NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	B.Tech. in Mechanical Engineering
Course Code:	2ME302
Course Title:	Fluid Mechanics
Course Type:	Core
Year of introduction:	2023-24

Credit Scheme

L	T	Practical component				C
		LPW	PW	W	S	
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Course Learning Outcomes (CLOs):

After successful completion of the course, student will be able to –

1 infer the basic principles of fluid statics, (BL2)
2 illustrate the concepts of kinematics and dynamics of fluids, (BL2)
3 utilise the principles of dimensional and model analysis, (BL3)
4 apply the concepts of incompressible and turbulent flows. (BL3)

Syllabus: **Total Teaching Hours: 30**

Unit	Syllabus	Teaching hours
Unit I	**Fluid Statics** Properties of fluids, pressure measurement, forces on submerged bodies, stability of floating bodies.	**06**
Unit II	**Fluid Kinematics and Dynamics** Control-volume analysis of mass, momentum and energy, fluid acceleration, differential equations of continuity and momentum, Bernoulli's equation.	**06**
Unit III	**Dimensional Analysis** Need for dimensional analysis, Buckingham's' method, dimension less numbers and their significance, hydraulic similarities, type of models, model analysis.	**06**
Unit IV	**Viscous Flow of Incompressible Fluids** Introduction of hydrodynamic boundary layer, flow between two parallel plates, Couette flow, flow through pipe, Hagen-Poiseuille equation, head losses in pipe, bend and fittings, different viscometers.	**08**

Unit V **Basics of Turbulent Flow and Compressible Flow** **04**

Reynolds experiment, types of flows, introduction to turbulent flow, Mach number and different flow regimes, Interlocution to Fluid Machines.

Self – Study: The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work: Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated

Suggested Readings/References:

1. Y A Cengel and J M Cimbala, Fluid Mechanics: Fundamentals and Applications; McGraw Hill Publication.
2. R W Fox, A T McDonald, P J Pritchard, Introduction to Fluid Mechanics; John Wiley and Sons.
3. F M White, Fluid Mechanics; McGraw-Hill Publishing Co.
4. A L Gerhart, B R Munson, J I Hochstein, P M Gerhart, T H Okiishi, Fundamentals of Fluid Mechanics; John Wiley and Sons.
5. D S Kumar, Fluid Mechanics and Fluid Power Engineering; S K Kataria & Sons.

Suggested list of experiments: (not restricted to the following)

Sr. No.	Title	Hours
1.	Study of viscometers and determination of viscosity by Redwood viscometer.	2
2.	Determination of Reynolds number for different types of flow through closed conduit.	2
3.	Verification of Bernoulli's theorem.	2
4.	Calibration of flow measuring devices.	2
5.	Determination of metacentric height.	2
6.	Calibration of triangular notch.	2
7.	To obtain surface profiles of free vortex flow.	2
8.	To obtain surface profiles of forced vortex flow.	2
9.	Determination of minor losses in piping systems.	2
10.	Determination of major losses in piping systems.	2
11.	Demonstration of Computational Fluid Dynamics (CFD) software tools.	2
12.	To study the applications and basic working principles of various hydraulic machines.	2
13.	Demonstration of in-house wind tunnel facility.	2