Subject: Fluid Mechanics I

CHE-221	**Fluid Mechanics-I**	**3 CH**		**CHE-221**	**Fluid Mechanics-I**	**3 CH**	
		Theory (3)				**Theory (3)**	
Pre-req.	No	Category	Core	Pre-req.	No	Category	Core

Existing Course Contents	**Proposed Changes**
• Fluid Statics: pressure forces on surfaces, Pressure distribution, Head Calculations, pressure measuring devices, Buoyancy, Pressure in accelerated rigid body motions. • Nature of Flow: Laminar & Turbulent Flow, Compressible & Non-Compressible • Bernoulli's equation and its applications; Continuity Equation, Energy Relationships & the Bernoulli equation, pressure terminology, diffusers, and sudden expansion • Momentum of a Flowing Fluid; Newton's 2nd law of motion & Momentum Balance, Calculations for Laminar& Turbulent pipe flow, nozzle flow & other example • Stress in Fluids; Viscosity, Newton's Law of Viscosity, Shear Stress Components, Newtonian and non-Newtonian flow • Flow of Incompressible Newtonian Fluids in Pipes &Channels Shear stress in a pipe, Friction factor & pressure drop, Losses in fittings and bend pipes, enlargements and contractions, friction in non-circular channels, • Velocity distribution for turbulent flow in a pipe. Piping network analysis • Flow measurement; Orifice meter, Venturi meter, Rota meter, Nozzle. Notch and Wier, Electromagnetic flow meter, • Flow of Compressible Newtonian Fluids • Motion of particles in fluid; drag force on a spherical particle, motion of bubbles and drops, accelerated motion of particles in centrifugal field • Sedimentation of fine particles and coarse particles	• **Introduction to fluid statics and fluid Mechanics:** Pressure forces on surfaces, Pressure distribution, Pressure measuring devices. Difference between fluid statics and fluid mechanics Applications of fluid mechanics in daily life and process industry • **Stress in Fluids:** Concept of Viscosity, Newton's Law of Viscosity Shear Stress Components Velocity profile Newtonian and non-Newtonian flow, Reynolds number • **Nature of Flow:** Different types of flow such as Compressible & Non-Compressible, uniform & non-uniform, steady and unsteady etc. Types of flow based on Reynolds number Nature of Laminar & Turbulent Flow • **Boundary layer concept:** Boundary layer formation and its applications • **Basic equations for fluid flow:** Bernoulli's equation and its applications Equation of continuity and its application • **Momentum of a Flowing Fluid:** Newton's 2nd law of motion & Momentum Balance, Velocity and pressure calculations for

	Laminar& Turbulent flow in a circular pipe. • **Flow of Incompressible Newtonian Fluids in Pipes &Channels:** Shear stress, velocity, and pressure distribution in a pipe, • **Flow of Compressible Newtonian Fluids** Flow of Compressible fluids flow of gases through nozzles mechanical energy balance Flow of Compressible fluids Mac Number • **Piping network analysis**: Types of pipes and pipes fittings Calculations of pressure losses and friction factor for different pipe fitting (bend, sudden enlargements and sudden contractions, friction in circular and non-circular channels) • **Introduction to Flow measuring devices:** Construction, working principle and selection criteria (Orifice meter, Venturi meter, Rota meter, Nozzle. Notch and Wier, Electromagnetic flow meter) Calculations of pressure drops across different flow measuring device, Flow of Compressible Newtonian Fluids