GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: Civil (Water Resources Engineering) (33)
SUBJECT NAME: ADVANCED FLUID MECHANICS
SUBJECT CODE:
1st Semester

Type of course: Core II

Prerequisite: Fundamental knowledge of properties of fluid, Fundamental knowledge of engineering mathematics, Knowledge of equations of motion, energy and momentum and free surface flow.

Rationale: Students will be able to understand Navier-Stokes equation solutions, design of open channel, finite difference method, finite element method and design of mobile boundary channel.

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.	Name of Topic	Teaching Hours	% Weightage
1	Flow in pipes: Equation of fluid motion, Momentum and Energy equations, Navier-Stokes equation exact and approximate solutions, laminar and turbulent flow in pipes, Boundary layer theory, boundary stress, skin drag, water hammer analysis.	18	40
2	Flow in channels: Steady-non uniform flow, water surface profiles and its computation, Design of channel transitions, unsteady flow - propagation of positive and negative waves, surges in channel resulting from gate operation, application of Method of Characteristics, Finite Difference and Finite element methods to transient flow in open channels, flow in mobile boundary channel, spatially varied flow, Dispersion in open channel.	24	60

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
5	**25**	**30**	**20**	**10**	**10**

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. Engineering Hydraulics - Hunter Rouse.
2. Engineering Fluid Mechanics - Narasimhan.
3. Open channel Hydraulics - V.T.Chow
4. Open channel flow - Henderson
5. Open channel hydraualics - Richard H. French
6. Flow through open channel – K. Subramanya
7. Flow through open channel – K. G. Ranga Raju
8. Open Channel Flow – M. Hanif Chaudhry
9. Fluid Mechanics – Granger
10. Fluid mechanics – Streeter and Wiley

Course Outcome:

After learning the course the students should be able to: understand advance topics of fluid mechanics and open channel flow and application of these topics in real life problems

List of Experiments/Tutorials:

1. Water surface profile in open channel flow
2. Pipe friction
3. Laminar and turbulent flow in pipes
4. Propagation of positive and negative waves
5. Surges in channel resulting from gate operation
6. Drag and lift on a flat plate and cylinder

Major Equipments:

1. Tilting flume
2. Wind tunnel

List of Open Source Software/learning website:

http://www.academia.edu/1468483/Hydrological_open_source_experiences_using_SWAT_and_OpenMI