

LOK JAGRUTI UNIVERSITY (LJU)
INSTITUTE OF ENGINEERING & TECHNOLOGY

Department of Civil Engineering
Bachelor of Engineering (B.E.) Semester – IV

Course Code:	017093402
Course Name:	Mechanics of Fluids
Category of Course:	Professional Core Course (PCC)
Prerequisite Course:	Mathematics I (017091191) Physics (017091102) Mechanics of Solids (017093301)

Teaching Scheme				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Total Hours
4	0	2	5	40

Syllabus				
Unit No.	Topic	Prerequisite Topic	Successive Topic	Teaching Hours
01	Properties of Fluids	Index Properties(017093303- Unit-4)	Quality of Water (017093504 -Unit-3), Water Treatment Process - 2 as per CPHEEO Manual 1991(017093504 -Unit-7), Primary Wastewater Treatment Units - Screens, Grit Chamber and Sedimentation Tank (017093603 - Unit-5)	3 (9%)
	1.1 Introduction to Fluid Mechanics			
	1.2 Properties of Fluid (Density, specific weight, specific volume, Specific gravity, Surface tension, Capillarity)			
	1.3 Newton's Law of Viscosity			
02	Measurement of Pressure	Trigonometry and Geometry (017091191 - Unit-2), Basic Differentiation and Integration (017091191 - Unit-3), Partial Derivatives (017091191 - Unit-5), Pressure Measurement (017091102 - Unit 7), Properties of Fluids (017093402 - Unit-1)	---	4 (10%)
	2.1 Hydrostatic Law & Hydrostatic Paradox			
	2.2 Pascal's Law			
	2.3 Various Types of Pressure			
	2.4 Simple U-tube Manometer, Differential U-tube Manometer and Inverted U-tube Manometer			
03	Fluid Flow	Properties of Fluids (017093402 - Unit-1)	Water Treatment Process - 2 as per CPHEEO Manual 1991 (017093504 -Unit-7), Primary Wastewater Treatment Units - Screens, Grit Chamber and Sedimentation Tank (017093603 -Unit-5)	2 (7%)
	3.1 Types of Fluid Flow			
	3.2 Reynold's Experiment & Reynold Number			
04	Fluid Kinematics	Trigonometry and Geometry (017091191 - Unit-2), Basic Differentiation and Integration (017091191 - Unit-3), Partial Derivatives (017091191 - Unit-5), Introduction to Fluid Flow (017093402 - Unit-3)	Intake Structures1991 (017093504 - Unit-4) , Conveyance of Water as per CPHEEO Manual (017093504 - Unit-5), Water Treatment Process - 1 as per CPHEEO Manual 1991 (017093504 -Unit-6), Water Treatment Process - 2 as per CPHEEO Manual 1991(017093504 - Unit-7), Water Treatment Process - 3 as per CPHEEO Manual 1991(017093504 -Unit-8)	5 (12%)
	4.1 Continuity Equation for 2-D and 3-D flow			
	4.2 Velocity potential and Stream function			
	4.3 Equipotential Line and Stream Line			
	4.4 Flownet and Its Characteristics & Uses			
05	Fluid Dynamics	Properties of Fluids (017093402 - Unit-1), Basic Differentiation and Integration (017091191 - Unit-3), Partial Derivatives (017091191 - Unit-5), Measurement of Pressure (017093402 - Unit-2), Fluid Kinematics (017093402 - Unit-4)	---	5 (12%)
	5.1 Euler's equation			
	5.2 Bernoulli's Equation and its Assumptions			
06	Flow Measuring Devices	Fluid Dynamics (017093402 - Unit-5)	---	3 (6%)
	6.1 Venturi meter			
	6.2 Pitot tube			
07	Orifice and Mouthpiece			4

	7.1 Orifice & Classification of Orifice 7.2 Hydraulic coefficients 7.3 Discharge through Large Orifice 7.4 Types of Mouthpiece and External Mouthpiece	Fluid Dynamics (017093402 - Unit-5)	---	(10%)
08	Notches and Weirs			4 (10%)
	8.1 Introduction to Notch and Weirs			
	8.2 Discharge over Rectangular Notch	---	---	
	8.3 Discharge over Triangular Notch			
	8.4 Advantages of a Triangular Notch over a Rectangular Notch			
09	Total Pressure and Centre of Pressure			5 (12%)
	9.1 Total pressure and center of pressure on Vertically immersed surface	Trigonometry and Geometry (017091191 - Unit-2), Basic Differentiation and Integration (017091191 - Unit-3), Partial Derivatives (017091191 - Unit-5), Centroid (017093301 - Unit-5), Moment of Inertia (017093301 - Unit-6)	---	
	9.2 Total pressure and center of pressure on Inclined immersed surface			
10	Buoyancy and Floatation			5 (12%)
	10.1 Buoyancy & Center of Buoyancy, Archimedes principle	Trigonometry and Geometry (017091191 - Unit-2), Centroid (017093301 - Unit-5), Moment of Inertia (017093301 - Unit-6)	Water Treatment Process - 2 as per CPHEEO Manual 1991(017093504 - Unit-7)	
	10.2 Metacenter and Metacentric height			
	10.3 Analytical method for Metacentric Height			
10.4 Conditions of Equilibrium for Submerged and Floating body				

