Teaching Scheme					Fluid Mechanics (22PCM203T)					
					Examination Scheme					
L	T	P	C	Hours/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	1	0	3	3	25	50	25	--	--	100

COURSE OBJECTIVES

- Inculcate the importance of fluid statics and dynamics.
- Acquire a sound knowledge on fluid properties and its transport.
- Familiar with various flow measurement and transportation devices.

UNIT I: Fluid properties and statics **7 Hr.**

Definition of fluid; Properties of fluids: Viscosity, compressibility and bulk modulus; Shear stress in a moving fluid; Difference between liquids and gases, compressible and incompressible fluids; Newtonian and non- Newtonian fluids; Continuum concept of a fluid: Statics of fluid systems, pressure and the variation of pressure due to gravity in a static fluid; Manometers: U-tube, differential and inclined manometers; Force on submerged bodies and centre of pressure.

UNIT II: Kinematics and dynamics of fluid flow **7 Hr.**

Fluid kinematics: Classification and types of flow; Velocity field and acceleration; Continuity equation and its applications; Stream line, streak line, path line, stream function and velocity potential function; Fluid dynamics: Reynolds experiment, laminar and turbulent flows, nature of turbulence and boundary layer; Euler's equation of motion; Bernoulli's theorem; Momentum equations and energy losses in fluid flow.

UNIT III: Dimensional analysis and flow measurement **7 Hr.**

Dimensional analysis: Dimensions of physical quantities, dimensional homogeneity, Buckingham pi theorem, important dimensionless numbers, model analysis (Reynolds, Froude and Mach number); Flow measurement: Application of Bernoulli's equation in pitot tube, venturi meter, orifice meter, rota meter, triangular and rectangular notch, mass flow meters, etc.

UNIT IV: Pumps and compressors **7 Hr.**

Classification of pumps: Characteristic curves, selection criteria; Types of compressors: COP and selection criteria; Compressible fluid flow; Ideal gas relations and energy calculations.

Max. 28 Hr.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1: Understand the properties of fluids and its static conditions.
CO2: Illustrate the kinematics and dynamics of fluid flow.
CO3: Apply Euler's and Bernoulli's equation in various flow systems.
CO4: Estimate the energy losses in fluid flow.
CO5: Apply dimensional analysis to predict physical parameters.
CO6: Evaluate the performance characteristics of pumps and compressors.

TEXT/REFERENCE BOOKS

1. Bansal, R.K. "A Textbook of Fluid Mechanics and Hydraulic Machines", 10th Edition, Laxmi Publications (2018).

2. de Nevers, N., “Fluid Mechanics for Chemical Engineers’’, 2nd Edition, McGraw-Hill (1991).
3. Munson, B.R., Okiishi, T.H., Huebsch, W.W. and Rothmayer, A. “Fundamentals of Fluid Mechanics”, 7th Edition, John Wiley Publication, (2012).
4. McCabe, W.L., Smith and Peter Hariott, “Unit Operations of Chemical Engineering”, 7th Edition, McGraw-Hill, New Delhi, (2012).
5. White, F.M., “Fluid Mechanics”, 7th Edition, McGraw-Hill Inc. (2011).

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100	**Exam Duration: 3 Hr.**
Part A: 10 Questions each carrying 5 marks	50 Marks
Part B: 5 Questions each carrying 10 marks	50 Marks