	MOHAMED SATHAK A J COLLEGE OF ENGINEERING Chennai 603103	Fromat no.	TLP 05
		Rev.Date	01/02/2021
	LESSON PLAN - THEORY	Rev. No.	0

Department of Civil Engineering			
Name of the Subject	FLUID MECHANICS	Name of the handling Faculty	Mr M.B. Shanmuhanathan
Subject Code	CE8302	Year / Sem	II / III
Acad Year	2021 - 2022	Batch	2020 - 2024

Course Objective

To understand the basic properties of the fluids, fluid kinematics and fluid dynamics.

To analyze and appreciate the complexities involved in solving the fluid flow problems.

Course Outcome

Explain the concepts of static, kinematic and dynamic equilibrium of fluids.

Solve the problems related to equation of fluid motions.

Analyse the dimensional parameters of the models.

Analyse the types of flow and losses of flow in pipes.

Solve the boundary layer problems.

Lesson Plan

Sl. No.	Topic(s)	T / R* Book	Periods Required	Mode of Teaching (BB / PPT / NPTEL / MOOC / etc)	Blooms Level (L1-L6)	CO	PO
UNIT I - FLUID PROPERTIES AND FLUID STATICS							
1	Fluid – definition, distinction between solid and fluid	T3	1	BB	L2	CO1	PO1-PO4
2	Units and dimensions	T3	1	BB	L1	CO1	PO1-PO4
3	Properties of fluids - density, specific weight, specific volume	T3	1	BB	L1	CO1	PO1-PO4
4	Specific gravity, viscosity, compressibility	T3	1	BB	L1	CO1	PO1-PO4
5	Vapour pressure, capillarity and surface tension	T3	1	BB	L1	CO1	PO1-PO4
6	**Fluid statics**: concept of fluid static pressure	T3	1	NPTEL	L2	CO1	PO1-PO4
7	Absolute and gauge pressures	T3	1	BB	L2	CO1	PO1-PO4
8	Pressure measurements by manometers-forces on planes	T3	1	BB	L2	CO1	PO1-PO4
9	Centre of pressure – buoyancy and floatation.	T3	1	BB	L1	CO1	PO1-PO4
Suggested Activity: Assignment (Manometers)							
Evaluation method: Paper Based							
UNIT II - FLUID KINEMATICS AND DYNAMICS							
10	**Fluid Kinematics** – Flow visualization - lines of flow, types of flow - velocity field and acceleration	T3	1	NPTEL	L2	CO1	PO1-PO4
11	continuity equation (one and three dimensional differential forms)	T3	1	BB	L3	CO2	PO1-PO4
12	Stream line-streak line-path line- stream function	T3	1	BB	L2	CO2	PO1-PO4
13	velocity potential function - flow net.	T3	1	BB	L2	CO2	PO1-PO4
14	**Fluid dynamics** - equations of motion	T3	1	BB	L3	CO1	PO1-PO4

15	Euler's equation along a streamline	T3	1	BB	L3	CO2	PO1-PO4
16	Bernoulli's equation – applications	T3	1	BB	L2	CO2	PO1-PO4
17	Venturi meter, orifice meter and Pitot tube	T3	1	BB	L3	CO2	PO1-PO4
18	Linear momentum equation and its application.	T3	1	BB	L2	CO2	PO1-PO4
Suggested Activity: Tutorial (Stream line-Streak line-Path line)							
Evaluation method: PPT							
UNIT III - DIMENSIONAL ANALYSIS AND MODEL STUDIES							
19	Fundamental dimensions	T3	1	BB	L2	CO3	PO1-PO4
20	Dimensional homogeneity	T3	1	BB	L2	CO3	PO1-PO4
21	Rayleigh's method	T3	1	BB	L3	CO3	PO1-PO4
22	Buckingham Pi- theorem method	T3	1	BB	L3	CO3	PO1-PO4
23	Dimensionless parameters	T3	1	BB	L3	CO3	PO1-PO4
24	Similitudes studies	T3	1	BB	L2	CO3	PO1-PO4
25	Model studies	T3	2	BB	L4	CO3	PO1-PO4
26	Distorted models.	T3	1	BB	L4	CO3	PO1-PO4
Suggested Activity: Tutorial (Buckingham Pi- theorem method)							
Evaluation method: PPT							
UNIT IV - FLOW THROUGH PIPES							
27	Reynold's experiment	T3	1	BB	L2	CO4	PO1-PO4
28	Laminar flow through circular pipe (Hagen poiseulle's)	T3	1	BB	L3	CO4	PO1-PO4
29	hydraulic and energy gradient	T3	1	BB	L3	CO4	PO1-PO4
30	Flow through pipes	T3	1	NPTEL	L2	CO4	PO1-PO4
31	Darcy - Weisbach's equation	T3	1	BB	L3	CO4	PO1-PO4
32	Pipe roughness -friction factor	T3	1	BB	L3	CO4	PO1-PO4
33	Moody's diagram	T3	1	BB	L2	CO4	PO1-PO4
34	Major and minor losses of flow in pipes	T3	1	BB	L4	CO4	PO1-PO4
35	Pipes in series and in parallel.	T3	1	BB	L3	CO4	PO1-PO4
Suggested Activity: Case Studies (Pipe roughness)							
Evaluation method: Group Discussion							
UNIT V - BOUNDARY LAYER							
36	Boundary layer – definition	T3	1	BB	L2	CO5	PO1-PO4
37	Boundary layer on a flat plate	T3	1	BB	L2	CO5	PO1-PO4
38	Laminar and turbulent boundary layer	T3	1	BB	L3	CO5	PO1-PO4
39	Displacement	T3	1	BB	L3	CO5	PO1-PO4
40	Energy and momentum thickness	T3	2	BB	L3	CO5	PO1-PO4
41	Momentum integral equation	T3	1	BB	L3	CO5	PO1-PO4
42	Boundary layer separation and control	T3	1	BB	L3	CO5	PO1-PO4
43	Drag in flat plate	T3	1	BB	L3	CO5	PO1-PO4

