



SECOND-YEAR DIPLOMA ENGINEERING SYLLABUS

Semester: 3rd

Course Code: 002206303

Type of Course: PCC-2

Course Name: Fluid Flow Operation

Course Prerequisites: Knowledge of fluid mechanics is essential for the chemical engineer because the majority of chemical-processing operations are conducted either partly or totally in the fluid phase. This course deals with basic concepts and principles in hydrostatics and hydrodynamics and their application in solving fluid - mechanics problems. Using various theoretical and practical concepts of fluid mechanics, power requirement for pumps, blowers and compressors can be determined and friction losses through pipes and fittings can also be calculated.

COURSE OBJECTIVE(S):

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences: To maintain flow of different fluids in the chemical plants according to the process requirement.

TEACHING & EXAMINATION SCHEME:

Teaching Scheme (Hrs/Week)				Examination Scheme					
Theory	Tutorial	Practical	Credit	SEE		CA			Total
				Th	Pr	MSE	PLE	LA	
3	0	0	3	60	00	20	20	00	100

SEE: Semester End Examination; CA: Continuous Assessment; Th: Theory; Pr: Practical; MSE: Mid Semester Examination; PLE: Participatory Learning Experience; LA: Laboratory Assessment

TOTAL Theory Hours: No. of Th. and Tut. Hrs/Week*15 = 45

COURSE CONTENT(S):

Unit No.	Content	Hours	Weightage (%)
1	Unit - I Fluid Static sand its Applications 1.1 Ideal fluid and Real fluid 1.2 Fundamentals of fluid statics and dynamics 1.3 Define pressure, Static pressure, Dynamic pressure, Vacuum, Density, Viscosity (Absolute and Kinematic), Specific gravity 1.4 Compressible and incompressible fluids 1.5 Derivation of equation of pressure in static fluid 1.6 Principle construction and working of: Simple U-tube manometer, Inclined manometer 1.7 Derive equation of pressure difference for U-tube manometer 1.8 Differential pressure cell	06	15
2	Unit- II Fluid-Flow Phenomena and basic equations of fluid flow 2.1 Velocity field, velocity gradient, shear stress and rate of shear 2.2 Boundary layer & it's formation In straight tubes 2.3 Newtonian and Non-Newtonian fluid 2.4 Reynolds's experiment and Reynolds Number	06	15



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	2.5 Numerical based on Reynolds Number		
3	Unit- III Basic Equations of Fluid Flow 3.1 Average velocity and mass velocity 3.2 Continuity equation for mass balance in steady flow 3.3 Bernoulli's equation and corrections in Bernoulli's equation 3.4 Hagen-Poiseuille's Equation 3.5 Numerical based on basic equations	06	15
4	Unit-IV Friction in Flowing Fluid 4.1 Roughness of pipe 4.2 Hydraulic radius and equivalent diameter 4.3 Friction factor chart 4.4 Friction losses from: (a) Sudden expansion of cross section (b) Sudden contraction of cross section 4.4.1 Friction loss in fittings and valves	05	09
5	Unit- V Transportation of fluid 5.1 Introduction of pipe and tube 5.2 Birmingham wire gauge(BWG) and schedule no. 5.3 Types and uses of fittings and joints 5.4 Construction and working of valves like: (a) Gate valve (b) Globe valve (c) Check valve (d) Butterfly valve (e) Ball valve (f) Control valve(Air to open and Air to close) 5.5 Classification of pumps 5.6 Construction and working of centrifugal, reciprocating and rotary pump 5.7 Explain characteristics of centrifugal pump 5.8 Developed head and power requirement in centrifugal pump 5.9 NPSH, and Cavitation in centrifugal pump 5.10 Numerical based on NPSH, efficiency, head and power 5.11 Introduction to Fan, Blowers, Compressors, Vacuum pump and jet ejectors	11	24
6	Unit- VI Flow Measurement 6.1 Classification of flow measuring devices 6.2 Construction, working principles and application of flow meters like Venturi meter, Orifice meter, Rotameter, weirs, Magnetic flow meter 6.3 Derivation of equation of flow rate through Orifice meter, Venturi meter. 6.4 Numerical of Orifice meter, Venturi meter	08	17
7	Unit- VII Fluidization 7.1 Fluidization and its industrial applications 7.2 Drag and drag coefficient Stokes' law 7.3 Condition for Fluidization 7.4 Minimum fluidization velocity	03	05
	TOTAL	45	100%

Text Book(s):

Title of the Book	Author(s)	Publication
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Unit Operation -1	Gavhane K. A.	Nirali Prakashan, Pune 2009
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Reference Book(s):

Title of the Book	Author(s)	Publication
Unit Operations of Chemical Engineering	McCabe, Warren L., Julian C. Smith	McGraw Hill Publication, New York 2004
Unit Operations of Chemical Engineering Vol-I	Chattopadhyay, P.	Khanna Prakashan, New Delhi, 1996
A Textbook Of Fluid Mechanics And Hydraulic Machines	Dr. R. K. Bansal	Publisher: Laxmi Publications, 2005

Web Material Link(s):

- <https://ndl.iitkgp.ac.in/>
- <https://www.vlab.co.in/>
- <http://www.nzifst.org.nz/unitoperations/flfltheory.htm>
- <https://www.slideshare.net/AjinkyaKhandizod/fluid-flow-operations-applications-of-fluid-mechanics-rheological-classifications-of-fluid>

Equivalent/Corresponding Course on NPTEL (SWAYAM):

NPTEL course on

<https://nptel.ac.in/>

COURSE EVALUATION:

Sr. No.	Activity	Marks	Weightage
1	Semester End Examination (External Th)	60	60%
2	Internal Examination	40	40%
2(a)	Mid Semester Examination	20	50%
2(b)	Attendance	10	25%
2(c)	Assessment Types (Any One from 2(c).1 to 2(c).7)	10	25%
2(c).1	Subject (Course) based Mini-Project		
2(c).2	Industry/Site Visit & Report		
2(c).3	Assignment		
2(c).4	Seminar		
2(c).5	Case Study		
2(c).6	Surprise Class Quiz		
2(c).7	Design Exercise		
2(c).7	Presentation		
2(d)	Practical (if Applicable)		

* For 4 Credit Subjects

1 Credit = 25 Marks



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Theory: 3 Credits = 75 Marks

practical: 1 Credit = 25 Marks

SEE Evaluation will be of 100 marks and converted to 50 Marks (75 Th + 25 Pr)

CA Evaluation will be of 100 Marks and converted to 50 Marks. (75 Th + 25 Pr)

Distribution of Marks for Theory Evaluation as per Bloom's Taxonomy Level:

Level	Remember	Understand	Apply	Analyze	Evaluate	Create
% Weightage	18%	31%	21%	10%	10%	10%

COURSE OUTCOMES: *(in the range of 4 to 6)*

CO1	Calculate the pressure difference using fundamental concept of fluid statics and carry out dimensional analysis
CO2	Solve various fluid flow problems using governing equations.
CO3	Calculate Friction losses from changes in velocity or direction
CO4	Understand the concept of fluidization
CO5	Select the metering equipments and fluid moving machinery for appropriate chemical engineering operations