GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Semester-VI
Subject Code: 3160618
Semester VI
Subject Name: OPEN CHANNEL FLOW

Type of course: Professional Elective Course-III

Prerequisite: Basic knowledge of hydraulics

Rationale:
1. To comprehend types of open channel and their behaviors.
2. To identify types of channels and its requirement.
3. To enable the students to apply the basic principles of flow to design different types of channels.

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)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	**Basic Flow Concepts:** Types of channels, classification of flows, basic equations, velocity distribution, velocity coefficients, pressure distribution.	3
2	**Energy and momentum principles:** Specific energy, critical flow, section factor for critical flow computation, first hydraulic exponent, computation of critical flow, specific force, specific force, channel transitions.	5
3	**Uniform flow in rigid boundary channels:** Shear stress distribution, velocity distribution in turbulent flow, Chezy's equation, Manning's equation, conveyance of a channel, section factor for uniform flow computation, second hydraulic exponent, computation of uniform flow.	8
4	**Uniform flow in mobile boundary channels**: Incipient motion condition, shield's analysis, regimes of flow, prediction of regimes, flow resistance.	6
5	**Design of channels:** Rigid boundary channels, non-scouring channels, alluvial channels.	6
6	**Gradually varied flow:** Differential equation of GVF, classification and analysis of flow profiles, computation of GVF.	5
7	**Hydraulic jump:** Types of jump, general equation for jump in prismatic channels, jump in horizontal and slopping rectangular channels, location of hydraulic jump	4
8	**Rapidly varied flow:** Flow over sharp crested weir, spillways, flow under sluice gate.	4

9	**Unsteady flow**: Waves, celerity of small gravity wave, St. Venant's equation, surges in open channels.	3

Course Outcomes: At the end of the course, Student will be able to

Sr. No.	CO statement	Marks % weightage
CO-1	Explain types of flow in open channel, velocity and pressure distribution	10
CO-2	Explain specific energy, compute uniform flow, critical flow, section factor and conveyance of channel and its transitions.	15
CO-3	Analyze and design of artificial channels with rigid and mobile boundary	20
CO-4	Classify various flow profiles and compute gradually varied flow profiles in various types of slopes in channel	20
CO-5	Comprehend hydraulic jump, its types and compute initial and sequent depth in case of various channels	20
CO-6	Analyze rapidly varied and unsteady flow in various hydraulic structures and its applications	15

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
10%	**10%**	**20%**	**20%**	**20%**	**20%**

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. V.T Chow, Open Channel Hydraulics, Mc Graw Hill, 2009.
2. K. Subramanya, Flow in Open Channels, Tata Mc. Graw Hill, 2009 and later ed.
3. K.G. Rangaraju , Flow through Open Channels, Tata Mc. Graw Hill, 1993.
4. M.H Chaudhury, Open Channel Flow, Prentice Hall of India, 2008 and later ed..
5. Rajesh Srivastava, Flow through open channels, Oxford higher education
6. NPTEL Web Resources on Open Channel Flow/Hydraulics

List of Experiments:

1. Establishing uniform flow in an open channel

2. Determining velocity distribution in open channel
3. Computing carrying capacity/conveyance of an open channel
4. Determination Mannnig's/Chezy's constant
5. Hydraulic jump below spillway/ sluice gate
6. Various flow profiles in mild sloped channel

List of Open Source learning website:

1. http://www.nptel.iitm.ac.in/courses/

Field Visit :

1. A visit Narmada canal project.
2. A visit to alluvial channel of Gujarat.