COURSE TITLE	**FLUID MECHANICS**
COURSE CODE	**01ME2301**
COURSE CREDITS	**4**

Objective:

1 To provide fundamental knowledge of fluids, its properties and behavior under various conditions

2 To provide fundamental knowledge of fluids, its properties and behavior under various conditions

3 Understanding the fluid flow phenomena and different types of flow.

Course Outcomes: After completion of this course, student will be able to:

1 Apply fluid properties and governing parameters to solve engineering problems in fluid mechanics

2 Analyze hydraulic systems by employing the fundamental principles of fluid statics

3 Apply appropriate assumptions to classify types of flows and solve governing fluid flow equations.

4 Analyze pressure and energy distribution in pipe systems by evaluating major and minor losses.

5 Evaluate the applicability of dimensional analysis techniques for modeling and solving real-life fluid flow problems.

6 Students will be able to analyze the boundary layer aspects of laminar and turbulent flows

Pre-requisite of course:NIL

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**INTRODUCTION TO FLUID STATICS** Definition of fluid, Fluid properties, Classification of fluids, Pascal's Law and Hydrostatic Law, Pressure and its variation in a static Fluid, Measurement of static fluid pressure: Manometers	4
2	**HYDROSTATIC FORCES AND BOUYANCY:** Hydrostatic forces on Plane –Inclined and Curved surfaces, Buoyancy, Condition of Equilibrium for Submerged and Floating Bodies, Centre of Buoyancy, Metacentre–Determination of Metacentric Height	6

Contents : Unit	Topics	Contact Hours
3	**FLUID KINEMATICS AND DYNAMICS** Description of fluid motion – Lagrangian and Eulerian approach, Types of flows, Control volume, Material derivative and acceleration, Streamlines, Pathlines and Streaklines, Circulation and Vorticity, Stream function and velocity potential function, Vortex flow, Continuity equation, Euler's equation of motion, Bernoulli's equation, Practical applications of Bernoulli's equation in flow measurement devices like venturi meter, orifice meter and pitot tube, elementary Theory of notches	10
4	**VISCOUS FLOW AND TURBULANT FLOW** Reynolds number, flow of viscous fluid through circular pipe-Hagen Poiseuille formula, Flow of viscous fluid between two parallel fixed plates, power absorbed in viscous flow through - journal, foot step and collar bearing, movement of piston in dash pot, methods of measurement of viscosity, Moody diagram resistance of smooth and rough pipes, shear stress and velocity distribution in turbulent flow through pipes	8
5	**FLOW THROUGH PIPES** Darcy-Weisbach equation, major and minor losses in pipes, pipe friction, parallel, series and branched pipes	3
6	**DIMENSIONAL ANALYSIS** Dimensional homogeneity, Rayleigh's method, Buckingham p theorem, Non-dimensional numbers, Model laws and distorted models, Modelling and similitude	5
7	**BOUNDARY LAYER FLOW** Boundary layers, Laminar flow and turbulent flow, Boundary layer thickness, Momentum integral equation, Drag and lift, Separation of boundary layer, Methods of preventing the boundary layer separation	6
Total Hours		**42**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**To determine the different types of flow Patterns by Reynolds's experiment** To determine the different types of flow Patterns by Reynolds's experiment	2
2	**Verification of Bernoulli's theorem** Verification of Bernoulli's theorem	2
3	**To determine the friction factor for different pipes** To determine the friction factor for different pipes	2
4	**To determine the loss coefficients for different pipe fittings (for sudden enlargement and sudden contraction)** To determine the loss coefficients for different pipe fittings (for sudden enlargement and sudden contraction)	2

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
5	**To determine the loss coefficients for different pipe fittings (for bend and elbow)** To determine the loss coefficients for different pipe fittings (for bend and elbow)	2
6	**To determine the coefficient of discharge through an orifice meter** To determine the coefficient of discharge through an orifice meter	2
7	**To determine the coefficient of discharge through venturi meter** To determine the coefficient of discharge through venturi meter	2
8	**To measure the velocity of flow using pitot tube** To measure the velocity of flow using pitot tube	2
9	**To determine the coefficient of discharge through open channel flow over a rectangular notch** To determine the coefficient of discharge through open channel flow over a rectangular notch	2
10	**To determine the coefficient of discharge through open channel flow over a V-shaped notch** To determine the coefficient of discharge through open channel flow over a V-shaped notch	2
11	**To determine metacentric height of floating body** To determine metacentric height of floating body	2
12	**Free and forced vortex flow** Free and forced vortex flow	2
Total Hours		**24**

Textbook :

1 FLUID MECHANICS AND HYDRAULIC MACHINES , R K RAJPUT, S CHAND, 2008

2 FLUID MECHANICS AND FLUID POWER ENGINEERING, D S KUMAR, S K KATARIA & SONS, 2009

References:

1 Fluid Mechanics and Hydraulic Machines, Fluid Mechanics and Hydraulic Machines, R.K. Bansal, Laxmi Publications, 2019

2 Fluid Mechanics, Fluid Mechanics, Frank M. White, McGraw Hill Publishing Company Ltd, 2016

3 Fundamentals of Fluid Mechanics, Fundamentals of Fluid Mechanics, Munson, Wiley India Pvt. Ltd, 2020

4 Fluid Mechanics: Fundamentals and Applications, Fluid Mechanics: Fundamentals and Applications, Yunus A. Çengel, John M. Cimbala, McGraw-Hill, 2018

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
15.00	20.00	25.00	25.00	15.00	0.00

Instructional Method:

1 STUDENTS WILL HAVE TO SUBMIT ASSIGNMENTS AS A PART OF CSE COMPONENT. LAB FILES WILL BE PREPARED FOR ALL EXPERIMENTS AND IT WILL BE CONSIDERED AS A TERM WORK.

Supplementary Resources:

1 http://nptel.iitm.ac.in/

2 http://media.efluids.com/galleries/all