DEPARTMENT OF CIVIL ENGINEERING

II B.Tech I Semester Academic Year: 2024-25

Course Name : FLUID MECHANICS (CE2104PC)

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SYLLABUS

UNIT I

Introduction: distinction between a fluid and a solid; density, specific weight, specific gravity, dynamic viscosity, kinematic viscosity, variation of viscosity with temperature, Newtons law of viscosity; vapor pressure, boiling point, cavitation, surface tension, capillarity, bulk modulus of elasticity, compressibility.

Fluid statics: Fluid pressure-pressure at a point, Pascal's law, pressure variation with temperature, density, and altitude. Piezometer, U-tube manometer, single column manometer, U-tube differential manometer, Micro manometer. Pressure gauges. Hydrostatic pressure and force; horizontal, verticaland inclined surfaces. Buoyancy and stability of floating bodies.

UNIT II

Fluid Kinematics: Classification of flows: Steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational and irrotational flows, compressible and incompressible flow; ideal and real fluids;one, two, three dimensional flows – Stream line, path line and streak lines and stream tube. Stream and velocity potential functions; one, two, three-dimensional continuity equations in cartesian coordinates.

Fluid dynamics: surface and body forces -Euler's and Bernoulli's equation; energy correction factor, momentum equation. Vortex flow -free and forced. Bernoulli's equation to real fluids flows.

UNIT III

Fluid Measurement in Pipes: practical applications of Bernoulli's equation-Venturi meter Orifice meter and - Pitot tube, momentum principle; forces exerted by fluid flow on pipe bend.

Flow over notches and weirs: flow over rectangular, triangular, and trapezoidal notches and weirs, endcontractions; velocity of approach. Broad crested weirs.

UNIT IV

Flow through pipes: Reynold's experiment – Reynold's number, loss of head through pipes. Darcy- Weis batch equation, minor losses. Total energy line, hydraulic grade line. Pipes in series, Pipes in equivalent, Pipes in parallel, siphon, branching of pipes, three reservoir problems, power transmission through pipes. Analysis of pipe network: hardy cross method, water hammer in pipes and control measures.

UNIT V

Laminar And Turbulent Flow: Laminar flow through circular pipes, annulus and parallel plates **Boundary Layer Theory:** Boundary layer analysis -assumptions and concept of Boundary layer theory. Boundary layer thickness, displacement, momentum and energy thickness Laminar andTurbulent boundary layer on each plate; laminar sub layer, smooth and rough boundaries. Local and average friction coefficients. Separation and control. Definition of Drag and Lift- Magnus effect.

TEXT BOOKS:

1. Fluid Mechanics by Modi and Seth, Standard book house.
2. Introduction to Fluid Machines by S.K. Som & G. Biswas, Tata McGraw Hill Pvt. Ltd.
3. A text of fluid mechanics and hydraulic machines, Dr.R.K. Bansal - Laxmi publications(P)ltd.,new Delhi

REFERENCE BOOKS:

1. Fluid Mechanics by Merie C. potter and David C. Wiggert, Cengage learning
2. Introduction to Fluid Machines by Edward J. Shaughnessy, Jr, Ira M. Katz and JamesP. Schaffer, Oxford University Press, New Delhi
3. Fluid Mechanics by A.K. Mohanty, Prentice Hall of India Pvt. Ltd., New Delhi