

## FLUID MECHANICS

<b>Sub Code</b>	<b>: 06 ME 36B/ 06 ME 46B</b>	<b>IA Marks</b>	<b>: 25</b>
<b>Hrs/week</b>	<b>: 04</b>	<b>Exam Hours</b>	<b>: 03</b>
<b>Total Lecture Hrs</b>	<b>: 52</b>	<b>Exam Marks</b>	<b>: 100</b>

### PART – A

#### UNIT 1:

**Properties of Fluids:** Introduction, properties of fluids, viscosity, thermodynamic properties, Surface tension and Capillarity, Vapour pressure and Cavitation.

**6 Hours**

#### UNIT 2:

**Fluid Statics:** Fluid pressure at a point, Pascal's law, pressure variation in a static fluid, Absolute, gauge, atmospheric and vacuum pressures, simple manometers, differential manometers, total pressure and center of pressure, vertical plane surface submerged in liquid, horizontal plane surface submerged in liquid, inclined plane surface submerged in liquid, curved surface submerged in liquid. Buoyancy, center of buoyancy, metacenter and metacentric height, conditions of equilibrium of floating and submerged bodies.

**7 Hours**

**Fluid Kinematics:** Types of fluid flow, Introduction, continuity equation, continuity equation in three dimensions (Cartesian co-ordinate system only), velocity and acceleration, velocity potential function and stream function.

**7 Hours**

#### UNIT 3:

**Dimensional Analysis:** Introduction, derived quantities, dimensions of physical quantities, dimensional homogeneity, Buckingham's  $\pi$  theorem, Raleigh's method, dimensionless numbers, similitude, types of similitudes.

6 Hours

**PART – B****UNIT 4:**

**Fluid Dynamics:** Introduction, equations of motion, Euler's equation of motion, Bernoulli's equation from Euler's equation, Bernoulli's equation for real fluids.

6 Hours

**UNIT 5:**

**Fluid flow measurements:** Introduction, venturimeter, orifice meter, Pitot tube.

**Flow through pipes:** Frictional loss in pipe flow, Darcy- Equation for loss of head due to friction in pipes, Chezy's equation for loss of head due to friction in pipes, hydraulic gradient and total energy line.

7 Hours

**UNIT 6:**

**Laminar flow and viscous effects:** Reynold's number, critical Reynold's number, Laminar flow through circular pipe-Hagen poiseulle's equation, Laminar flow between parallel and stationery plates.

6 Hours

**UNIT 7:**

**Flow past immersed bodies:** Drag, Lift, expression for lift and drag, pressure drag and friction drag, boundary layer concept, displacement thickness, momentum thickness and energy thickness.

**Introduction to compressible flow:** Velocity of sound in a fluid, Mach number, Propagation of pressure waves in a compressible fluid.

7 Hours

**Text Books:**

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1. **Fluid Mechanics** by Oijush K.Kundu, IRAM COCHEN, EL SEVIER 3<sup>rd</sup> Ed. 2005.
2. **Fluid Mechanics** by Dr. Bansal.R.K, Lakshmi Publications, 2004.
3. **Fluid Mechanics and hydraulics**, Dr. Jagadishlal: Metropolitan Book Co-Ltd., 1997.
4. **Fluid Mechanics (SI Units)**, Yunus A. Cingel John M. Oimbala. Tata MaGrawHill,2006.

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**Reference books:**

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1. **Fluid Mechanics, Fundamental & applications**, by Yunus A, Cenegel, John M,Cimbala, Tata MacGraw Hill, 2006.
2. **Fluid Mechanics** by John F.Douglas, Janul and M.Gasiosek and john A. Swaffield, Pearson Education Asia, 5<sup>th</sup> ed., 2006
3. **Fluid Mechanics and Fluid Power Engineering**,” Kumar.D.S, Kataria and Sons.,2004.
4. **Fluid Mechanics** R.K.Hegde, Niranjana Murthy Spana Book House, 2005.

**Scheme of examination:**

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One Question to be set from each chapter. Students have to answer any FIVE full questions out of EIGHT questions, choosing at least 2 questions from part A and 2 questions from part B.