Hydraulic Engineering

Course Code	Credit Hours
CE- 464	2-1

Course Description

This course extends the theory of uniform flow to encompass the frequently occurring non-uniform flows commonly encountered in real-world applications. The chapter on unsteady flow treats the cases of sudden valve closure. The curriculum covers advanced topics such as sediment transport, reservoir sedimentation, and their relevance to dam and hydropower engineering

Text Book:

1.   J. F. Douglas, J. A. Swaffield "Fluid Mechanics" fourth edition.

2.   Hubert Chanson, "The hydraulics of Open Channel Flow: An Introduction" second edition.

3.   Graf and Altinakar, "Fluivial Hydraulics".

Reference Book:

1.   Open Channel Hydraulics. Terry W. Sturm. Latest Edition.

2.   Open Channel Flow. Francis M. Henderson, Latest edition

Prerequisites :

CE-251 Fluids Mechanics – I & CE-252 Fluids Mechanics - II

ASSESSMENT SYSTEM FOR THEORY

	Without Project (%)	With Project/Complex Engineering Problems (%)
Quizzes	15	10-15
Assignments	10	5-10
Mid Terms	25	25
Project	-	5-10
End Semester Exam	50	45-50

ASSESSMENT SYSTEM FOR LAB

Lab Work/ Psychomotor Assessment/ Lab Reports	70%
Lab Project/ Open Ended Lab Report/ Assignment/ Quiz	10%
Final Assesment/ Viva	20%

Teaching Plan

Week No	Topics/Learning Outcomes

1	Subcritical, supercritical flow and critical depth. Flow in venture flume and over broad-crested weir
2	Hydraulic Jump and occurrence & utility. Derivation of equation & problems
3	Dynamic equation of gradually varied flow. Water surface profiles
4-5	Quasi steady flow through pipe, orifice under varying head
6	Sediment Transport in channels an overview. Properties of individual sediment particles
7	Mid semester Exam
8	Bed forms & types. Different modes of sediment transport
9	Threshold conditions. Shield criterion. Shield curve. Problems
10-11	Calculation of bed load in channels. Formulas of Van Rijn, Meyer-Peter and Muller and Nielson Problems
12	Rouse-Vanoni profile. Role of Sediment diffusivity. Problems
13-14	Logarithmic velocity profile in channels. Calculation of suspended load by numerical integration. Problems
15	Transport capacity of channels. Exner equation. Modification in channel morphology. Problems
16	
17-18	End Semester Exam

Practical:.

Experiment No	Description
1	Critical Depth-derivation of the specific energy
2	The Hydraulic Jump
3	Force on sluice gate
4	OEL: Discharge measurement in a Nullah in H-12 campus
5	Characteristics of flow over an Ogee weir
6	Characteristics of flow over a crump weir
7	Fixing water surface profile in the channel by weir operation
8	Characteristics of flow over a dam spillway
9	Hands-on training of ANN operation in Matlab on the data of observed dimensionless sediment volume in laboratory.