

INSTITUTE	DIPLOMA STUDIES
PROGRAM	DIPLOMA ENGINEERING (CHEMICAL ENGINEERING)
SEMESTER	3
COURSE TITLE	UNIT OPERATION - II
COURSE CODE	09CH2301
COURSE CREDITS	4

Objective:

- 1 To study about Fluid Flow Operations generally carried out in Chemical Processes Industries involving.
- 2 To study about Fluid Flow Operations generally carried out in Chemical Processes Industries involving

Course Outcomes: After completion of this course, student will be able to:

- 1 Understand basic parameters, types of flow and behaviour of fluid.
- 2 Understand different kind of fittings and joints.
- 3 Operate different type of pumps and valves.
- 4 Operate different type of flow measurement devices.

Pre-requisite of course: Concepts of units and dimensions, knowledge of basic physics.

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
2	0	4	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	Fluid Statics and its Applications Introduction of Fluid static and dynamics, Nature of Fluid, Ideal fluid & Real fluid, Pressure Concept: Definitions of static head, Static pressure, Gauge pressure, Absolute pressure, Dynamic pressure, Total pressure, Vacuum (negative pressure), Manometers–Simple U Tube manometer, Purpose of pressure measurement. Mechanical pressure gauges, Bourdon tube, diaphragm & bellows gauges. Continuous Gravity Decanter, Centrifugal Decanter.	4
2	Fluid–Flow Phenomena Reynolds No. and its significance, The Velocity Field, Velocity gradient and rate of shear, Boundary layer, Boundary layer separation and Wake formation, Classify fluid with example, Viscosity concept: Absolute, Kinematic, Relative viscosity, Steady state and unsteady state conditions.	4

Contents : Unit	Topics	Contact Hours
3	Basic Equations of Fluid Flow Continuity equation, Average velocity, Mass velocity, Bernoulli Equation with Derivation, Correction factors in Bernoulli Equation, Significance of Hagen–Poiseuille's Equation. Introduction to compressible fluid, Mach- Number	6
4	Friction in Flowing Fluid Explain: Friction factor chart, Roughness of pipe, Define skin friction, form friction, Hydraulic radius and equivalent diameter, Friction loss from Sudden expansion of cross section, Friction loss from sudden Contraction of cross section.	4
5	Transportation of Fluid Difference between pipe & tube. Different types of fittings & joints-their applications Explain: various Types of valves like: Gate valves, Globe valve, Check valves, Non-Return Valve, Control valve, Pumps: Classification of pumps. Construction and working of Reciprocating and centrifugal pump and Diaphragm pump. Developed head and power requirement, Suction lift and Cavitation in centrifugal pump, Characteristic curves of Centrifugal pump, Simple problems based on NPSH, Efficiency, Head and H.P.,	6
6	Flow Measurement Different methods of flow measurement, Classification of flow measuring devices, Construction, working principles and application of flow meters like Rotameter, Orifice meter, Venturimeter, Pitot tube, all types of weirs., Derivation of equation for Orifice meter and Venturimeter, Simple example based on formula of Orifice meter, Venturimeter.	4
Total Hours		28

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	Experiment No.1 Reynolds's Experiment	4
2	Experiment No. 2 Bernoulli's Experiment	8
3	Experiment No. 3 V. Notch & Rectangular Notch	8
4	Experiment 4 Venturi meter	8
5	Experiment No. 5 Orifice meter	4
6	Experiment No. 6 Pitot tube	4
7	Experiment No. 7 Study of Pipes, Tubes & Fittings	8

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
8	Experiment No. 8 Reciprocating Pump	6
9	Experiment No. 9 Centrifugal Pump	6
Total Hours		56

Textbook :

- Unit Operations of Chemical Engineering, W.L. McCabe, J. C. Smith & Harriott, McGraw-Hill, 2007

References:

- Introduction to Chemical Engineering, Introduction to Chemical Engineering, L.Badge & Julius T. Banchemo, McGraw-Hill, 2001
- Unit Operation – II , Unit Operation – II , K. A. Gavhane, Nirali Publication, 2012
- Unit Operations of Chemical Engineering , Unit Operations of Chemical Engineering , P. Chattopadhyay , Nirali Publication, 2010

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
40.00	40.00	10.00	10.00	0.00	0.00

Instructional Method:

- The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc
- The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room
- Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory
- Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Supplementary Resources:

- <https://www.vlab.co.in/broad-area-chemical-engineering>
- https://onlinecourses.nptel.ac.in/noc22_ch03/preview