DEPARTMENT OF CIVIL ENGINEERING

SCHEME OF COURSE WORK

Course Details:

Course Title	**: Fluid Mechanics**
Course Code	**: 20CE1105**
L T P C	**: 3 0 0 3**
Program:	**: B. Tech.**
Specialization:	**: Civil Engineering**
Semester	**: III**
Prerequisites	**: Applied Mechanics, Calculus and Linear Algebra, Ordinary Differential Equation and Vector Calculus.**
Courses to which it is a prerequisite	**: Hydraulics and Hydraulic Machinery, Water Resources Engineering**

COURSE OUTCOMES (COs):

After completion of this course the student would be able to

CO	Course Outcomes	Learning Outcomes
1	Explain various fluid properties and compute pressures using manometers	1. Explain the properties of fluids (L2) 2. Explain the concepts of pressure measurement (L2) 3. Estimate the fluid pressure in pipes using manometers (L3)
2	Compute the hydrostatic forces on plane and curved surfaces and explain the concepts of Kinematics of fluids	1. Compute the hydro static fluid pressure on various surfaces (L3) 2. Explain the concept of fluid kinematics and discuss various types of flowing fluids (L2) 3. Demonstrate applications of continuity equations (L2)
3	Apply the fluid dynamic principles to measure quantities of fluid flowing in pipes, tanks and channels	1. Demonstrate the applications of Bernoulli's equation (L2) 2. Demonstrate the applications of Momentum equation (L2) 3. Compute the discharge through pipes, tanks and channels (L3)
4	Differentiate between turbulent and laminar fluid flows and also compute head loss due to pipe friction	1. Demonstrate Laminar, Transition and Turbulent flows through pipes (L2) 2. Explain Laminar flow through parallel plates (L2) 3. Estimate the various energy losses in pipe flow (L3)
5	Explain the concepts of boundary layer theory and compute the drag and lift forces	1. Explain the concepts of laminar and turbulent boundary layers (L2)

		2. Explain the concepts of boundary layer separation (L2) 3. Compute the Drag and lift forces on objects presentation flowing fluid medium (L3)

PROGRAMME OUTCOMES (POs)

1. Graduates will be able to apply the knowledge of mathematics, science, engineering fundamentals to solve complex civil engineering problems.
2. Graduates will attain the capability to identify, formulate and analyse problems related to civil engineering and substantiate the conclusions
3. Graduates will be in a position to design solutions for civil engineering problems and design system components and processes that meet the specified needs with appropriate consideration to public health and safety.
4. Graduates will be able to perform analysis and interpretation of data by using research methods such as design of experiments to synthesize the information and to provide valid conclusions.
5. Graduates will be able to select and apply appropriate techniques from the available resources and modern civil engineering and software tools, and will be able to predict and model complex engineering activities with an understanding of the practical limitations.
6. Graduates will be able to carry out their professional practice in civil engineering by appropriately considering and weighing the issues related to society and culture and the consequent responsibilities.
7. Graduates will be able to understand the impact of the professional engineering solutions on environmental safety and legal issues.
8. Graduates will transform into responsible citizens by resorting to professional ethics and norms of the engineering practice.
9. Graduates will be able to function effectively in individual capacity as well as a member in diverse teams and in multidisciplinary streams.
10. Graduates will be able to communicate fluently on complex engineering activities with the engineering community and society, and will be able to prepare reports and make presentations effectively.
11. Graduates will be able to demonstrate knowledge and understanding of the engineering and management principles and apply the same while managing projects in multidisciplinary environments.
12. Graduates will engage themselves in independent and life-long learning in the broadest context of technological change while continuing professional practice in their specialized areas of civil engineering.

PROGRAMME SPECIFIC OUTCOMES(PSOs):

1. Collect, process and analyse the data from topographic surveys, remote sensing, hydrogeological investigations, geotechnical explorations, and integrate the data for planning of civil engineering infrastructure.

