Course Syllabi: UES031 Fluid Mechanics (L : T : P :: 3 : 1 : 2)

1. **Course number and name:** UES031; Fluid Mechanics

2. **Credits and contact hours:** Credits: 4.5; Hours: 6

3. **Text book, title, author, and year**

   - *Streeter, V.L., Wylie E. B. and Bedford, K.W., Fluid Mechanics, McGraw Hill Book Company (1998).*
   - *Jain, A.K., Fluid Mechanics including hydraulic machines, Khanna Publishers (2004).*
   - *Kumar D.S., Fluid Mechanics and Fluid Power Engineering, S. K. Kataria (2009).*
   - *Subramanya, K., Theory and Application of Fluid Mechanics, Tata McGraw Hill (2001).*
   - *ModiP.N. and Seth S.M., Hydraulics and Fluid Mechanics, Standard Book House (2002).*
   - *Shames I.H., Mechanics of Fluid, McGraw Hill (2005).*
   - *Fox, R.W. and McDonald, A.T., Introduction to Fluid Mechanics, John Wiley and Sons (2008) 5thed.*

   a. Other supplemental materials
      - Nil

4. **Specific course information**

   a. Brief description of the content of the course (catalog description)

   Introduction: Physical properties of fluids, Types of fluids.
   Fluid statics: Basic equation for pressure field, Measurement of pressure, Hydrostatic forces on immersed plane and curved surfaces, Buoyancy and flotation.
   Fluid kinematics: Methods of describing fluid motion, Velocity and acceleration of a fluid particle, Type of fluid flows, Displacement of a fluid particle, Circulation and vorticity, Continuity equation, Velocity potential and stream function.
   Fluid dynamics: Euler's equation, Bernoulli's equation, Momentum equation, Kinetic energy and momentum correction factors.
   Flow though pipes: Energy losses, HGL and TEL, Concept of equivalent pipe, Pipes in series and parallel, Flow through a siphon, Transmission of power.
   Flow measuring devices: Venturimeter, Orificemeter, Pitot tube, Rotameter, Circular orifice, Current meter, Notches.
   Dimensional analysis: Methods of dimensional analysis, Model studies.
   Open channel flow: Types of channels, Classification of flows, Uniform flow formulae.
   Turbines and pumps: Brief description of types and working of turbines and pumps.
   Laboratory work: Verification of Bernoulli's Theorem, Calibration of Venturimeter, Determination of hydrostatic force and its location on a vertically immersed surface, Calibration of orifice meter, to check the stability of a ship model, Determination of friction factor for pipes of different materials, Determination of hydraulic coefficients of an orifice, Verification of momentum equation, Determination of loss coefficients for various types of pipe fittings, Calibration of a triangular notch, to check the calibration of rotameter, Visualization of laminar and turbulent flow.

5. **Specific goals for the course**

   After the completion of the course, the students will be able to:

- Learn about different types of fluid flows; different methods applied for describing fluid in motion.
- Learn about different types of energies associated with Fluid in motion.
- Learn about the measurement of flow in pipes and flow in open channels.
- Explain the concept of equivalent pipe; Energy losses in flow in pipe.
- Learn about types and working of turbines and pumps.

6. **Brief list of topics to be covered**
    - Fluid Statics
    - Fluid Kinematics
    - Fluid Dynamics
    - Flow through pipes
    - Open channel flow
    - Turbines and Pumps