hydraulics and Fluid Mechanics', Standard Book House.
3. K. Subramanya, 'Theory and Applications of Fluid Mechanics', Tata McGraw Hill.
4. R.L. Daugherty, J.B. Franzini and E.J. Finnemore, 'Fluid Mechanics with Engineering Applications', International, Student Edition, Mc Graw Hill.

VI. REFERENCE BOOKS:

1. Fluid Mechanics by R.C. Hibbeler, Pearson India Education Services Pvt.Ltd
2. Introduction to Fluid Mechanics and Fluid Machines by S K Som, Gautam Biswas, Suman Chakraborty, Mc Graw Hill Education (India) Private Limited
3. Hydraulic Machines by Banga & Sharma (Khanna Publishers).
4. Open channel flow by V.T. Chow (McGraw Hill Book Company).

VII. ELECTRONICS RESOURCES:

1. <http://site.iugaza.edu.ps/mymousa/files/Fluid-Mechanics-and-Hydraulics-Lab-Manual-2015-.pdf>
2. <http://www.public.asu.edu/~lwadays/classes/cee341/manual.pdf>
3. <https://issuu.com/loisburchette4023/docs/fluid-mechanics-lab-manual-for-mech>

VIII. MATERIAL ONLINE:

1. Course Template
2. Laboratory manual

