GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

FLUID MECHANICS

Course Code: GR15A2007 L:3 T:1 P:0 C:4
II Year I Semester

Prerequisites
- Concepts about behavior of Fluid flows
- Knowledge of Mathematics

Course Objectives
- To provide the student strong background in the different types of fluids and fluid properties and their behavior.
- To train the students to have the solid foundation in the mathematical and technical concept required to engineering problems such as types of fluid flows, fluids at static condition, dynamic Condition and kinematic condition.
- To prepare the students to excel in post graduate program or to succeed in industry.

Course Outcomes
- An ability to express the principle properties of fluids viscosity, surface tension etc and their type of flows at static condition. Able to calculate the fluid pressure at different condition.
- Design diameter, length require of a pipe in net working. An ability to find the role of fluid flows in a weirs, pipes and identifying the laminar and turbulent flows for that requires simple and complex applications can handle social and global needs.

Unit-I
Introduction: Dimensions and units-Physical properties of fluids specific gravity, Viscosity, surface tension, vapor pressure and their influences on fluid motion pressure at a point, Pascal's law, Hydrostatic law-atmospheric, gauge and vacuum pressure measurement of pressure. Pressure gauges, Manometers: differential and Micro Manometers.

Unit-II
Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces-Center of pressure. Derivations and problems.

Unit-III

Fluid Kinematics: Description of fluid flow, Stream line, path line and streak lines and stream tube. Classification of flows: Steady, unsteady, uniform, non uniform, laminar, turbulent, rotational and Irrotational flows - Equation of continuity for one, two , three dimensional flows stream and velocity potential functions, flow net analysis.

Fluid Dynamics: Surface and body forces- Euler's and Bernoulli's equations for flow along a stream line for 3-D flow, (Navier - stokes equations (Explanatary) Momentum equation and its application -forces on pipe bend.

Unit-IV

Boundary layer Theory Approximate Solutions of Navier Stoke's Equations, Boundary layer concepts, Prandtl contribution, Characteristics of boundary layer along a thin flat plate, Vonkarman momentum integral equation, laminar and turbulent Boundary layers (no derivations), BL in transition, separation of BL, control of BL, flow around submerged objects-Drag and Lift- Magnus effect.

Laminar & Turbulent Flows: Reynolds experiment - Characteristics of Laminar & Turbulent flows. Flow between parallel plates, Flow through long tubes, flow through inclined tubes.

Unit-V

Closed Conduit Flow: Laws of Fluid friction -Darcys equation, Minor losses _ pipes in series -pipes in parallel - Total energy line and hydraulic gradient line. Pipe network problems, variation of friction factor with Reynolds number -Moodys Chart.

Measurement of Flow: Pitot tube, Venturimeter and orifice meter –classification of orifices, flow over rectangular, triangular and trapezoidal and Stepped notches -Broad crested weirs.

Text Books

1. Modi and Seth, Fluid Mechanics, Standard book house, 19th Edition, 2011.
2. S. K. Som & G. Biswas, Introduction to Fluid Machines, Tata Mc. Graw Hill publishers, Pvt. Ltd., 3rd Edition, 2012.
3. Edward J. Shaughnessy, M. Katz and James P. Schaffer, Introduction to Fluid Machines, Oxford University Press, New Delhi, 1st Edition, 2005.

Reference Books

1. J. F. Douglas, J.M. Gaserek and J. A. Swaffirld (Longman), Fluid Mechanics, 5th Edition, 2005.
2. Frank. M. White, Fluid Mechanics, Tata Mc. Graw Hill Pvt. Ltd, 4th Edition, 2013.
3. A.K. Mohanty, Fluid Mehanics, Prentice Hall of India Pvt. Ltd., New Delhi, 2nd Edition, 1994.
4. Dr. R.K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P) ltd., New Delhi, 9th Edition, 2012.