Course Type	Course Code	Name of the Course	L	T	P	Credits
DC	CHC202	Fluid and Particle Mechanics	3	1	0	11

Course Objective
To provide knowledge on necessary fundamental concepts of fluid flow, transportation and metering of fluids, particle characterization, handling and processing of particles.
Learning Outcomes
Students will have essential knowledge on fluids, flow behavior, boundary layer theory, pipe flows, flow measurement techniques, fluid transportation, characterization and processing techniques for particles.

Unit No.	Topics to be Covered	Class Hours	Learning Outcome
	Section A: Fluid Mechanics		
1	**Basic concepts:** Fluids and properties, fluid statics, flow phenomena, Reynolds number, shear rate, shear stress, rheological properties of fluids	**6 L + 1 T**	Introduction to fluid and its properties
2	**Mechanism of fluid flow**: Mechanism of compressible and non-compressible fluid flow, equation of continuity, Bernoulli's theorem, velocity profiles in laminar and turbulent system, basic concept of boundary layers	**5 L + 3 T**	Students will know basic flow behaviors and governing equation
3	**Friction factor and fittings**: Friction factor and friction losses in pipes, roughness factor and its significance, pipe fittings and valves, equivalent length of fittings and valves, energy loss calculations	**5 L + 3 T**	Basic understanding of applications in pipe flow
4	**Transportation and metering:** Reciprocating and centrifugal pumps, pump characteristics, pump power calculations, pump selection, priming, cavitation, NPSH of pumps, fans, blowers, compressors, orifice meter, venturimeter, pitot tube, rotameters, coefficient of discharge and calculations	**6 L + 2 T**	Students will be introduced to pumps and flow measuring instrument

Section B: Fluid Particle Mechanics			
5	**Characterization and size reduction of particles:** Particle size distribution, size reduction, crushing efficiency and laws of crushing, classification and selection of size reduction equipment	**5 L + 1 T**	Introduction to particle size and distribution and size reduction
6	**Fluid-Particle flow Systems**: Motion of solid particles in a fluid, free and hindered settling, fluid flow through a packed bed of particles, pressure drop – flow relationship, basics of fluidization, bubbling and non-bubbling fluidization, slurry transport	**6 L + 2 T**	Students will understand dynamics of particles in fluid
7	**Mechanical Separations**: Classification, filtration, sedimentation, centrifugal and cyclone separators	**6 L + 1 T**	Expected to know various mechanical separation methods
8	**Mixing and Agitation**: Introduction to mixing and agitation	**3 L + 1 T**	Basic introduction to mixing and agitation

Textbooks:

1. S. K. Som, G. Biswas, and S. Chakraborty. Introduction to Fluid Mechanics and Fluid Machines. McGraw Hill India, 2017
2. W. L. McCabe, J. M. Smith, and P. Harriott. Unit Operations in Chemical Engineering, McGraw Hill Education, 2017
3. D. W. Green and M. H. Southard, Perry's Chemical Engineers' Handbook. McGraw Hill Education, 2019

Reference books:

1. R. W. Fox, A. T. McDonald, and P. J. Pritchard. Fox and McDonald′s Introduction to Fluid Mechanics. Wiley, 2010