



MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AN AUTONOMOUS INSTITUTION)

(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)

Accredited by NAAC with 'A' Grade & Recognized Under Section 2(f) & 12(B) of the UGC act, 1956

COURSE CONTENT

FLUID MECHANICS AND HYDRAULIC MACHINES								
III Semester: ME								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
2530319	Foundation	3	0	0	3	40	60	100
		Practical Classes: Nil			Total Classes: 45			
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
Prerequisites: Engineering Mechanics, Thermodynamics								

Course Overview:

Fluid Mechanics and Hydraulic Machines introduce the fundamentals of fluid properties, flow behavior, and measurement techniques. It also covers the principles and performance of hydraulic turbines and pumps for practical engineering applications.

Course Objectives:

1. To understand the basic principles of fluid mechanics.
2. To identify various types of flows.
3. To understand boundary layer concepts and flow through pipes.
4. To evaluate the performance of hydraulic turbines.
5. To understand the functioning and characteristic curves of pumps.

Course Outcomes: After Completion of the Course, Students should be able to

1. Explain the effect of fluid properties on a flow system.
2. Identify type of fluid flow patterns and describe continuity equation.
3. Analyze fluid flow, measuring devices, and boundary layer concepts by applying Fluid Mechanics principles in design.
4. Select and analyze an appropriate turbine with reference to given situation in power plants.
5. Estimate performance parameters of a given Centrifugal and Reciprocating pump.

UNIT - I: Fluid statics: Dimensions and units: Physical properties of fluids, Specific gravity, Viscosity and surface tension, Vapour pressure and their influence on fluid motion, Atmospheric, Gauge and vacuum pressures, Measurement of pressure, Piezometer, U-tube and differential manometers.

UNIT - II: Fluid kinematics: Stream line, Path line and streak lines and stream tube. Classification of flows: Steady and unsteady, Uniform and non, Uniform, Laminar and turbulent, Rotational and irrotational flows, Equation of continuity for one dimensional flow and three-dimensional flows.

Fluid dynamics: Surface and body forces, Euler's and Bernoulli's equations for flow along a stream line.

Measurement of flow: Pitot tube, venture meter, and orifice meter, Flow nozzle Momentum equation and its application on force on pipe bend.

UNIT - III: Closed conduit flow: Reynold's experiment, Darcy Weisbach equation, Minor losses in pipes, pipes in series and pipes in parallel, total energy line & hydraulic gradient line.

Boundary Layer Concepts: Definition, thicknesses, characteristics along thin plate, laminar and turbulent boundary layers (No derivation) boundary layer in transition, separation of boundary layer, submerged objects – drag and lift.

UNIT - IV: Basics of turbo machinery: Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

Hydraulic Turbines: Classification of turbines, Heads and efficiencies, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design –draft tube theory- functions and efficiency.

Performance of hydraulic turbines: Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer.

UNIT - V: Centrifugal pumps: Classification, working, work done – barometric head-losses and efficiencies specific speed- performance characteristic curves, NPSH.

Reciprocating pumps: Working, Discharge, slip, indicator diagrams.

TEXT BOOKS:

1. Hydraulics, Fluid mechanics and Hydraulic Machinery, Modi and Seth, standard Book House, 22nd Edition, 2019.
2. Fluid Mechanics and Hydraulic Machines, R.K. Bansal, Laxmi Publications, 10th Edition, 2020.

REFERENCE BOOKS:

1. Fluid Mechanics and Hydraulic Machines, Er. R. K. Rajput, S. Chand, 2019.
2. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, S.K. Kataria and Sons, 22nd Edition, 2018.
3. Fluid Mechanics and Machinery, D. Rama Durgaiyah, New Age International publishers, 1st Edition, 2002.

ELECTRONIC RESOURCES:

1. <https://elearn.nptel.ac.in/shop/nptel/introduction-to-fluid-mechanics/>
2. <https://www.nptelprep.in/courses/112105183/videos?>
3. <https://archive.nptel.ac.in/courses/105/105/105105203/?>

MATERIALS ONLINE:

1. Course template
2. Tutorial question bank
3. Tech talk and Concept Video topics
4. Open-ended experiments
5. Definitions and terminology
6. Assignments
7. Model question paper – I
8. Model question paper – II
9. Lecture notes
10. E-Learning Readiness Videos (ELRV)