



ACADEMIC YEAR: 2018-2019

Subject Code	CE8302	L	P	T	C
Subject Title	Fluid Mechanics	3	0	0	3
Year / Dept / Sem	II/CIVIL/III	Regulation Year		2017	
Faculty Name / Desg / Dept	Mr.R.PANDIARAJAN /AP/CIVIL				
Course Prerequisite	1. Properties of fluids 2. Fluid statics 3. Fluid dynamics 4. Dynamic similitude 5. Flow of compressible and incompressible fluids in closed conduits 6. Uniform flow in prismatic open channels.				

CE8302

FLUID MECHANICS

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COURSE OBJECTIVES:

To understand the basic properties of the fluid, fluid kinematics, fluid dynamics and to analyse and appreciate the complexities involved in solving the fluid flow problems.

UNIT I FLUID PROPERTIES AND FLUID STATICS 9

Fluid – definition, distinction between solid and fluid - Units and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapour pressure, capillarity and surface tension - Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by manometers-forces on planes – centre of pressure – buoyancy and floatation.

UNIT II FLUID KINEMATICS AND DYNAMICS 9

Fluid Kinematics – Classification and types of flow - velocity field and acceleration - continuity equation (one and three dimensional differential forms)- stream line-streak line-path line- stream function - velocity potential function - flow net. Fluid dynamics - equations of motion -Euler's equation along a streamline - Bernoulli's equation – applications - venturi meter, orifice meter and Pitot tube- linear momentum equation and its application to pipe bend.

UNIT III DIMENSIONAL ANALYSIS AND MODEL STUDIES 9

Fundamental dimensions - dimensional homogeneity - Rayleigh's method and Buckingham Pi-theorem - dimensionless parameters - similitudes and model studies - distorted models.

UNIT IV FLOW THROUGH PIPES 9

Reynold's experiment - laminar flow through circular pipe (Hagen poiseulle's) - hydraulic and energy gradient – flow through pipes - Darcy - Weisbach's equation - pipe roughness -friction factor- Moody's diagram- major and minor losses of flow in pipes - pipes in series and in parallel.

UNIT V BOUNDARY LAYER 9

Boundary layer – definition- boundary layer on a flat plate – laminar and turbulent boundary layer- displacement, energy and momentum thickness – Momentum integral equation-Boundary layer separation and control – drag on flat plate.

TOTAL: 45 PERIODS

OBJECTIVES:

At the end of the course students should be able to

- Get a basic knowledge of fluids in static, kinematic and dynamic equilibrium.
- Understand and solve the problems related to equation of motion
- Gain knowledge about dimensional and model analysis.
- Learn types of flow and losses of flow in pipes.
- Understand and solve the boundary layer problems.

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.

REFERENCES:

1. 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.

Course Objectives (CO)	<p>CO1: To understand the basic properties of the fluid, fluid kinematics, fluid dynamics</p> <p>CO2: To analyse and appreciate the complexities involved in solving the fluid flow problems.</p>
Expected Course Outcomes (ECO)	<p>At the end of the course, the students should be able to:</p> <p>ECO1: The students will be able to understanding of fluid mechanics fundamentals, including concepts of mass and momentum conservation.</p> <p>ECO2 : The students will be able to ability to apply the Bernoulli equation to solve problems in fluid mechanics</p> <p>ECO3: The students will be able to ability to use potential flow theory to solve problems in fluid mechanics..</p> <p>ECO4: The students will be able to get a basic knowledge of fluids in static, kinematic and dynamic equilibrium</p> <p>ECO5: The students will able to gain the knowledge of the applicability of physical laws in addressing problems in hydraulics.</p> <p>ECO6: The students will able to perform dimensional analysis for problems in fluid mechanics.</p>

Programme Outcomes of Civil Engineering

- Graduates of Civil Engineering program will be able to apply the fundamental knowledge of mathematics, science and engineering to solve problems pertaining to Civil Engineering.
- Graduates of Civil Engineering program will be able to identify, analyze, formulate, and solve civil Engineering problems in accordance with Indian Standard codes of practice.
- Graduates of Civil Engineering program will be able to design a system component, or process to meet desired needs within realistic constraint such as economic, environmental, social, political, ethical, health safety, manufacturability, and sustainability.
- Graduates of Civil Engineering program will be able to design and conduct experiments, as well as to analyze and interpret data.
- Graduates of Civil Engineering will be able to use the techniques, skills, and modern civil engineering tools, necessary for engineering practice.
- Graduates of Civil Engineering program will be able to incorporate specific contemporary issues into the identification, formulation, and solution of specific civil engineering problems.
- Graduates of Civil Engineering program will be able to work on the basis of broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- Graduates of Civil Engineering program will be able to understand the role of Civil Engineers and ethical responsibility.
- Graduates of Civil Engineering program will be able to function on multidisciplinary teams.
- Graduates of Civil Engineering program will be able to deliver effective verbal, written, and graphical communications.
- Graduates of Civil Engineering program will be able to recognize the need for, and an ability to engage in life-long learning.
- Graduates of Civil Engineering program will be able to perform economic analysis, quality checks, time/labour management and cost estimates related to design, construction, operations and maintenance of systems in the civil technical specialties.

