



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3133608
Semester – III
Subject Name: Basics of Fluid Flow

Type of course: Engineering Science

Prerequisite: A good understanding regarding basic states of matter along with behaviour of fluid under static and dynamic conditions. Mathematical background is also essential in this respect.

Rationale: This subject is intended to make students aware about types and behavior of fluid with the basic fundamentals underlying the operation of fluid for chemical technologies. Apparently the subject aims at measurement techniques involved for the pressure concepts, fluid flow and equipments used for the transportation of fluids.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
3	1	2	5	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	Introduction to fluid and its application: Fluid properties and its classification, Pressure – Hydrostatic Equation, Pressure scales and Measurement, Manometers – different types of manometers	03
2	Fluid Flow phenomena and its basic equations: Fluid flow over a flat plate, Boundary layer, Transition length, Wake formation, Continuity equation, Bernoulli's equation, Correction factors in Bernoulli's Equation, Pump Work.	08
3	Flow of incompressible fluids in conduits and thin layers: Shear stress distribution, friction factor, Hagen Poiseulli's Equation, Flow through non-circular cross sections, Equivalent diameter, Hydraulic radius, friction loss from sudden expansion or contraction of cross section and fittings and valves, Form friction and skin friction.	08
4	Flow past Immersed bodies: Drag, Drag Coefficients, Stream lining, Stagnation pressure. Flow of fluid through a bed – Fluidization, Types of fluidization and applications. Motion of particles through fluids	10
5	Transportation and metering of fluids: Pipes, tubes, joints and fittings selection of pipe size, Valves like Gate, Globe, Plug cocks, Ball, Check valves Introduction to fluid flow measuring instruments like venturimeter, orifice meter, area	08



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	meters like Rota meter, target meters, coriolis meters, magnetic meters etc.	
6	Fluid Flow through Machinery: Pumps, its characteristics like developed head, power requirement, suction lift and cavitations; positive displacement pumps like reciprocating, rotary pumps, centrifugal pump, introduction to centrifugal blowers, compressor, vacuum pumps, jet ejectors	08

Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	23	20	18	15	5

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. W.L.Mc.Cabe, J.C.Smith and P.Harriot, "Unit operations of chemical engineers", McGraw Hill International edition VII.
2. Chemical Engineering Vol.I and II by Coulson and Richardson. Pergamon Press Publications.
3. Noel de.Nevers, "Fluid mechanics for Chemical Engineers", McGraw Hill International edition.
4. Fluid Mechanics – Basic Concepts and Principles. Shiv Kumar, Ane Books Private Limited

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	To identify different system of units and dimensions with conversion	7
CO-2	To explain flow of fluid in different flow geometries and interpreting energy balance equation to estimate losses in different sections of flow.	18
CO-3	To predict flow of incompressible fluid in conduits and thin layers with frictional losses encountered in flow situations.	18
CO-4	To analyze flow of fluids past immersed bodies with industrial applications of Fluidization.	21
CO-5	To describe application of industrial flow measuring instruments along	18



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	with pipes, tubes, joints and valves.	
CO-6	To categorize fluid flow through different types of machinery such as pumps, blowers, compressors, vacuum pump and jet ejectors.	18

List of Experiments:

1. Calibration of Rotameter
2. Determination of discharge coefficient of V – notch.
3. Estimation of viscosity of fluid by Stoke's law
4. Determination of Hydraulic coefficients of Orifice.
5. Frictional pressures drop in annular pipe.
6. Frictional pressures drop in circular pipe.
7. Verification of Bernoulli's Equation
8. Equivalent length of pipe fittings
9. Verification of Bernoulli's Equation

Major Equipments

To study utility of major Equipments like: venturi meter, orifice meter, rotameter, Notches, Pipes and fitting and Valves.

List of Open Source Software/learning website:

Reference to NPTEL lectures can be made for a better understanding regarding fluid flow under different conditions.