

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Course Description

Title of Course: Fluid mechanics & Fluid Machines

L-T Scheme: 3-1

Course Code: MEC407T

Course Credits: 3

Course Objectives:

- To introduce the students to fundamental concepts and terminologies involved in fluid mechanics and the effect of hydrostatic pressure on the submerged body.
- To enable the students to understand the Kinematics of fluid flow to solve real life fluid engineering problems.
- To introduce the students to real world of fluid dynamics and its utility in running hydraulic machines.
- To familiarize the students with the concept Momentum and its Analysis for various devices.
- To familiarize the students with measurement equation of friction losses in pipes like Darcy – Weisbach equation.
- To introduce the students with flow measuring devices for open channels like notches & weirs.
- To enable the students to understand the concept of Dimensional Analysis & Model investigation applied to flow systems

Course Outcomes:

At the end of the course, the student will be able to :

- Understand fluid properties and their significance, concept of fluid pressure on different shapes of submerged body.
- Visualise different types of fluid flow, and compare them based on kinematic flow descriptions. Develop continuity equations in 1D & 3D.
- Describe the Bernoulli's equation and Euler's equations and its significances.
- Understand how mass and momentum is conserved based on Bernoulli's & Newton's laws and its applications
- Describe various losses in pump flow and friction loss through pipes.
- Understand the basic principle of flow measurement used for open channels.
- Conceptualise the Dimensional Analysis method for various flow systems, State dimensionless parameter and its importance.

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Course Contents:

Module 1:

Introduction: Fluid Properties: Definition of a fluid, Viscosity-dynamic and kinematic, Surface Tension. Fluid Statics: Basic equation of fluid statics, Manometers, Force on plane areas and curved surfaces, center of pressure, Buoyant force, Stability of floating and Submerged bodies.

Module 2:

Kinematics of fluid flow: fluid flow and classifications. Continuity equation in 1D & 3D. Potential flow & Stream function; types of flow lines.

Module 3:

Dynamics of fluid: equations of motion; Euler's equation; Bernoulli's equation; Applications of Bernoulli's equation.

Module 4:

Momentum Analysis of flow systems; the linear momentum equation for steady flow, Momentum equation and its applications

Module 5:

Flow through pipes; Darcy – Weisbach equation of friction loss; Major and minor Losses in pipe
Hydraulic grade line and total energy line.

Module 6:

Basic principle for flow through orifices, V-notches (rectangular-v), weirs (rectangular). Flow through open channels; use of Chezy's formula.

Module 7:

Dimensional Analysis & Model investigation applied to flow systems – Buckingham Pi theorem.

Module 8:

Hydraulic press, Hydraulic accumulator, Hydraulic Ram, Hydraulic lift, Hydraulic coupling, Hydraulic torque convertor Gear pump.

Module 9:

Introduction of Hydraulic Turbines and Classifications; i.e. Pelton Wheel, Francis Turbine, Kaplan Turbine.
Function of Draft Tube.

Text Books:

1. Fluid Mechanics & hydraulic machines – R.K.Bansal, Luxmi Publications.

References:

1. Fluid Mechanics and Fluid Power Engineering - Dr. D.S. Kumar
2. Fluid Mechanics – Fundamentals & Applications – Cengel & Cimbala, TMH.