

**UNIT I****Chapter 1 : Properties of Fluid 1-1 to 1-24**

Definition of fluid, concept of continuum, density, specific weight, specific gravity, viscosity, viscosity laws, types of fluid and rheology, measurement of viscosity, application based numerical on viscosity-flow through pipe, lubrication, bearing, brake fluids, parallel plates, rotating shafts etc., vapor pressure surface tension, capillarity, compressibility.

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1.14.2 Capillarity.....1-15

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**Laws of fluid statics** : forces acting on fluid element, Pascal's law, hydrostatics law, hydraulic ram

**Pressure measurement** : pressure scale, piezometer, barometer, manometer - simple, inclined, differential, micro manometer, inverted.

**Forces acting on surfaces immersed in fluid** : total pressure and center of pressure on submerged plane surfaces, curved surface submerged in liquid including numerical on dam, gate.

**Buoyancy** : flotation, stability of bodies.

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Flow description methods, types of flows, velocity and acceleration fields, continuity equation in 1D & 3D flow, flow visualization (path line, stream line and streak line), stream tube, angularity, vorticity, stream function and velocity potential function, flow net.			<b>3.12</b>	<b>Stream Function.....</b>	<b>3-11</b>
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3.3.5	Laminar and Turbulent Flow.....	3-3	<b>Flow measurement :</b> Venturimeter, orifice meter, pitot tubes, static pitot tube, introduction to coriolis flow meter, introduction to orifices, notches and weirs.		



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4.11.5	Introduction to Orifices.....	4-13
4.11.6	Introduction to Notches and Weirs.....	4-15
4.12	<b>Solved Examples</b> .....	4-18
<b>Chapter 5 : LAMINAR FLOW</b>		<b>5-1 to 5-17</b>
Laminar flow : Entrance region theory, velocity and Shear Stress distribution for laminar flow through pipe, fixed parallel plates and Couette flow, velocity profile of turbulent flow.		
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5.2	<b>Critical Reynolds Number and Entrance Region Theory</b> .....	5-1
5.3	<b>Velocity and Shear Stress Distribution for Laminar Flow through Pipe and Hagen-Poiseuille Equation</b> .....	5-2

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5.5	<b>Velocity Profile of Turbulent Flow</b> .....	5-8
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### UNIT IV

#### Chapter 6 : Internal Flows - Flow Through Pipes

6-1 to 6-21

**Internal Flow** : Losses - major & minor losses, hydro dynamically smooth and rough boundaries, Moody's chart, compounding of pipes & equivalent pipe, siphons, transmission of power.

6.1	<b>Internal and External Flows and Introduction to Pipe Flow</b> .....	6-1
6.2	<b>Energy losses through pipes</b> .....	6-1
6.2.1	Major Energy Loss (Frictional Loss, $h_f$ ).....	6-1
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6.3	<b>Hydrodynamically Smooth and Rough Boundaries</b> .....	6-5
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**6.12 Solved Examples..... 6-10**

**UNIT V**

**Chapter 7 : External Flow 7-1 to 7-18**

**External Flow** : Boundary layer formation over a flat plate, boundary layer thickness, displacement thickness, momentum thickness and energy thickness, boundary layer separation and methods to control separation, drag and lift concepts, types of drag, drag & lift coefficients, aerofoil, bluff body, streamline body.

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7.1.2 Concept of Boundary Layer..... 7-1

7.1.3 Thicknesses of Boundary Layer ..... 7-2

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7.1.3.3 Momentum Thickness ( $\theta$ ) ..... 7-3

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7.1.4 Boundary Layer along a long, thin, Smooth Flat Plate and its characteristics ..... 7-4

7.1.5 Separation of Boundary Layer ..... 7-6

7.1.6 Methods of Controlling Separation..... 7-7

7.1.7 Solved Examples ..... 7-8

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7.2.2 Types of Drag and Bluff & Streamline bodies..... 7-11

7.2.3 Expressions for Drag & Lift and Drag and Lift Coefficients ..... 7-13

7.2.4 Airfoil and Polar Diagram ..... 7-14

7.2.5 Solved Examples..... 7-15

**UNIT VI**

**Chapter 8 : Dimensional Analysis and Similitude 8-1 to 8-24**

**Dimensional Analysis** : Introduction, system of dimensions, Dimensional homogeneity, Buckingham-Pi Theorem, repeating variables, dimensionless numbers and their physical significance.

**Similitude and Model Testing** : Model and prototype, similarity, scaling parameters, model laws, objectives, importance and application of model studies.

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8.1.1 Applications of Dimensional Analysis..... 8-1

**8.2 System of Dimensions..... 8-1**

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**8.4 Dimensional Homogeneity (Fourier's Principle) ..... 8-3**

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8.8.3	Mach Number and Mach's Model Law ..... 8-8	<b>8.9</b>	<b>Types of Models .....8-10</b>
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