FACULTY OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF

CIVIL ENGINEERING

Marwadi University
Marwadi Chandarana Group

Open Channel Flow

01CI0613

Objectives of the Course:

- To analyze the flow in open channels.
- To design optimum cross section for various types of channels.
- To compute Uniform flow
- To compute hydraulic jump formation and loss of energy.

Credit Earned: 03

Prerequisite: Basics of Fluid Mechanics and Hydraulics

Students learning outcomes:

After successful completion of the course, it is expected that students will be able to,

1. Understand spatially varied flow.
2. Compute energy loss due formation of hydraulic Jump.
3. Design optimal channel sections for the uniform flow condition.
4. Analyse the water surface profile for the non-uniform flow condition.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA (M)	CSE (I)	Viva (V)	Term Work (TW)	
03	00	00	03	50	30	20	25	25	150

Detailed Syllabus

Sr No.	Title of the unit	Number of hours
1	**Introduction**	**08**
	1.1 Introduction channel, Types of channels, classification of flow, velocity distribution, one-dimensional method of flow analysis	04
	1.2 Pressure distribution, equation of continuity, energy equation, Energy depth relationships, specific energy, critical depth, section factor, computation	**04**

2	**Uniform Flow**	**10**
	2.1 Introduction Steady uniform flow, Chezy equation, Darcy-Weis batch friction factors, Manning formula, Velocity distribution-shear stress distribution,	03
	2.2 Optimum shape of the cross-section,	04
	2.3 Energy equation-specific energy-specific energy diagram-discharge diagram Application of specific energy and discharge diagrams.	03
3	**Non-Uniform Flow**	**10**
	3.1 Introduction, Non-Uniform steady flow-equations for gradually varied flow- classification of flow profile, various water surface profiles (flow profiles), Analysis of flow profile,	05
	3.2 uniform flow computation, Direct Step method, Graphical methods	05
4	**Rapidly Varied flow -**	**10**
	4.1 Concept of a hydraulic jump, classification of a hydraulic jump, characteristics of jumps,	05
	4.2 characteristics of jump in rectangular channel, and non-rectangular channel, Location of hydraulic jump, use of jump as an energy dissipator,	05
5	**Spatially varied Flow**	**04**
	5.1 Introduction, SVF with increasing discharge,	02
	5.2 SVF with decreasing discharge, side weir, Bottom racks	02
	Total	**42**

Suggested Theory Distribution

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve an effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
5%	20%	45%	10%	10%	10%

Instructional Method and Pedagogy:

1. At the start of the course, the course delivery pattern, and prerequisite of the subject will be discussed.
2. Lectures will be taken in the classroom with the use of multi-media presentations, and whiteboard– a mix of both.

3. Attendance is compulsory in lectures and laboratory which carries a 5% component of the overall evaluation.
4. A minimum of two internal exams will be conducted an average of two will be considered as a part of a 15% overall evaluation
5. Assignments/tutorials based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular intervals. It carries a weightage of 5%.
6. The assignments/tutorials/technical visits are planned in such a way that they cover the practical aspects of the course contents.

Recommended Study Material

1. Flow in open channels by K. Subramanya, Tata Mcgraw-Hill Publishing Company Limited, New Delhi.
2. Fluid Mechanics and Hydraulic Machines by R. K. Rajput, S. Chand Publication
3. Fluid Mechanics by A.K. Jain, Khanna Publishers, New Delhi
4. Fluid Mechanics & Hydraulic Machines, R.K. Bansal, Laxmi Publication.
5. Theory and Applications of Fluid Mechanics by K Subramanya, McGraw Hill Publication
6. Hydraulics and Fluid Mechanics by P.N. Modi and S.M. Seth, Standard Book House, New Delhi
7. Open channel Hydraulics by Ven Te, Chow, McGraw Hill Book Company, INC, New York.
8. https://archive.nptel.ac.in/courses/105/103/105103021/