GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3131307
Semester – III
Subject Name: Basics of Environmental Hydraulics

Type of course: Professional

Prerequisite: None

Rationale: To impart fundamental knowledge of hydraulics as applicable in Environmental Engg

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
4	0	2	5	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	Properties of Fluid : Types of Fluid, Properties of Fluid, Fluid as a Continuum ,Control Volume Concept	02
2	Hydrostatics: Fluid Pressure at a point, Pressure-height relationship, Absolute, gauge and atmospheric pressure, Measurement of pressure using various types of manometer, Intensity of pressure, Centre of pressure on horizontal, vertical and inclined surfaces, curved surface.	06
3	Basics of Fluid Kinetics & Dynamics: Different types of flow, Continuity Equation, Euler's Equation Bernoulli's Equation and its application, Flow measurement using pitot tube, venturi meter and pipe orifices	06
4	Flow Through Pipes: Major and minor losses of energy in pipes , Hydraulic gradient and total energy line, Flow through pipes in series, in parallel, equivalent pipe Floe through branch pipe	08
5	Flow through orifice and Mouthpiece Classification of orifices & concept of venacontracta, Hydraulic Coefficient, Discharge through small orifice, large orifice, fully submerged orifice & partially-submerged orifice, Time of emptying a tank through an orifice of rectangular tank, hemi-spherical tank and circular horizontal tank, Classification of mouthpieces, Discharge through an external cylindrical mouthpiece, convergent divergent and an internal mouth piece	12
6	Flow Through Notches and Weirs Classification of notches and weirs, Discharge through a rectangular notch or weir, triangular notch or weir, trapezoidal notch or weir and stepped notch, Velocity of approach , Empirical formula for discharge through rectangular weir, cipolletti weir or notch , Discharge over a broad-crested weir, narrow-crested weir and submerged weir Time emptying a tank with rectangular and triangular weir or notch	12

7	Flow through open channel Types of open channel and types of flow, Empirical formula for determination of flow through open channel Most efficient cross section for rectangular channel, trapezoidal channel and triangular channel	10

Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	**15**	**40**			

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Fluid mechanics V.L.Streeter and E.B. Wylie, Mcgraw Hill, 1985, New York
2. Theory and applications of fluid mechanics K Subramanya, Tata Mcgraw Hill Publishing Co, 1993, New Delhi
3. Introduction to fluid mechanics E.J. Shaughnessy, I.M. Katz, and J.P Schaffer, SI Edition 2005, Oxford University press, New Delhi.
4. Fluid Mechanics, F.M. White 5th edition, McGraw Hill, New York.
5. Fluid Mechanics by Dr. D.S. Kumar
6. Fluid Mechanics & Hydraulic Mechanics by Dr.P.N. Modi & Sheth
7. Fluid Mechanics By Dr. A.K. Jain
8. Hydraulic Fluid Mechanics & Fluid Mechanics By S. Ramamruthan
9. Engineering Fluid Mechanics By R.J. Grade & A.C Mirajgaoker

Course Outcomes:

Sr. No.	CO statement	Marks % Weightage
CO-1	Relate the properties of fluids with context of environmental hydraulics.	10
CO-2	Examine the application of hydrostatics, kinematics & dynamics & flow measurement techniques.	20
CO-3	Solve the problems related to flow through pipes & channels for conveyance of water.	40

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CO-4	Identify field application of orifices, weirs & notches in environmental hydraulics.	30

List of Practicals:

Students will have to perform following experiments in laboratory and prepare the laboratory manual. The students will have to solve atleast five examples and related theory from each topic as an assignment/tutorial.

1. Measurement of viscosity (Verification of Stokes law)
2. Study of pressure measurement devices
3. Study Characteristics of Laminar and Turbulent flows (Reynolds experiment)
4. Calibration of flow measuring devices (Venturimeter, Orificemeter)
5. Calibration of Rectangular and V notch.

Design based/open ended problem

1. Assignments on Properties of Fluid
2. Assignments on Hydrostatics
3. Assignments on Basics of Fluid Kinetics & Dynamics
4. Assignments on Flow Through Pipes
5. Assignments on Flow through orifice and Mouthpiece
6. Assignments on Flow Through Notches and Weirs
7. Assignments on Flow through open channel