3CE105 Fluid Mechanics & Hydraulics (Core)

L-T-P-Cr: 3-1-0-4 Objective: To impart knowledge and skill of experimental fluid properties, basic and empirical equations of fluid mechanics pertaining to both statics and dynamics. Theory: 1. Introduction: Fluid properties- density, viscosity, compressibility, ideal and real fluids. 2 Lecture

2. Hydrostatics: fluid force on plane and curved surfaces, manometry, buoyancy, uniformly accelerated motion. 4 Lectures

3. Kinematics of fluid flow: Stream Lines, Pathlines, Streaklines; Eularian and Lagrangian Concepts; Irrotational motion; Stream and Potential Functions, Flow Nets and solution to Laplace equation. 5 Lectures

4. Dynamics of fluid flow: Control Volume Concepts, Euler and Bernouli’s theorem and various applications like pitot tube, venturimeter, orifice meter, notches and weirs etc; Impulse momentum theory and applications. 7 Lectures

5. Introduction to NavierStoke’s Equation, Flow of fluids in closed conduits, Laminar flow of viscous incompressible fluids, Darcy-Weisbach equation, Major & minor losses in pipes, Moody’s diagram Hardy-Cross method for pipe networks. 6 Lectures 6. Dimensional Analysis. 1 Lectures

7. Forces on immersed bodies: concepts of separation, drag force, circulation and lift force. Dimensional Analysis, Model Similitude: Theory and application. 5 Lectures

8. Introduction to Turbulent Flow 5 Lectures

9. Concepts of boundary layer flow: Introduction, boundary layer growth over a flat plate, Boundary layer thickness, laminar boundary layer, turbulent boundary layer, transition from laminar to turbulent flow. 7 Lectures

Text Books: 1. A. K. Jain, Fluid Mechanics. 2. Modi& Seth, Fluid Mechanics. 3. Garde and Mazumadar, Fluid Mechanics, Nemchand Bros, Roorkee.

Reference Books: 1. V. L. Streeter E.B. and Wylie, Fluid Mechanics, McGraw Hill. 2. Fox & McDonald, Fluid Mechanics, John Wiley. 3. Munson, Fluid Mechanics, John Wiley. 4. F. M. White, Fluid Mechanics, McGraw Hill Int. edition. 5. R. L. Dougherty, J.B. Franzini, E.J. Finnermore: Fluid Mechanics with Engineering Application, McGraw Hill International Edition. 6. I.H. Shames, Fluid Mechanics, PHI.

Expected Outcome: Students will be able to understand fluid properties and define and solve experimental problems in fluid mechanics using the basic and empirical equations of fluid mechanics