UTKALMANI GOPABANDHU INSTITUTE OF ENGINEERING, ROURKELA



LESSON PLAN

DEPARTMENT OF CHEMICAL ENGINEERING

LESSON PLAN



SUBJECT CODE

: TH-2

NAME : Fluid Mechanics

BRANCH : CHEMICAL

SEMESTER :Diploma-III

CREDIT POINTS : 4

NUMBER OF MODULES : 4

CLASSES REQUIRED : 60

PRE-REQUISITE:To the use of solids, use/application and handling of fluids
(e.g. both liquids and gases) is in wide spectrum of
engineering practice. Fluid statics, fluid flow phenomena,
flow measurement, fluid flow through pipe lines, fluidized
bed etc. There are many units processes particularly in
chemical, petrochemical, pharmaceutical etc.

MODULE-I

FLUID STATICS: 1. Fluid and its classification 2. Properties of fluid and its units 3.Newton's law of viscosity, Newtonian & Non-Newtonian fluid 4. Hydrostatic equilibrium and pressure head 5. Fluid pressure measuring devices 6. Different types of manometers and its applications 7. Derivation of monomeric equation. 1.8 Equation of continuity.

Objectives:

To introduce fundamental aspects of fluid flow behavior, its properties and understand stress-strain relationship in fluids, classify their behavior. To understand the various flow measuring devices. To use important concepts of continuity equation.

SESSION NO	TOPICS TO BE COVERED	PRIMARY REFERENCE (BOOKS/NOTES)			
1	Basic concept of Fluid	T1, R1, R2			
2	Classification of Fluids	T1, R1, R2			
3	Properties of fluid and its units	T1, R1, R2			
4	Newton's law of viscosity, Newtonian & Non- Newtonian fluid	T1, R1, R2			
5	Hydrostatic equilibrium and pressure head	T1, R1, R2			
6	Fluid pressure measuring devices	T1, R1, R2			
7	Different types of manometers and its applications	T1, R1, R2			
8	Different types of manometers and its applications	T1, R1, R2			
9	Derivation of monomeric equation	T1, R1, R2			
10	Solve simple problems on using monomeric equation	T1, R1, R2			
11	Equation of continuity	T1, R1, R2			
12	Solve simple problems on using continuity equation	T1, R1, R2			

MODULE-II

FLUID FLOW PHENOMENA: 1. Types of flow: laminar and turbulent flow, Reynolds's number, critical velocity 2. Mechanism of fluid flow in pipes, Reynolds' experiment 3. Bernoulli's theorem, pump work (solve simple problems) 4. Flow of incompressible fluids in pipe 5. Friction factor, roughness and estimate friction loss in pipes & coils, equivalent length 6. Fanning's equation (Solve simple problems) 7. Friction losses through sudden enlargement and contraction in pipes 8. Flow of fluids in non-circular conduits. 9. Water hammer.

Objectives:

To analyze laminar and turbulent flows. Mechanism of fluid flow in pipes. To use important concepts of Bernoulli's equation & Fanning equation.

SESSION NO	TOPICS TO BE COVERED	PRIMARY REFERENCE			
		(BOOKS/NOTES)			
1	Types of flow: laminar and turbulent flow	T1, R1, R2			
2	Reynolds's number, critical velocity	T1, R1, R2			
3	Solve simple problems on using Reynolds's number	T1, R1, R2			
4	Mechanism of fluid flow in pipes,	T1, R1, R2			
5	Reynolds' experiment	T1, R1, R2			
6	Bernoulli's theorem, pump work	T1, R1, R2			
7	Derivation of Bernoulli's theorem	T1, R1, R2			
8	Solve simple problems on using Bernoulli's theorem	T1, R1, R2			
9	Solve simple problems on using Bernoulli's theorem	T1, R1, R2			
10	Flow of incompressible fluids in pipe	T1, R1, R2			
11	Friction factor, roughness and estimate friction loss in pipes & coils, equivalent length	T1, R1, R2			
12	Fanning's equation	T1, R1, R2			
13	Solve simple problems on using Fanning's equation	T1, R1, R2			
	Friction losses through sudden enlargement and	T1, R1, R2			
14	contraction in pipes				
15	Flow of fluids in non-circular conduits.	T1, R1, R2			
16	Water hammer	T1, R1, R2			

MODULE-III

FLOW MEASUREMENT: 3.1 Working of flow measuring devices, advantages & disadvantages 3.2 Expression for flow measurement through orifice meter, venturi meter & Pitot tube 3.2 Working of Rota meter and its calibration 3.3 Simple problems on flow measurement.