Sr No.	Practical Title	Link to Theory Syllabus
1	To Find Reynold's Number for a fluid flow.	Unit-3
2	To Verify the Bernoulli's Theorem.	Unit-5
3	To Determine the Coefficient of Discharge of Venturimeter.	Unit-6
4	To Determine the Coefficient of Discharge of Orificemeter.	Unit-7
5	To Determine the Coefficient of Discharge of V Notch	Unit-8
6	To Determine the Coefficient of Discharge of Rectangular Notch	Unit-8
7	To Determine the Metacentric Height of a Floating Body	Unit-10

Major Components/ Equipment

Sr. No.	Component/Equipment
1	Weight Scale
2	Adjustable weights
3	Collecting tank
4	Coloured Fluid (Dye)
5	Open/Close Valve
6	Piezometer tube
7	Stopwatch
8	Measuring tank
9	Scale
10	Venturimeter
11	U tube manometer
12	Mercury
13	Orificemeter
14	V notch
15	Rectangular Notch

Proposed Theory + Practical Evaluation Scheme by Academicians (% Weightage Category Wise and it's Marks Distribution)						
L:	4	T:	0	P:	2	
Note: In Theory Group, Total 4 Test (T1+T2+T3+T4) will be conducted for each subject.						
Each Test will be of 25 Marks.						
Each Test Syllabus Weightage: Range should be 20% - 30%						
Group (Theory or Practical)	Group (Theory or Practical) Credit	Total Subject Credit	Category	% Weightage	Marks Weightage	
Theory	4	5	MCQ	22%	28	
Theory			Theory Descriptive	6%	7	
Theory			Formulas and Derivation	21%	26	
Theory			Numerical	31%	39	
Expected Theory %	80%			Calculated Theory %	80%	100
Practical	1		Individual Project	0%	0	
Practical			Group Project	0%	0	
Practical			Internal Practical Evaluation (IPE)	14%	70	
Practical			Viva	6%	30	
Practical			Seminar	0%	0	
Expected Practical %	20%		Calculated Practical %	20%	100	
Overall %	100%			100%	200	

Course Outcome	
1	Student will get engineering knowledge of fluid properties and also Students can distinguish between various types of fluid flow. Also able to understand the various types of manometers for measuring the pressure of fluid in the pipe
2	Student will be able to understand the seepage occurrence by using flow net. Students can have knowledge of Bernoulli's equation and its impotence on real life applications.
3	In the context of civil engineering student will gain the knowledge of engineering instruments like venturimeter, orifice and mouthpiece, Notches and weir to measure discharge of water through the pipe.
4	Students Recognize various stability conditions in the floating and submerged bodies with buoyancy effect.
Suggested Reference Books	
1	Fluid Mechanics, Streeter, V.L. ,Wylie, E. Benjamin, McGraw-Hill
2	Fluid Mechanics with Engineering Applications, Daugherty, R.L., Franzini, J.B., Finnemore, E.J., McGraw Hill
3	Fluid Mechanics, Jain, A.K., Khanna Publishers
4	Fluid Mechanics and Hydraulic Machines, R.K. Bansal, Laxmi Publications
5	Fundamentals of Fluid Mechanics, Munson, Wiley India Pvt. Ltd
6	Fluid Mechanics, Frank .M. White, McGraw Hill Publishing Company Ltd

List of Open Source Software/Learning website	
1	https://nptel.ac.in/course.html
2	https://nptel.ac.in/courses/105/103/105103192/

Practical Project/Hands on Project		
Sr. No.	Project List	Linked with Unit
1	Report on various fluids and its properties	Unit 1
2	Identification of type of flow based on Reynold's Number	Unit 3
3	Find Discharge through Venturi meter used on field.	Unit 6
4	Report on the on-field use of notches in various hydraulic structures (considering all aspects of hydraulic structures)	Unit 7
5	Prototype of pontoon considering the principles of buoyant force and metacenter	Unit 10