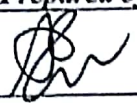
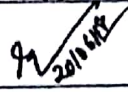
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	-	-	-	-	-	-	-	-
CO2	2	2	1	-	-	-	-	-	-	-	-	-
CO3	-	2	-	1	-	-	-	-	-	-	-	-
CO4	3	-	-	-	1	-	-	-	-	-	-	-
CO5	1	2	1	-	-	1	1	-	-	-	-	-
CO6	-	3	2	1	-	-	-	-	-	-	-	-
Additional Topics beyond syllabus/Seminars/Assignments	1. Fluid Mechanics and Fluid Power 2. Losses In Pipes											
Related Website URLs	W1: https://howdy.tamu.edu/Inside/HR2504/PDFs/SYL_201411_11260.pdf W2: http://textofvideo.nptel.iitm.ac.in/video.php?courseId=105101082											
Related Video Course Materials (min. 3 no.s)	V1: https://www.youtube.com/watch?v=vy2LW9tUFHA V2: https://www.youtube.com/watch?v=bC8v6hlXnSk V3: https://www.youtube.com/watch?v=R7Fz8q0lOSo V4: https://www.youtube.com/watch?v=ev9Xyulwiul V5: https://www.youtube.com/watch?v=wTnl_kfPBhQ											

S.No	Topic Name	Book	Page no	Mode of delivery	No of hrs	Assignments hrs
UNIT I FLUID PROPERTIES AND FLUID STATICS						
1	Introduction to Mechanics of Fluids & Properties of fluids and Fluid statics	T4	1	Brain storming	2	2
2	Fluid definition, distinction between solid and fluid - Units and dimensions	T4	2	Class room teaching	1	3
3	Properties of fluids density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillarity and surface tension.	T4	3-39	Class room teaching	6	9
4	Fluid statics: concept of fluid static pressure, absolute and gauge pressures	T4	48	Class room teaching	3	11
5	Pressure measurements by manometers and pressure gauges- forces on planes - centre of pressure - buoyancy and floatation.	T4	54, 97,160-191	Class room teaching	5	16
UNIT II FLUID KINEMATICS AND DYNAMICS						
1	Introduction To Fluid Kinematics and Dynamics	T4	192	Brain storming	1	17
2	Fluid Kinematics - types of flow - velocity field and acceleration	T4	195	Class room teaching	4	21
3	continuity equation (one and three dimensional differential forms)- Equation of streamline - streak line - path line -stream function - velocity potential function - circulation - flow net	T4	198-231	Class room teaching	5	26
4	Fluid dynamics - equations of motion - Euler's equation along streamline - Bernoulli's equation - applications	T4	259-290	Class room teaching	2	28
5	Venturi meter, Orifice meter and Pitot tube. Linear momentum equation and its application.	T4	291-343	Class room teaching	2	30
UNIT III BOUNDARY LAYER						
1	Introduction To boundary layer	T4	725	Brain storming	1	40 31
2	Boundary layer - definition- boundary layer on a flat plate	T4	728	Class room teaching	2	42 33
3	Laminar and turbulent boundary layer- displacement, energy and momentum thickness	T4	742-768	Class room teaching	2	44 35
4	Momentum integral eqn-Boundary layer separation and control	T4	739	Class room teaching	2	46 37
5	Drag in flat plate - drag and lift coefficients.	T4	785	Class room teaching	2	48 39
UNIT IV DIMENSIONAL ANALYSIS AND MODEL STUDIES						
1	Introduction To dimensional analysis and model studies	T4	386	Brain storming	1	49 40

3	Rayleigh's method	T4	390	Class room teaching	2	53
4	Buckingham π - Theorem	T4	394	Class room teaching	2	55
5	Dimensionless parameters - Similitude and model studies - Distorted Models.	T4	397	Class room teaching	3	58

UNIT V FLOW THROUGH PIPES

1	Introduction To Flow Through Pipes	T4	638	Brain storming	1	81 50
2	Viscous flow - Shear stress, pressure gradient relationship - laminar flow between parallel plates	T4	535-570	Class room teaching	2	33 52
3	Laminar flow through circular tubes (Hagen poiseuille's) - Hydraulic and energy gradient - flow through pipes	T4	541	Class room teaching, Suitable Analogies	2	35 54
4	Darcy -Weisbach's equation - pipe roughness -friction factor- Moody's diagram	T4	606	Class room teaching	2	37 56
5	Major and minor losses of flow in pipes - Pipes in series and in parallel	T4	638	Group discussion and role play, Class room teaching	2	39 58

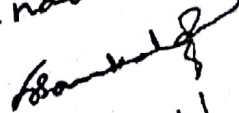
	Prepared by	Approved by
Signature		
Name	Mr.R.PANDIARAJAN	Mr.P.SURESHKUMAR
Designation	Assistant Professor / Civil	ASP & HOD (Civil)
Signed date	20.06.2018	20.06.18

LEGEND:

METHODOLOGY TO MAP OBJECTIVE WITH OUTCOME

Course outcomes are achieved through

- Suitable Analogies.
- Class room teaching.
- Assignments.
- Tutorials
- Weekly, monthly and model exams.
- Brain storming.
- Group discussion and role play.
- Seminars/Workshops.
- Expert lectures.

Endorsed /

19/6/18