SARDAR RAJA COLLEGE OF ENGINEERING, ALANGULAM

DEPARTMENT OF CIVIL ENGINEERING

MICRO LESSON PLAN

SUBJECT NAME : MECHANICS OF FLUIDS

SUBJECT CODE : CE 6303

YEAR/SEM : II / III

STAFF NAME : M.MATHAVAN

ASST.PROF / CIVIL

CE 6303 **MECHANICS OF FLUIDS** **L T P C**
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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, temperature, viscosity, compressibility, vapour pressure, capillarity and surface tension - Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by manometers and pressure gauges- forces on planes - centre of pressure - bouncy and floatation.

UNIT II FLIUD KINEMATICS AND DYNAMICS 9

Fluid Kinematics - Flow visualization - lines of flow - types of flow - velocity field and acceleration - continuity equation (one and three dimensional differential forms)- Equation of streamline - stream function - velocity potential function - circulation - 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.

UNIT III FLOW THROUGH PIPES 9

Viscous flow - Shear stress, pressure gradient relationship - laminar flow between parallel plates - Laminar flow through circular tubes (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 IV BOUNDARY LAYER 9

Boundary layer - definition- boundary layer on a flat plate - thickness and classification - displacement , energy and momentum thickness - Boundary layer separation and control - drag in flat plate – drag and lift coefficients.

UNIT V DIMENSIONAL ANALYSIS AND MODEL STUDIES 9

Fundamental dimensions - dimensional homogeneity - Rayleigh's method and Buckingham Pi- Theorem - Dimensionless parameters - Similitude and model studies - Distorted Models.

TOTAL:45 PERIODS

OUTCOMES:

• The students will be able to get a basic knowledge of fluids in static, kinematic and dynamic equilibrium.

• They will also gain the knowledge of the applicability of physical laws in addressing problems in hydraulics.

TEXT BOOKS:

1. Modi P.N and Seth "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi. 2003

2. Ramamirtham, S., "Fluid Mechanics and Hydraulics and Fluid Machines", Dhanpat Rai and Sons, Delhi, 2001.

3. Bansal, R.K., "Fluid Mechanics and Hydraulics Machines", 5th edition, Laxmi Publications Pvt. Ltd, New Delhi, 2008.

REFERENCES:

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, 1995.

3. Jain A. K. "Fluid Mechanics", Khanna Publishers, 2010

4. Roberson J.A and Crowe C.T., "Engineering Fluid Mechanics", Jaico Books Mumbai, 2000.

5. White, F.M., "Fluid Mechanics", Tata McGraw Hill, 5th Edition, New Delhi, 2003.

CE6303 MECHANICS OF FLUIDS

SUBJECT DESCRIPTION AND OBJECTIVES

DESCRIPTION

This subject aims to enable students to: understand key concepts and fundamental principles, together with the assumptions made in their development, pertaining to fluid behaviour, both in static and flowing conditions; deal effectively with practical engineering situations, including the analysis and design of engineering systems and devices involving fluids and flow; appreciate possible applications and links to other disciplines; and engage in further specialised study or research. The subject also aims to enhance interests in fluid phenomena and applications. Topics include: fluid properties and statics; conservation laws of mass, momentum and energy; flow in pipes; external flow (lift and drag); boundary layers; flow measurements; and environmental fluid mechanics.

Subject Aims

This subject aims to enable students to:

- understand key concepts and fundamental principles, together with the assumptions made in their development, pertaining to fluid behaviour, both in static and flowing conditions
- deal effectively with practical engineering situations, including analysis and design of engineering systems and devices involving fluids and flow
- engage in further specialised study or research

The subject also aims to enhance interests in fluid phenomena and applications.

OBJECTIVES

The student is introduced to the definition and properties of fluid. Principles of fluid statics,kinematics and dynamics are dealt with subsequently. The application of similitude and model study are covered subsequently. After undergoing this course, the student would have learnt fluid properties and application to real situations of fluid flow.

MICRO LESSON PLAN

Week	Hrs	Lecture Topics	Book
I		**UNIT I FLUID PROPERTIES AND FLUID STATICS**	
	1	Fluid - definition, distinction between solid and fluid	T3
	2	Units and dimensions - Properties of fluids	T3
	3	Density, specific weight, specific volume, specific gravity	T3
	4	Temperature, viscosity, compressibility, vapour pressure, capillarity and surface tension	T3
	5	Fluid statics: concept of fluid static pressure	T3
II	6	Absolute and gauge pressures	T3
	7	Pressure measurements by manometers and pressure gauges (AV Class)	T3
	8	Forces on planes-- centre of pressure	T3
	9	Bouncy and floatation	T3
III		**UNIT II FLIUD KINEMATICS AND DYNAMICS**	
	10	Fluid Kinematics - Flow visualization - lines of flow	T3
	11	Types of flow - velocity field and acceleration	T3
	12	Continuity equation (one and three dimensional differential forms)	T3
	13	Equation of streamline - stream function - velocity potential function	T3
	14	Circulation - flow net. Fluid dynamics - equations of motion	T3
IV	15	Euler's equation along a streamline	T3
	16	Bernoulli's equation – applications (AV Class)	T3
	17	Venturi meter, Orifice meter and Pitot tube	T3
	18	Linear momentum equation and its application	T3
V		**UNIT III FLOW THROUGH PIPES**	
	19	Viscous flow - Shear stress, pressure gradient relationship	T3
	20	Laminar flow between parallel plates	T3
	21	Laminar flow through circular tubes (Hagen poiseulle's)	T3
	22	Hydraulic and energy gradient - flow through pipes	T3
	23	Darcy -Weisbach's equation	T3
VI	24	Pipe roughness -friction factor	T3
	25	Moody's diagram	T3
	26	Major and minor losses of flow in pipes	T3
	27	Pipes in series and in parallel.(AV Class)	T3
VII		**UNIT IV BOUNDARY LAYER**	
	28	Boundary layer - definition	T3
	29	Boundary layer on a flat plate	T3

	30	Thickness and classification	T3
	31	Displacement	T3
	32	Energy and momentum thickness (AV Class)	T3
VIII	33	Boundary layer separation and control	T3
	34	Drag in flat plate	T3
	35	Drag coefficients	T3
	36	Lift coefficients	T3
IX	**UNIT V DIMENSIONAL ANALYSIS AND MODEL STUDIES**		
	37	Fundamental dimensions	T3
	38	Dimensional homogeneity	T3
	39	Rayleigh's method	T3
	40	Buckingham Pi- Theorem	T3
X	41-42	Dimensionless parameters	T3
	43-44	Similitude and model studies (AV Class)	T3
	45	Distorted Models.	T3

Prepared By
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