



*Strategic Plan for Learning and Teaching*  
*Department of Chemical Engineering*

<b>Branch Name:</b>	Chemical Engineering (CHE)	<b>Session :</b>	2018-2019
<b>Subject Name:</b>	Fluid Mechanics	<b>Year:</b>	2 <sup>nd</sup>
<b>Subject Code:</b>	CHE 301	<b>Semester :</b>	3 <sup>rd</sup>

<b>Course Objective:</b>	To understand basic concept of fluid flow and its application to chemical process industries including pipe flow, fluid machinery and agitation & mixing.
<b>Course Outcome:</b>	<ul style="list-style-type: none"> <li>• Knowledge of basic principles of fluid mechanics</li> <li>• Ability to analyze fluid flow problems with the application of the momentum and energy equations</li> <li>• Capability to analyze pipe flows as well as fluid machinery</li> </ul>

**Teaching-Learning Plan:**

Lecture Class No.	Reference to the WBUT Syllabus	Subject Topics to be discussed/ covered/ delivered	Text book / Referred book SL.No.
1	Mod I	Definition of Fluid, Continuum concept of fluid, Terminologies of fluid flow, velocity – local, average, maximum	2,4
2		Flow rate – mass, volumetric, velocity field; dimensionality of flow	
3		Flow visualization – streamline, pathline, streak line, stress field	
4		Viscosity, Newtonian fluid, Non-Newtonian fluid	
5		Reynold's number — its significance, laminar, transition and turbulent flows, Prandtl boundary layer, compressible and incompressible flows	
6		Basic equation of fluid statics, pressure variation in a static field	
7		Pressure measuring devices – manometer, U-tube, inclined tube, force on submerged bodies (straight, inclined), center of pressure	
8		Related problems	
9		Basic laws for a system, relation of system derivatives to the control volume formulation	
10		Conservation of mass, continuity equation, momentum balance equation- Introduction to Navier Stoke's and Euler's Equation	
11	Mod II	Introduction to rotational and irrotational flow, momentum correction factor	1,4
12		Introduction, flow of incompressible fluid in circular pipe, laminar flow for Newtonian fluid	
13		Hagen-Poiseuille equation, introduction to turbulent flow in a pipe-Prandtl mixing length	
14		Energy consideration in pipe flow, relation between average and maximum velocity	
15			
16		Bernoulli's equation–kinetic energy correction factor, head loss	
17			
18		Friction factor-Fanning and Darcy, Moody diagram, major and minor losses	
19			
20		Pipe fittings and valves, schedule no, equivalent diameter	
21	Mod III	Introduction, general equation for internal flow meters, Orifice meter,	1,3,4
22		Venturimeter, Weirs	

23		Concept of area meters: rotameter, Local velocity measurement: Pitot tube			
24					
25					
26		Hot wire anemometer, mass flow-meter			
27		Introduction, concept of drag and lift, variation of drag coefficient with Reynolds number,			
28		Stream-lined body and bluff body, packed bed			
29		Concept of sphericity, Ergun equation, modified friction factor			
30		Related problems			
31		Mod IV		Introduction, different types of fluidization, minimum fluidization velocity, governing equation, pneumatic conveying and other industrial uses	1,4
32					
33	Introduction, Basic classification of pumps, Non-Mechanical Pumps—acid egg, steam jet ejector, air lift pump, Mechanical pump				
34					
35	Centrifugal pumps- cavitation, NPSH, Positive displacement pumps (rotary, piston, plunger, diaphragm pumps)				
36					
37	Pump specification; basic characteristics curves for centrifugal pumps, fan, blower and compressor.				
38					
39	Related problems				
40					

**Recommended Text/ Reference Books:**

Sl.No.	Name of Text/ Reference Book	Name of Author	Publisher & edition
1	Unit Operations of Chemical Engineering:	Mc Cabe, Smith & Harriot	TMH, 6 <sup>th</sup> Edn
2	Fluid Mechanics	A K Mohanty	PHI
3	Transport Process and Unit Operations	Geankoplis	PHI, 3rd Edn.
4	A Textbook of Fluid Mechanics and Hydraulic Machines	R K Bansal	LP, 9 <sup>th</sup> Edn

**Course Co-ordinator / Faculty**

Sl. No.	Name of the Course Co-ordinator / Faculty	Signature of Course coordinator / Faculty		Signature of HOD	
1	Prof. Dr. A.K.Das				
2	Dr. Sujoy Bose				