MECHANICS OF FLUIDS

III Semester

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A5AE06	PCC	3	-	-	3	30	70	100

COURSE OBJECTIVES:

The objectives of the course are to enable the student:

1. To understand the basic principles of fluid mechanics
2. To identify various types of flows
3. To understand concepts of flow measuring and calculate the energy losses
4. To understand type of flow such as laminar and turbulent flows
5. To understand the difference between compressible and incompressible flow

UNIT-I FLUID PROPERTIES AND FLUID STATICS

Density, Specific weight, Specific gravity, viscosity, Vapour pressure, compressibility, Surface tension Pressure at a point, Pascal's law, pressure variation with temperature, density and altitude. Hydro static law, Piezometer, Simple and differential manometers, pressure gauges, total pressure and center of pressure plane, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

UNIT-II FLUID KINEMATICS, FLUID DYNAMICS

Stream line, path line, streak line, stream tube, classification of flows, steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational, irrotational flows, one, two and three dimensional flows, Continuity equation in 3D flow, stream function, velocity potential function.
Surface and Body forces, Euler's and Bernoulli's equation derivation, Navier stokes equation (explanation only), Momentum equation - applications, Vortex Free and Forced. Forced vortex with free surface.

UNIT-III SIMILITUDE AND FLOW MEASUREMENT, REYNOLDS EXPERIMENT

Flow through venturimeter and orifice meter, flow through notches and weirs Viscometers hot wire anemometers, pitot tube flow through nozzles, Characteristics of real fluids.
Darcy's equation, Minor losses - pipes in series, pipes in parallel, total energy line and hydraulic gradient line, numerical problems, Dimensional analysis

UNIT-IV BOUNDARY LAYER CONCEPTS

Flow through pipes-laminar & turbulent flows, Definition, thicknesses, characteristics along thin plate, laminar and turbulent layers, boundary layer in transition, separation of boundary layer, Submerged objects drag and lift, Von-Karman momentum equation ,shockwaves

UNIT-V FLOW OF COMPRESSIBLE FLUID

Introduction, Thermodynamic relations, basic equations of compressible flow, Velocity of sound wave in a fluid for isothermal and adiabatic process, Mach number and its applications, Mac angle propagation of pressure waves and stagnation properties.

Text Books:

1. P. N. Modi, S. M. Seth (2011), Hydraulics and fluid mechanics including hydraulic machines, 18th revised edition Standard Book House, India.
2. R. K. Bansal (2011), A Textbook of Fluid Mechanics and Hydraulic Machines, 10th edition, Laxmi Publications, New Delhi, India.

Reference Books:

1. Yumus A. Cengel, John M. Cimbala (2010), Fluid Mechanics (SI Units), 2nd edition, Tata McGraw hill education (P) Ltd, New Delhi, India.
2. Frank M. White (2011), Fluid Mechanics, 7th edition, Tata McGraw Hill, New Delhi, India.

COURSE OUTCOMES:

Student is able to

1. Determine the fluid properties for different types of fluids
2. Evaluate the flow depends upon it's flow property
3. Choose the appropriate notch for the real-time applications
4. Estimate the type of flow such as laminar and turbulent flows
5. Choose the type of flows such as compressible or in compressible to determine the effect of compressibility on flow properties