2. Analyse and design of substructures and superstructure for buildings, bridges, irrigation structures and pavements.

3. Estimate, cost evaluation, execution and management of civil engineering projects.

Course Outcome versus Program Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	3	1	3	-	1	1	-	-	-	-	1
CO-2	2	3	2	2	2	-	-	-	-	-	-	1
CO-3	3	2	2	3	2	1	1	-	-	-	-	1
CO-4	2	2	1	1	1	-	-	-	-	-	-	1
CO-5	2	2	2	2	-	-	-	-	-	-	-	1

Course Outcome Vs Programme Specific Outcomes:

CO	PSO1	PSO2	PSO3
CO1	1	1	-
CO2	1	1	-
CO3	1	1	-
CO4	1	1	-
CO5	-	1	-

Mapping Levels:
1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), put -: No Correlation

Assessment Methods:	Assignment / Seminar / Mid-Test / End Exam

Teaching-Learning and Evaluation:

Week	TOPIC / CONTENTS	CO	Sample questions	Teaching-learning strategy	Assessment Method & Schedule
1	**UNIT-I-INTRODUCTION:** Dimensions and units – Physical properties of fluids specific gravity, viscosity, surface tension, vapor pressure and their influences on fluid motion pressure at a point,	CO-1	Discuss various physical properties of fluids.	Lecture/Discussion	Assignment/ Quiz
2	Pascal's law, Hydrostatic law - atmospheric, gauge and vacuum pressure- measurement of pressure. Pressure gauges, Manometers: differential and Micro Manometers.	CO-1	Define Hydrostatic law. Explain various types of pressure gauges and manometers.	Lecture Lecture Problem solving	

3	**UNIT-II-HYDROSTATIC FORCES**: Hydrostatic forces on submerged plane, Horizontal, Vertical surfaces	CO-2	Determine the hydrostatic forces on submerged planes.	Lecture Problem solving	
4	Hydrostatic forces on inclined and curved surfaces. Center of pressure. Derivations and problems.	CO-2	Determine the hydrostatic forces on inclined and curved surfaces.	Lecture Problem solving	
5	**FLUID KINEMATICS:** Lagrangean and Eularian approaches- Description of fluid flow, Stream line, path line and streak lines and stream tube. Classification of flows : Steady, unsteady, uniform, nonuniform, laminar, turbulent, rotational and irrotational flows	CO-2	Write about classificationof flows. Define streamline,streak line, path line.	Lecture Lecture Problem solving	
6	Equation of continuity for one, two, three dimensional flows – stream and velocity potential functions, flownet.	CO-2	Write the continuity equation for three dimensional flow.	Lecture Problem solving	
7	**UNIT-III-FLUID DYNAMICS:** Surface and body forces, Concepts of fluid system and control volume – Euler's and Bernoulli's equations for flow for 3-D flow	CO-3	Write the Bernoulli's equations for flow along a stream line for 3-D flow	Lecture Problem solving	
8	Momentum equation and its application – forces on pipe bend.	CO-3	Discuss momemtum equation and its applications.	Lecture	
9	**MID TEST - I**				
10	**MEASUREMENT OF FLOW**: Pitot tube, Venturi meter and orifice meter	CO-3	Deduce the expression for discharge of Orifice meter. Deduce the expression for discharge of Orifice meter.	Lecture Problem solving	Assignment/ Quiz
11	classification of orifices, flow over rectangular, triangular and trapezoidal notches.	CO-3	Discuss the flow through different notches.	Lecture Problem solving	
12	**UNIT-IV-VISCOUS FLOW**: Reynold's experiment – Classification of Laminar and Turbulent flows, hydrodynamically smooth and rough pipes.	CO-4	Discuss the Characteristics of Laminar & Turbulent flows.	Lecture	

13	Flow between parallel plates, Flow through long pipes.	CO-4	Explain the Flow between parallel plates. Explain the flow through inclined tubes.	Lecture Problem solving
14	**CLOSED CONDUIT FLOW:** Laws of Fluid friction – Darcy's equation, Minor losses – pipes in series – pipes in parallel	CO-4	Discuss various minor losses in pipes Explain the Laws of Fluid Friction	Lecture Problem solving
15	Total energy line and hydraulic gradient line. variation of friction factor with Reynold's number – Moody's Chart.	CO-4	Draw the sketch showing Total energy line and hydraulic gradient line and also define the terms.	Lecture Problem solving
16	**UNIT-V-BOUNDARY LAYER THEORY** – concepts, Prandtl contribution, Characteristics of boundary layer along a thin flat plate, laminar and turbulent boundary layers (no deviations)	CO-5	Define Boundary layer and Characteristics of boundary layer along a thin flat plate.	Lecture/Discussion
17	BL in transition, separation of BL, control of BL, flow around submerged objects Drag and Lift-Magnus effect.	CO-5	Write about separation of Boundary Layer. Discuss Drag and Lift Effect	Lecture Lecture Problem solving
18	**MID TEST - II**			
END EXAM				