22MEHO202	ADVANCED FLUID MECHANICS				
PREREQUISITES	**CATEGORY**	**L**	**T**	**P**	**C**
	PE	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

1. Enhanced understanding of fluid mechanics, including the equations of motion in differential form, and turbulence.

UNIT I	**INTRODUCTION**	**9**	**0**	**0**	**9**

Eulerian and Lagrangian Description of Fluid Motion, Lines of Flow Visualization and Acceleration of Flow, Angular Deformation of Fluid Elements, Linear and Volumetric Deformation; Perspectives from Mass Conservation, Continuity Education in Integral Form Stream Function and Velocity Potential.

UNIT II	**VISCOUS FLUID FLOW**	**9**	**0**	**0**	**9**

Euler Equation for Inviscid Flow, Bernoulli's Equation, Examples of Bernoulli's Equation, Reynolds Transport Equation, Reynolds Transport Theorem Mass and Linear Momentum Conservation, Reynolds transport theorem arbitrarily moving control volume, Reynolds transport theorem angular momentum conservation, Introduction to traction vector and stress tensor, Cauchy/Navier equation, Navier Stokes equation.

UNIT III	**FLUID DYNAMICS**	**9**	**0**	**0**	**9**

Lubrication Theory, Thin Film Dynamics, Stokes Flow past a Sphere.

UNIT IV	**TURBULENCE**	**9**	**0**	**0**	**9**

Introduction to Turbulence, Statistical Treatment of Turbulence and Near - Wall Velocity Profiles, Introduction to Boundary Layer Theory, Similarity Solution of Boundary Layer Equation, Momentum Integral Method, Application of Momentum Integral Method and Boundary Layer Separation, Potential Flow.

UNIT V	**COMPRESSIBLE FLOWS**	**9**	**0**	**0**	**9**

Stagnation properties, Compressible Flows - variable area- Normal Shock- Converging Nozzle- Converging Diverging Nozzle- Compressible Flow with Friction.

TOTAL(45L) : 45 PERIODS

TEXT BOOKS:

1. Rouse, H. (1957), “Advanced Fluid Mechanics”, John Wiley & Sons, N York
2. Mohanty A.K. (1994), “Fluid Mechanics”, Prentice Hall of India, N Delhi

REFERENCES:

1. Wand D.J., and Harleman D.R. (91964) “Fluid Dynamics”, Addison Wesley.
2. Schlichting, H.: (1976) “Boundary Layer theory”, International Text – Butterworth
3. Lamb, H.R. (1945) “Hydrodynamics”, Rover Publications
4. White, F.M. (1980) “Viscous Fluid Flow”, McGraw Hill Pub. Co, N York
5. Yalin, M.S.(1971), “Theory of Hydraulic Models”, McMillan Co., 1971.

COURSE OUTCOMES: Upon completion of this course, the students will be able to:		**Bloom Taxonomy Mapped**
CO1	Explain the fundamental concepts of fluid Fluid flow.	Understand
CO2	Apply the Bernoulli to solve problems related to Viscous fluid flow.	Apply
CO3	Device the concepts of fluid dynamics in various geometry.	Create
CO4	Depict the turbulence of fluid Fluid flow.	Analyze
CO5	Interpret the knowledge for Compressible Flows in various geometrical configuration.	Evaluate

COURSE ARTICULATION MATRIX

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	3	0	0	0	0	0	0	0	1	2	2	0
CO2	3	3	2	3	0	0	0	0	0	0	0	1	2	2	0
CO3	3	3	2	3	3	0	0	0	0	0	0	1	2	2	0
CO4	3	3	2	3	0	0	0	0	0	0	0	1	2	2	0
CO5	3	3	2	3	3	0	0	0	0	0	0	1	2	2	0
Avg	**3**	**3**	**2**	**3**	**1.2**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**2**	**0**
3/2/1 – indicates strength of correlation (3 – high, 2- medium, 1- low)															