

19AG103

FLUID MECHANICS AND OPEN CHANNEL HYDRAULICS

Hours Per Week :

| | | | |
|---|---|---|---|
| L | T | P | C |
| 2 | 0 | 2 | 3 |

Total Hours :

| | | | | | | | | |
|----|---|----|-------|---------|----|----|---|----|
| L | T | P | WA/RA | SSH/HSB | CS | SA | S | BS |
| 30 | - | 30 | 5 | 40 | - | 8 | 5 | 5 |



Source :

<https://theconstructor.org/wp-content/uploads/2011/10/Open-Channel-Flow.jpg>

COURSE DESCRIPTION AND OBJECTIVES:

The course deals with the basic principles, fundamental concepts and theories of fluid mechanics to familiarize the behaviour of the fluids at rest as well as in motion and the main of the course is to impart knowledge on static, kinematics and dynamic aspects of fluids.

COURSE OUTCOMES:

Upon completion of the course, student will able to achieve the following outcomes:

| COs | Course Outcomes | POs |
|-----|--|-----|
| 1 | Apply properties of fluids like viscosity, density, specific weight etc. | 1 |
| 2 | Apply pressure in fluid-flowing pipes and vessels. | 2 |
| 3 | Evaluate various kind of pressure measuring instruments. | 5 |
| 4 | creativecontinuity equation and energy equations in flow measurement. | 5 |
| 5 | Analyses of open channels for irrigation purposes. | 3 |

SKILLS:

- ✓ Differentiate between Newtonian and non-Newtonian fluids.
- ✓ Determine fluid pressure using different types of gauges.
- ✓ Determine hydrostatic forces on a body immersed in a fluid.
- ✓ Uses of flow measuring devices like Pitot tube.

| | |
|---|-------------|
| UNIT - I | L-06 |
| Ideal and real fluid: Pressure and its measurement, Pascal's law, pressure forces on plane and curved surfaces, centre of pressure, buoyancy, meta centre and meta centric height, condition of floatation and stability of submerged and floating bodies. | |
| UNIT - II | L-06 |
| Kinematics of fluid flow: Lagrangian and Eulerian description of fluid motion, continuity equation, path lines, streak lines and stream lines, stream function, velocity potential and flow net. Types of fluid flow, translation, rotation, circulation and vorticity, Vortex motion; Dynamics of fluid flow, Bernoulli's theorem, venturimeter, orifice meter and nozzle, siphon. | |
| UNIT - III | L-06 |
| Laminar flow: Stress strain relationships, flow between infinite parallel plates both plates fixed, one plate moving, discharge, average velocity; Laminar and turbulent flow in pipes, general equation for head loss Darcy, Equation, Moody's diagram. | |
| UNIT - IV | L-06 |
| Minor and major hydraulic losses through pipes and fittings: Flow through network of pipes, hydraulic gradient and energy gradient; Flow through orifices (Measurement of Discharge, Measurement of Time), Flow through Mouthpieces, Flow over Notches, Flow over weirs, Chezy's formula for loss of head in pipes, Flow through simple and compound pipes. | |
| UNIT - V | L-06 |
| Open channel design and hydraulics: Chezy's formula, Bazin's formula, Kutter's Manning's formula, Velocity and Pressure profiles in open channels, Hydraulic jump; Dimensional analysis and similitude: Rayleigh's method and Buckingham's 'Pi' theorem, types of similarities, dimensional analysis, and dimensionless numbers. Introduction to fluid machinery. | |

LABORATORY EXPERIMENTS

| LIST OF EXPERIMENTS | TOTAL HOURS-30 |
|---|----------------|
| 1. Determination of viscosity . | |
| 2. Study of manometers and pressure gauges. | |
| 3. Verification of Pascal's law. | |
| 4. Determination of hydrostatic forces on plane surface. | |
| 5. Verification of Archimedes law. | |
| 6. Determination of meta-centric height. | |
| 7. Verification of Bernoulli's theorem. | |
| 8. Determination of coefficient of discharge of venturi-meter and orifice meter. | |
| 9. Determination of coefficient of friction in pipeline. | |
| 10. Determination of minor losses. | |
| 11. Determination of coefficient of discharge and calibration of rectangular notch. | |
| 12. Determination of coefficient of discharge and calibration of triangular notch. | |
| 13. Determination of coefficient of discharge, coefficient of velocity and coefficient of contraction for flow through orifice. | |
| 14. Determination of coefficient of discharge for mouth piece | |

TEXT BOOKS:

1. Bansal, R K. 2010, "A text book of fluid mechanics and Hydraulic machines". Laxmi Publications (P) Ltd. New Delhi.

REFERENCE BOOKS:

1. Chow V .T, 1983, "Open Channel Hydraulics". Mc Graw Hill Book Co., New Delhi.
2. Khurmi R .S., 1970, "A Text Book of Hydraulics, Fluid Mechanics and Hydraulic Machines" S. Chand & Company Limited, New Delhi.
3. LaJagadish, 1985, "Fluid Mechanics and Hydraulics". Metropolitan Book Co. Pvt. Ltd., New Delhi.
4. Modi P. M and Seth S.M.1973, "Hydraulics and Fluid Mechanics". Standard Book House, Delhi.