Suggested Activity: Assignment (Momentum integral equation)	
Evaluation method: Paper Based	
Content Beyond the Syllabus Planned	
1	Viscous flow - Shear stress, pressure gradient relationship
2	Laminar flow between parallel plates

Text Books

1	Modi P.N and Seth "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi, 2009.
2	Jain.A.K.., "Fluid Mechanics" (Including Hydraulic Machines), Khanna Publishers, Twelfth Edition, 2016.
3	Subramanya.K " Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Education Private Limited, New Delhi, 2010.
4	Rajput.R.K. “Fluid Mechanics", S.Chand and Co, New Delhi, 2008.

Reference Books

1	Streeter, V.L., and Wylie, E.B., “Fluid Mechanics”, McGraw Hill, 2000.
2	Fox W.R. and McDonald A.T., Introduction to Fluid Mechanics John-Wiley and Sons, Singapore, 2013.
3	White, F.M., “Fluid Mechanics”, Tata McGraw Hill, 5th Edition, New Delhi, 2017.
4	Mohd. Kaleem Khan, "Fluid Mechanics and Machinery", Oxford University Press, New Delhi, 2015.
5	Bansal.R.K., “Fluid Mechanics and Hydraulic Machines”, Laxmi Publications Pvt. Ltd., New Delhi, 2013.

Website / URL References

1	https://www.youtube.com/watch?v=DpsRNq5mlVQ&feature=emb_logo
2	https://www.youtube.com/watch?v=ZCaNOpKK5W4&feature=emb_logo
3	https://www.youtube.com/watch?v=wtgVocDQfvo&feature=emb_logo

Blooms Level

Level 1 (L1) : Remembering **Level 2 (L2) : Understanding** **Level 3 (L3) : Applying**	Lower Order Thinking	Fixed Hour Exams	**Level 4 (L4) : Analysing** **Level 5 (L5) : Evaluating** **Level 6 (L6) : Creating**		Higher Order Thinking	Projects / Mini Projects

Mapping syllabus with Bloom's Taxonomy LOT and HOT

Unit No	Unit Name	L1	L2	L3	L4	L5	L6	LOT	HOT	Total
Unit 1	FLUID PROPERTIES AND FLUID STATICS	5	4					9	0	9
Unit 2	FLUID KINEMATICS AND DYNAMICS		5	**4**				9	0	9
Unit 3	DIMENSIONAL ANALYSIS AND MODEL STUDIES		3	**3**	**2**			6	2	8
Unit 4	FLOW THROUGH PIPES		3	**6**				9	0	9
Unit 5	BOUNDARY LAYER		2	**6**				8	0	8
Total		5	17	19	2			41	2	43
Total Percentage		11.63	39.53	44.19	1.00			95.3488	4.65116	100

CO PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	0	0	0	0	0	0	0	0	2	1
CO2	3	2	3	2	0	0	0	0	0	0	0	0	1	1
CO3	3	2	1	2	0	0	0	0	0	0	0	0	1	0
CO4	3	2	2	2	0	0	0	0	0	0	0	0	1	0
CO5	3	2	2	2	0	0	0	0	0	0	0	0	1	0
Avg	3	2	1.8	1.8									1.2	1

Justification for CO-PO mapping

CO1	By learning hydrostatic and properties of fluids attribute to Engineering and science knowledge (PO1), this will help in solving problems on static and fluid flow (PO2),basic part of design and development of solution on water retaining structures and tanks (PO3) and By learning the properties of fluid is useful in various fluid mechanic research. (PO4).

CO2	By learning fluid kinematics and dynamics can solve problems (PO1), This will help in analyzing complex problems (PO2), design and development of solution (PO3) and in investigation of complex problem (PO4).
CO3	By learning dimensional and model analysis ,can solve problems (PO1). can analyze and design various flow components (PO2,PO3),conduct investigation of complex problems(PO4)
CO4	By learning Bernoulli"s principle the fundamental engineering knowledge is learned (PO1). This will help in analyzing complex problems on fluid flow (PO2), design and development of solution on water supply drains (PO3) and investigate the behaviour of the flow (PO4).
CO5	By learning the boundary layer principle the lift and drag of plates which is the engineering principle of various airplane and ship (PO1). Can analyze the movement and force on airplane wings (PO2) Calculate of channels and pipe flow friction in pipe surface (PO3) the losses can be tested in lab for the field application (PO4)

3	**High level**	**2**	**Moderate level**	**1**	Low level

Name & Sign of Faculty Incharge :

Name & Sign of Subject Expert :

Head of the Department :

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