Devi Ahilya Vishwavidhyalaya, Indore, India **Institute of Engineering & Technology**					**II Year B.Tech. (Civil Engineering)**	
Course Code & Name	**Instructions Hours per Semester and Credits**					
4RVPC2 **Fluid Mechanics-I**	**Classroom Instruction (CI)**		**Lab Instruction (LI)**	**Term Work (TW) and Self Learning (SL)**	**Total no. of Hours Per semester**	**Total Credits (Total Hours/30)**
	L	**T**	**P**	**TW+SL**	**120**	**4**
	20	**10**	**20**	**70**		

Course Learning Objectives:

1. To get familiar with knowledge of fundamental fluid and fluid flow characteristics.
2. Illustrate the basics of properties of fluids and fluid flow at rest and in motion
3. To understand various methods to determine pressure measurement velocity measurement of fluid.
4. To understand various Principles of pipe flow losses occurred on pipe flow and its applications in real life.
5. To understand the Flow through Open Channels

Prerequisites:

COURSE CONTENTS

UNIT-1

Introduction: Scope and Application of Fluid Mechanics: Physical Properties of fluids; density; specific weight, specific volume, specific gravity, viscosity, dynamic and kinematic viscosity, Newton's law of viscosity, classification of fluids, compressibility, cohesion, adhesion, surface tension, capillarity, vapour pressure.

Equilibrium of fluids : Pressure at a point, variation, barometer, gauges, manometers, hydrostatic forces, equilibrium of fluid in motion, floatation – stability of floating and submerged bodies, fluid masses subjected to rotation, free and forced vortices.

UNIT-II

Kinematics of Fluid flow: Velocity field, classification of flows, stream, path and streak lines, continuity equation, stream function, velocity potential, flow-nets.

Dynamics of Fluid flow: Euler's equation of motion, Bernoulli's equation, pilot tube, prandil tube, flow through openings- orifices, mouth pieces, etc., flow through notches weirs, empirical formulae.

UNIT-III

Dimensional Analysis & Model Study: Units and dimensions, dimensional homogeneity, Buckingham II Theorem, dimensionless numbers, principles of similitude and applications.

UNIT-IV

Flow through Pipes: Laminar flow, flow between parallel plates, measurement of viscosity, reynold's experiment, turbulent flow in pipes, solution of pipe flow problems, flow in pipeNetwork- Handy Cross Method, Losses in pipes, measurement of pipe flow- orifice, nozzle, bend meters, rotameters, concept of water hammer and surges.

UNIT-V

Flow through Open Channels: classification, geometric elements, continuity, energy and momentum equations, pressure, velocity distributions, uniform flow, concept of normal depth, chezy, manning and other formulae, best hydraulic sections, specific energy, specific force, hydraulic jump and its characteristics, gradually varied flow, surface profiles, dynamic equations.

Course Outcomes:

CO. No.	CO	PO
CO1	Apply the basic fundamental of fluid and fluid flow characteristics.	PO-1, PO-2
CO2	Apply knowledge of basic methods to determine pressure measurement of fluid Assessment	PO-1, PO-2
CO3	Apply the fundamental principles of fluid mechanics to various flow problems.	PO-1, PO-2, PO-3
CO4	Solve the problems on pipe networks and boundary layer.	PO-2, PO-3
CO5	Develop understanding of methods of dimensional analysis & modelling criteria	PO-1, PO-2, PO-3, PO-4

BOOKS RECOMMENDED:

1. Nagaratnam S, Fluid Mechanics
2. Jain A K, Fluid Mechanics
3. Subramanaya K, Fluid Mechanics
4. Modi P N & S M Seth, Hydraulics & Fluid Mechanics
5. Chow V T, Open Channel Hydraulics.
6. Rangaraju K G, Flow through open channels
7. Streeder V L, Fluid Mechanics.

CO-PO Relationship

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO 1	PSO 2	PSO 3
4RVPC2.CO1	2	3										3	2	2
4RVPC2.CO2	2	3										3	3	2
4RVPC2.CO3	2	3	3									3	2	3
4RVPC2.CO4		2	3									3	3	3
4RVPC2.CO5	2	3	3	3								3	2	2

List of Practical Assignment:

1. **Measurement of Fluid Properties -** Determination of viscosity using viscometer, verification of Newton's law of viscosity.
2. **Pressure Measurement Devices -** Use of piezometer, U-tube/differential manometer, and barometer for pressure determination.
3. **Hydrostatics & Stability -** Determination of metacentric height and study of stability of floating/submerged bodies.
4. **Hydrostatic Forces on Surfaces -** Measurement of forces on vertical and inclined plane surfaces.
5. **Flow Visualization & Continuity -** Demonstration of streamlines, pathlines, streaklines, and verification of continuity equation.

6. **Flow Measurement Devices -** Calibration of Venturimeter, Orificemeter, and Pitot tube.
7. **Discharge Measurement -** Determination of coefficient of discharge for orifice, mouthpiece, notches, and weirs.
8. **Pipe Flow Studies -** Reynolds experiment, determination of frictional and minor losses in pipes.
9. **Open Channel Flow -** Determination of Manning's coefficient, velocity distribution, and study of hydraulic jump.
10. **Model Studies & Dimensional Analysis -** Application of Buckingham π theorem and verification of similitude principles using a hydraulic model.