

GUJARAT TECHNOLOGICAL UNIVERSITY

Diploma in Chemical Engineering

Semester: 3

Subject Code

Subject Name Fluid Flow Operation

Sr. No.	Course content
1.	Fluid Statics and its Applications : 1.1 Introduction of Fluid static and dynamics 1.2 Nature of Fluid, Ideal fluid & Real fluid 1.3 Pressure Concept : Definitions of static head, Static pressure, Gauge pressure, Absolute pressure, Dynamic pressure, Total pressure, Vacuum(negative pressure). 1.4 Equation of pressure in static fluid, Compressible fluids, Incompressible fluids, Manometers–Simple U Tube manometer, Inclined manometer, Piezometer, Two fluid manometer, Micromanometer 1.5 Continuous Gravity Decanter, Centrifugal Decanter
2.	Fluid–Flow Phenomena : 2.1 The Velocity Field, Velocity gradient and rate of shear, Boundary layer, Boundary layer separation and Wake formation. 2.2 Classify fluid with example 2.3 Viscosity concept : Absolute, Kinematic, Relative viscosity 2.4 Steady state and unsteady state conditions 2.5 Reynold experiment and Explanation of a) Reynold no. b) Turbulent flow c) Laminar flow d) Transition flow
3.	Basic Equations of Fluid Flow : 3.1 Continuity equation, Average velocity–Mass velocity, 3.2 Bernoulli Equation with Derivation 3.3 Correction factors in Bernoulli Equation–Kinetic energy correction factor, Correction for fluid friction, Pump work in Bernoulli Equation, 3.4 Significance of Hagen–Poiseuilles Equation
4.	Friction in Flowing Fluid : 4.1 Explain : Friction factor chart, Roughness of pipe, skin friction and form friction. Hydraulic radius and equivalent diameter 4.2 Friction from changes in velocity or direction – Friction loss from sudden expansion of cross section, Friction loss from sudden contraction of cross section, 4.3 Friction loss in fittings and valves

5.	Transportation of Fluid : 5.1 Difference between pipe & tube. 5.2 Different types of fittings & joints-their applications 5.3 Explain : various Types of valves like a) Gate valves b) Globe c) Check valves d) Control valve 5.4 Pumps : 5.4.1 Classification of pumps. 5.4.2 Construction and working of Reciprocating and centrifugal pump. 5.4.3 Developed head and power requirement, Suction lift and Cavitation in centrifugal pump 5.4.4 Characteristic curves of Centrifugal pump. 5.4.5 Simple problems based on NPSH, Efficiency, Head and H.P. 5.5 General characteristics of Compressor,Fan, Ejectors,Blower, Vacuum pumps and Jet Ejectors(Description and uses)
6.	Flow Measurement : 6.1 Different methods of flow measurement 6.2 Classification of flow measuring devices 6.3 Construction, working principles and application of flow meters like Rotameter, Orifice meter, Venturimeter, Pitot tube, All types of weirs, 6.4 Derivation of equation for Orifice meter and Venturimeter 6.5 Simple example based on formula of Orifice meter, Venturimeter
7.	Conveying : 7.1 Pneumatic conveying 7.2 Hydraulic conveying 7.3 Industrial Application of Conveying
8.	Fluidization : 8.1 Introduction, 8.2 Porosity of static bed, Porosity of fluidized bed, Minimum porosity 8.3 Bed Pressure drop & Bed height

LABORATORY EXPERIMENTS :

1. Venturimeter
2. Orifice meter
3. Pitot tube
4. Rotameter
5. V. Notch & Rectangular Notch
6. Reynold's Experiment
7. Bernoullies Experiment
8. Reciprocating Pump
9. Centrifugal Pump

10. Flow through Fluidized bed
11. Study of Pipes, Tubes & Fittings
12. Study of different types of Valves 2 Hours
13. Study of Different types of Pump

Reference Books:

1. Unit Operations of Chemical Engineering, Warren, McCabe & Julian Smith; McGraw Hill Publication
2. Introduction to Chemical Engineering By L.Badger & Julius T. Banchero
3. Hydraulics & Hydraulic Machines By Modi & Sheth
4. Principles of Unit Operations By Foust & Wenzel
5. Unit Operations of Chemical Engineering By P. Chattopadhyay Vol-I
6. A text book of Fluid Mechanics By R.S. Khurmi