

Maulana Abul Kalam Azad University of Technology, West Bengal

(Formerly West Bengal University of Technology)

Syllabus for B. Tech in Civil Engineering

(Applicable from the academic session 2018-2019)

Semester IV [Second year]

CE(ES)401	Introduction to Fluid Mechanics	2L + 0T	2 Credits																												
Course Outcome	On successful completion of this course, student should be able to:																														
	<ol style="list-style-type: none"> 1. define basic terms, values and laws in the areas of fluids properties, statics, kinematics and dynamics of fluids, and hydraulic design of pipe systems; 2. describe methods of implementing fluid mechanics laws and phenomena while analyzing the operational parameters of hydraulic problems; 3. practically apply tables and diagrams, and equations that define the associated laws; 4. calculate and optimize operational parameters of hydraulic problems; 5. explain the correlation between different operational parameters; 6. select engineering approach to problem solving based on the acquired physics and mathematical knowledge. 																														
Prerequisite	Introduction to Civil Engineering, Physics.																														
Module 1	Properties of fluids: Fluid – definition, distinction between solid and fluid - Units and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapour pressure, capillarity and surface tension.	3L																													
Module 2	Fluid statics: Pressure at a point, basic equation for pressure field, pressure variation in a fluid at rest- incompressible fluid, compressible fluid, absolute pressure, gauge pressure; pressure measurements by manometers – general, inclined, inverted, micro-manometer; pressure and forces on submerged planes and curved surfaces, centre of pressure, buoyancy and floatation, Stability of submerged and floating bodies, metacentric height.	4L																													
Module 3:	Fluid Kinematics: The velocity field, Eulerian and Lagrangian flow descriptions, concepts of: - one-, two- and three-dimensional flows, steady and unsteady flows, streamlines, streaklines, pathlines; The acceleration field; Control volume and system representation, Continuity Equation, Momentum Equation, Moment-of-momentum equation, applications to pipe bends.	6L																													
Module 4:	Fluid Dynamics: Application of Newton's Law along a streamline, Bernoulli Equation, Kinetic energy head, potential energy head and pressure energy head, total energy head, Pitot tube, Examples of use of Bernoulli Equation, measurement of flows - venturimeter, energy line and hydraulic grade line.	7L																													
Module 5:	Dimensional Analysis: Buckingham Pi Theorem, determination of Pi terms, correlation of experimental data, examples.	3L																													
Module 6	Flow through Pipes: Laminar flow, Reynolds number, critical velocity, turbulent flow, shear stress at pipe wall, velocity distribution, loss of head for laminar flow, Darcy-Weisbach Formula, friction factor, contraction and expansion head losses. Concept of boundary layer and its growth.	7L																													
Module 7	Pipeline Systems: Pipes in series, pipes in parallel, equivalent pipes, branching pipes, pipe networks.	7L																													
Module 8	Hydraulic Machines: Basics of hydraulic machines, specific speed of pumps and turbines.	3L																													
Reference	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Sl.</th> <th>Book Name</th> <th>Author</th> <th>Publishing House</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Fluid Mechanics</td> <td>Sadhu Singh</td> <td>Khanna Publishing House</td> </tr> <tr> <td>2</td> <td>A Textbook of Fluid Mechanics</td> <td>R. K. Bansal</td> <td>Laxmi Publications (P) Ltd., New Delhi.</td> </tr> <tr> <td>3</td> <td>Hydraulics & Fluid Mechanics Including Hydraulics Machines</td> <td>P. N. Modi and S. M. Seth</td> <td>Standard Book House, New Delhi, 2017.</td> </tr> <tr> <td>4</td> <td>Introduction to Fluid Mechanics and Fluid Machines</td> <td>S. K. Som, G. Biswas and S. Chakraborty</td> <td>Tata McGraw Hill Education Private Limited, New Delhi, 2012.</td> </tr> <tr> <td>5</td> <td>Fluid Mechanics</td> <td>F. M. White</td> <td>Tata McGraw Hill Education India Private Limited, 2017.</td> </tr> <tr> <td>6</td> <td>Fluid Mechanics and Hydraulic Machines</td> <td>K. Subramanya</td> <td>McGraw Hill Education (India)</td> </tr> </tbody> </table>	Sl.	Book Name	Author	Publishing House	1	Fluid Mechanics	Sadhu Singh	Khanna Publishing House	2	A Textbook of Fluid Mechanics	R. K. Bansal	Laxmi Publications (P) Ltd., New Delhi.	3	Hydraulics & Fluid Mechanics Including Hydraulics Machines	P. N. Modi and S. M. Seth	Standard Book House, New Delhi, 2017.	4	Introduction to Fluid Mechanics and Fluid Machines	S. K. Som, G. Biswas and S. Chakraborty	Tata McGraw Hill Education Private Limited, New Delhi, 2012.	5	Fluid Mechanics	F. M. White	Tata McGraw Hill Education India Private Limited, 2017.	6	Fluid Mechanics and Hydraulic Machines	K. Subramanya	McGraw Hill Education (India)		
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