Objectives:

To study the Fundamental concepts of flow measuring devices. Expression for flow measurement through orifice & venturi meter

SESSION NO	TOPICS TO BE COVERED	PRIMARY REFERENCE (BOOKS/NOTES)					
1	Working of flow measuring devices, advantages & disadvantages	T1, R1, R2					
2	Construction and Working principle of orifice T1, R1, R2 meter						
3	Expression for flow measurement through orifice meter,	T1, R1, R2					
4	Simple problems on flow measurement through orifice meter	T1, R1, R2					
5	Construction and Working principle of Venturi meter	T1, R1, R2					
6	Expression for flow measurement through Venturi meter	T1, R1, R2					
7	Simple problems on flow measurement through Venturi meter	T1, R1, R2					
8	Expression for flow measurement through Pitot tube	T1, R1, R2					
9	Simple problems on flow measurement through Pitot tube	T1, R1, R2					
10	Working of Rota meter	T1, R1, R2					
11	Calibration of Rota meter	T1, R1, R2					
12	Simple problems on flow measurement	T1, R1, R2					

MODULE-IV

PUMPS AND FITTINGS: 4.1 Concept of transportation of fluid by pipes and tubes 4.2 Different pipe fittings and its application 4.3 Different types of valves and their applications 4.4 Classification of pumps 4.5 Construction and working of reciprocating and centrifugal pumps 4.6 Performance characteristics of reciprocating and centrifugal pumps. 4.7 Cavitation, Net positive suction head, Air binding & priming of pump 4.8 Centrifugal pump troubles and remedies 4.9 Working of Piston pump, plunger pump, gear pump, diaphragm pump 4.10 Pumping device for gas: blower, compressor and vacuum devices

Objectives:

To study the Fundamental concepts of transportation of fluid by pipes and tubes & its application. To understand the different types of valves and pumps.

SESSION NO	TOPICS TO BE COVERED	PRIMARY REFERENCE (BOOKS/NOTES)
1	Concept of transportation of fluid by pipes and tubes	T1, R1, R2
2	Different pipe fittings and its application	T1, R1, R2
3	Different types of valves and their applications	T1, R1, R2
4	Classification of pumps	T1, R1, R2
5	Construction and working of reciprocating	T1, R1, R2
6	Construction and working of centrifugal pumps	T1, R1, R2
7	Performance characteristics of reciprocating and centrifugal pumps.	T1, R1, R2
8	Cavitation, Net positive suction head,	T1, R1, R2
9	Air binding & priming of pump	T1, R1, R2
10	Centrifugal pump troubles and remedies	T1, R1, R2
11	Working of Piston pump, plunger pump, gear pump, diaphragm pump	T1, R1, R2
12	Pumping device for gas: blower, compressor and vacuum devices	T1, R1, R2

MODULE-V

FLUIDIZATION: 5.1 Pressure drop in porous medium 5.2 Concept of fluidization and types of fluidization 5.3 Minimum fluidization velocity 5.4 Fluidized bed pressure drop 5.5 Principle of pneumatic conveyance 5.6 Flow through packed bed.

Objectives:

To study the Fundamental concepts of Fluidization, types of fluidization and Application.

SESSION NO	TOPICS TO BE COVERED	PRIMARY REFERENCE (BOOKS/NOTES)
1	Concept of Fluidization and Application	T1, R1, R2
2	Types of fluidization	T1, R1, R2
3	Minimum fluidization velocity	T1, R1, R2
4	Derive Minimum fluidization velocity	T1, R1, R2
5	Pressure drop in porous medium	T1, R1, R2
6	Fluidized bed pressure drop	T1, R1, R2
7	Principle of pneumatic conveyance	T1, R1, R2
8	Flow through packed bed.	T1, R1, R2

Course Delivery Plan

WEEK	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
MODULE	1	1	1	2	2	2	2	3	3	3	4	4	4	5	5

BOOKS FOR REFERENCE:

TEXT BOOKS

T1: Unit operation I by K Gavane, Nirali Publication

REFERENCE

R1: Unit operation of Chemical Engineering by Mc Cabe & J M Smith, Tata Mc Grawhill.

R2: Introduction to Chemical Engineering by Badgero and Banchero, Tata Mc Grawhil.

	Prepared by	Approved by				
Signature	Subasini Jena	Born.				
Name	SUBASINI JENA	B.K GANTAYAT				
Designation	Lecturer	HOD, Chemical.				