

**Objective:** This subject introduces the basic concepts of fluids, their behavioural properties, analyzing the fluid flows using primary equations. This subject further deals with various flow measuring devices and concepts of boundary layer flows.

### UNIT – I

**Introduction:** Dimensions and units – physical properties of fluids, specific gravity, viscosity, surface tension and capillarity, vapor pressure and their influences on fluid motion. Newtonian and non Newtonian fluids. Fluid Pressure at a Point; Pascal's law, Hydrostatic law, Atmospheric, Absolute and gauge pressure; Hydrostatic paradox, Pressure measurement manometers; Simple, differential and Micro Manometers

**Hydrostatic Forces On Surfaces:** Total Pressure and Centre of Pressure: on Horizontal Plane Surface; Vertical Plane Surface; Inclined Plane Surface and Curved Surfaces.

### UNIT-II

**Buoyancy:** Buoyancy; Buoyant Force and Centre of Buoyancy, Stability of submerged bodies and floating bodies; Metacentre and metacentric height, analytical method for metacentric height.

**Kinematics Of Fluid Motion:** Methods of describing fluid motion; Classification of flow; Steady, unsteady, uniform and non-uniform flows; Laminar and turbulent flows; Three, two and one dimensional flows; Irrotational and rotational flows; Streamline; Pathline; Streakline; Equation for acceleration; Convective acceleration; Local acceleration; Continuity equation; Velocity potential and stream function; Flownet; Vortex flow – free vortex and forced vortex flow.

### UNIT-III

**Dynamics Of Fluid Flow:** Forces acting on a Fluid in Motion; Euler's equation of motion; Bernoulli's equation ; Energy correction factor; Momentum principle; Force exerted on a pipe bend.

**Flow Measurements In Pipes:** Discharge through Venturi Meter; Discharge through Orifice Meter; Discharge through flow nozzle; Measurement of velocity by Pitot tube, pitot-static tube.

### UNIT-IV

**Flowthrough Orifices And Mouthpieces:** Flow through Orifices: Classification of Orifices; Determination of coefficients for an Orifice Flow through large rectangular Orifice; Flow through submerged Orifice – fully sub-merged and Partially sub-merged. Classification of Mouthpieces; Flow through external and internal cylindrical Mouthpiece

**Flow Over Notches & Weirs:** Classification of Notches and Weirs; Flow through rectangular, triangular and trapezoidal notches and weirs; End contractions; Velocity of approach; Cipolletti weir, Broad crested weir.

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## UNIT-V

**Analysis Of Pipe Flow:** Energy losses in pipelines; Darcy – Weisbach equation; Minor losses in pipelines; Hydraulic Grade Line and Total Energy Line; Concept of equivalent length; Hydraulic power transmission through a pipe; Siphon; Pipes in series, parallel & branched pipes.

**Laminar & Turbulent Flow In Pipes:** Reynolds's experiment; Characteristics of laminar flow; Steady laminar flow through a circular pipe(Hazen poiseuille equation). Characteristics of turbulent flow, Prandtl's mixing length theory, Hydro dynamically smooth and rough boundaries, Velocity distribution, Friction factor for pipe flow.

### Text Books:

- (1) Fluid Mechanics by Modi and Seth, Standard book house.
- (2) A text of Fluid mechanics and hydraulic machines by Dr.R.k.Bansal – Laxmi Publications (P) Ltd., New Delhi.
- (3) Fluid Mechanics and Machinery by D.Rama Durgaiah, New Age International.

### References:

- (1) Fluid Mechanics and Machinery, CSP Ojha, Oxford Higher Education
- (2) Fluid mechanics and machinery by Garde, New Age Pubilishers.
- (3) Theory and applications of fluid mechanics by K.Subramanyam, TMH Pubilications, New Delhi.
- (4) Principles of Fluid Mechanics and Fluid Machines by M.Narayana Pillai, Universities Press.
- (5) Introduction to Fluid Machines by S.K.Som & G.Biswas .Tata Mc.Grawhill publishers Pvt.Ltd.
- (6) Fluid Mechanics by A.K.Mohanty, Prentice Hall of India Pvt.Ltd., New Delhi.

