SRM Institute of Science and Technology

Faculty of Engineering and Technology

Department of Chemical Engineering

Course Code & Title: **15CH204 CHEMICAL ENGINEERING FLUID MECHANICS**

Course Strategy Description

Course description:

This course deals with (i) behavior of fluids static and kinematic conditions (ii) the calculation and prediction of flow past immersed bodies. (iii) Accessories required for the transportation of fluids and (iv) meters required to measure the fluid flow properties.

Compulsory/Elective course: Compulsory for B.Tech. Chemical Engineering

Credit hours: 4 credits

Course coordinator(s): Dr.S.VISHALI, Associate Professor, Department of Chemical Engineering

Instructor(s):

Name of the instructor	Room number	Email (@ktr.srmuniv.ac.in)	Consultations (day order/periods)
Dr.S.VISHALI	B 205	vishali.s	Day – 1: 2 and 3
Dr.K.ANBALAGAN	PGA 204	anbalagan.k	Day – 1: 2 and 3
Dr.K.SOFIYA	PGA 205	sofiya.k	Day – 1: 2 and 3

Relationship to other courses

Course category: Professional core

Prerequisite: Nil Co-requisite: Nil

Following courses: 15CH206L MECHANICAL OPERATIONS AND FLUID MECHANICS LABORATORY - I

15CH209 PRINCIPLES OF MASS TRANSFER

15CH302 PROCESS HEAT TRANSFER

Text book(s) and/or required materials:

1. McCabe, W.L., Smith, J.C., and Harriot, P., "Unit Operations in Chemical Engineering", 7th Edition, McGraw-Hill, 2005.

Reference book(s):

2. Coulson J.M., Richardson J.F., Backhurst J.R. and Harker J.M., "Coulson & Richardson's Chemical Engineering", Vol. I, 6th Edn., Butter worth Heinemann, Oxford, 1999.
3. Noel deNevers, "Fluid Mechanics for Chemical Engineers", 2nd Edn., McGraw Hill International Editions, 1991. Fluid Mechanics, By Frank M. White, McGraw-Hill, 2003

Class schedule: B Slot; Four 50 minutes lecture sessions per week, for 15 – 16 weeks

DAY ORDER: HOUR	**TIMING**
DAY - 2: 6 AND 7	12.30 PM -2.15 PM
DAY - 4: 8	2.20 PM-3.10 PM
DAY - 5: 4	10.40 AM -11.30 AM

Instructional Objectives (IOs) and Student Outcomes (SOs)

S.No.	Instructional Objectives	Student Outcomes				
1.	Nature of fluids and fluid flow phenomena	a	b			
2.	Kinematics of flow	a	b			
3.	Flow past immersed bodies	a	b			
4.	Transportation of fluids	b	c			
5.	The metering of fluids	c				

Teaching plan

Section	Topics	L/T	Text book/chapter	IOs	SOs	Problem solving (Y/N)
UNIT I: FLUID FLOW PHENOMENA		**12**				
1	Nature of fluids: incompressible and compressible, properties, hydrostatic equilibrium	2	1	1	a, b	Y
2	Manometers, types of manometers	2	1,2	1	a, b	Y
3	Potential flow, boundary layer, the velocity field, laminar flow	2	1	1	a, b	N
4	Newtonian and non-Newtonian fluids, Newton's-law of viscosity, turbulence, Reynolds number	2	1	1	a, b	N
5	Eddy viscosity, flow in boundary layers, laminar and turbulent flow in boundary layers rate equation.	2	1	1	a, b	Y
6	Boundary-layer formation in straight tubes	2	1	1	a, b	N
UNIT II: KINEMATICS OF FLOW		**12**				
7	Streamlines and stream tubes	1	1	2	a, b	N
8	Bernoulli equation, pump work in Bernoulli equation.	2	1,2	2	a, b	Y
9	Flow of incompressible fluids in conduits and thin layers	2	1	2	a, b	Y
10	Friction factor, relationships between skin-friction parameters	2	1	1,2	a, b	Y
11	Hagen-Poiseuille equation, hydraulically smooth pipe, von Karman equation, roughness parameter	3	1,2	1,2	a, b	Y
12	Equivalent diameter, form friction losses in Bernoulli equation, couette flow.	2	1	1,2	a, b	N
UNIT III FLOW PAST IMMERSED BODIES		**12**				
13	Drag, drag coefficients, drag coefficients of typical shapes	2	1	2,3	a, b	N
14	Ergun equation	2	1	2,3	a, b	Y
15	Terminal settling velocity, free and hindered settlings	2	1	2,3	a, b	N
16	Stokes' law, Newton's law, criterion for settling regime	2	1	2,3	a, b	Y
17	Fluidization, and its types	2	1	3	a, b	N
18	Conditions for fluidization, minimum fluidization	2	1	3	a, b	Y

	velocity					
UNIT IV: TRANSPORTATION OF FLUIDS		**12**				
19	Introduction to: pipe and tubing, joint and fittings, stuffing boxes, mechanical seals	2	1,2	4	b, c	N
20	Gate valves and globe valves, plug cocks and ball valves, check valves.	2	1,2	4	b, c	N
21	Classification and selection of pumps, blowers and compressors.	2	1,2	2,4	b, c	N
22	Pumps: developed head, power requirement, suction lift and cavitation, NPSH	2	1	4	b, c	Y
23	Constructional features and working principle of single suction volute centrifugal pump	1	1	4	b, c	N
24	Constructional features and working principle of reciprocating pump	1	1,2	2,4	b, c	N
25	Characteristic curves of a centrifugal pump, comparison of devices for moving fluids, constructional features and working principle of jet ejectors	2	1,2	2,4	b, c	N
UNIT V: METERING OF FLUIDS		**12**				
26	Constructional features and working principles of venturi meter	2	1,2	5	c	N
27	Constructional features and working principles of orificemeter	2	1,2	5	c	N
28	Rotameters, pitot tube, target meters	2	1,2	2,5	c	N
29	Vortex-shedding meter, turbine meter, magnetic meters.	2	1,2	2,5	c	N
30	Application of Bernouli equation to venturi meter and orifice meter, flow rate calculations from the readings of venture meter, orifice meter and pitot tube	4	1,3	2,5	c	Y

Evaluation methods

S.NO.	Test	Topics covered	Marks	Test/Exam duration (min)
1.	Cycle test – I	Unit I and II	15	100

2.	Cycle test – II	Unit III, IV and V	25	180
3.	Surprise test	Questions from any units	5	20
4.	Assignment	Questions from any units	5	-
5.	Final exam	All the units	50	180

Surprise test

The surprise test will not be announced. The questions for this test will be covered until the previous class.

Home assignments

A few units will have home assignment. All the assignments should be submitted on or before the last date of submission.

Teaching Methodology

Chalk and talk and power point presentation

Prepared by: Dr. K. Suresh, Assistant Professor (O.G.), Department of Chemical Engineering

Dated:

Revision no.: 1 **Date of revision:** **Revised by:** Mr. V. Ganesh, AP/Chemical

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Course Coordinator Academic Coordinator HoD/Chemical