

Subject: Fluid Mechanics-1

CHE- 214	Fluid Mechanics- 1	3CH	
		Theory+Lab (2+1)	
Pre- req.	Nil	Category	Foundation Course
Course Contents as per PEC Guidelines 2023-2024			
• Significance and application of fluid mechanics in chemical plants. • Concept, properties and types of fluids, stress analysis of static fluids, newton's law of viscosity, Newtonian and non-Newtonian fluids. • Pressure forces on surfaces, pressure distribution, estimation and measurement • Manometry and Head calculations, pressure measuring devices, buoyancy, pressure in accelerated rigid body motions. Fluid Statics and Dynamics • Fluid statics: Navier-stokes equation, • Nature of flow: laminar & turbulent flow, compressible & non-compressible • Bernoulli's equation and its applications; continuity equation • Momentum of a flowing fluid; newton's 2nd law of motion & momentum balance, calculations for laminar & turbulent pipe flow, nozzle flow & flow & another example. • Stress in fluids; viscosity, shear stress components, Newtonian and non-Newtonian flow • Dimensional analysis and similitude, viscous flow in internal flows, Concept of boundary layer and its importance in fluid dynamics • 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 Devices • Orifice meter, venturi meter, rotameter, nozzle. Notch and weir, electromagnetic flow meter, concept of centrifugal pumps; flow measuring devices such as Bernoulli devices • Navier-stokes equation			

Weekly plan/ Reference Books	
1	Significance and application of fluid mechanics in chemical plants.
2-3	Concept, properties and types of fluids, stress analysis of static fluids, newton's law
	of viscosity, Newtonian and non-Newtonian fluids. Pressure forces on surfaces, pressure distribution, estimation and measurement
4	Manometry and Head calculations, pressure measuring devices, buoyancy, pressure in accelerated rigid body motions.
5	Fluid statics: Navier-stokes equation, Nature of flow: laminar & turbulent flow, compressible & non-compressible
6	Bernoulli's equation and its applications; continuity equation
7-8	Momentum of a flowing fluid; newton's 2nd law of motion & momentum balance, calculations for laminar & turbulent pipe flow, nozzle flow & other example.
9-10	Mid Term Exams
11-12	Stress in fluids; viscosity, shear stress components, Newtonian and non-Newtonian flow Dimensional analysis and similitude, viscous flow in internal flows,
13	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.
14	Orifice meter, venturi meter, rotameter, nozzle. Notch and weir, electromagnetic flow meter, concept of centrifugal pumps; flow measuring devices such as Bernoulli devices
15-16	Navier-stokes equation
17	Revision
18	End Semester Exam
TEXT AND REFERENCE BOOKS: - Holland, F.A. Bragg, R."Fluid flow for Chemical Engineers",2 Edition,Butterworth & Heinemann.1995. - White,F.M."Fluid Mechanics",7th Edition, McGraw-Hill.2011. - Noel-de-Nevers "Fluid Mechanics for Chemical Engineers" McGraw-Hill,2004 - McCabe Warren L., Smith Julian C., Harriott peter "Unit Operations of Chemical Engineering"7th Edition, 2010.McGraw-Hill Inc. - Coulson J.M., Richardson J.F. "Chemical Engineering" Vol-I, 6th 1999.Butterworth, Elsevier. - Munson B.R., Huebsch W.W., Rothmayer A.P. "Fundamental of Fluid Mechanics"Wiley; 7th edition,2012 - Fundamental of Fluid Mechanics, 6th Edition.	

