

INSTITUTE	FACULTY OF TECHNOLOGY
PROGRAM	BACHELOR OF TECHNOLOGY (CIVIL ENGINEERING)
SEMESTER	7
COURSE TITLE	DESIGN OF HYDRAULIC STRUCTURES
COURSE CODE	01CI0711
COURSE CREDITS	4

Objective:

- 1 To design hydraulic structures as an integrated part of water resources project
- 2 To develop an understanding of the principles of design of earth dams, gravity dams, spillways, and energy dissipation devices
- 3 To understand site selection criteria for different types of dams
- 4 To know function of various hydraulic structure of irrigation project.

Course Outcomes: After completion of this course, student will be able to:

- 1 Select a suitable type of Dam and its site
- 2 Compute various forces, and stresses acting on the gravity dam and check safety factors
- 3 Locate the Phreatic line and carry out seepage analysis.
- 4 Design of Ogee and Chute spillway
- 5 Explain various energy dissipation devices.

Pre-requisite of course:Basics of Irrigation Engineering

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	1	0	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	Types of Dams and Site Exploration Introduction and definition, Classification of Dam and Types of Dam, Site section, merit, and demerits of the dam, Subsurface exploration, Foundation treatment methods	4
2	Gravity Dam Definition, Forces Acting on Dam, Causes of failures of Dam, Design criteria of a dam, Principal and Shear stresses, Stability analysis of Gravity dam, Design of Gravity Dam, Joints and Galleries in Dams	12

Contents : Unit	Topics	Contact Hours
3	Earth and Rock-fill Dams Introduction and Definition, Classification of Non-Rigid Dam, causes of failure of earthen dam, Preliminary profile of earth dam, construction materials, Cutt off, Seepage control measure & drainage system, Typical section, site selection, construction, Stability analysis of slope and foundation, Design consideration in Earthquake Region, Rock fill dams	12
4	Spillways and Gates Definition and types of spillway and components, Design of ogee spillway, Design of chute spillway, spillway gates, aeration, and galleries	8
5	Energy Dissipators Energy Dissipation by Hydraulic Jump, Location of a hydraulic jump, Design criteria for stilling basins, and their design, IS standardized basin, various methods and design of ED	6
Total Hours		42

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	Tutorial-1 Site investigation & foundation treatment	1
2	Tutorial-2 Compute different forces acting on gravity dam	1
3	Tutorial-3 Figure out principal and shear stresses	1
4	Tutorial-4 Design of concrete gravity dam-1	1
5	Tutorial-5 Design of concrete gravity dam-2	1
6	Tutorial-6 Stability analysis of concrete gravity dam	1
7	Tutorial-7 Primary cross section of earthen dam	1
8	Tutorial-8 Compute phreatic line in earthen dam	1
9	Tutorial-9 Stability Analysis for earthen dam	1
10	Tutorial-10 Design of ogee spillways-1	1
11	Tutorial-11 Design of ogee spillway-2	1
12	Tutorial-12 Design of chute spillway-1	1

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
13	Tutorial-13 Design of chute spillway-2	1
14	Tutorial-14 Methods of Energy Dissipation	1
Total Hours		14

Textbook :

- 1 Irrigation Engineering and Hydraulic Structures, y S K Garg, Khanna Publishers, Delhi, 2023

References:

- 1 Irrigation and Water Resources Engineering, Irrigation and Water Resources Engineering, G L Asawa, , New Age Publishers, 2008

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 effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
5.00	20.00	45.00	10.00	10.00	10.00

Instructional Method:

- 1 Prerequisites of the course and its pattern shall be discussed at the commencement of the course
- 2 Lectures shall be conducted in the classroom using various teaching aids.
- 3 Presence in all academic sessions is mandatory which shall carry 5% marks of the total internal evaluation
- 4 A minimum of two internal exams will be conducted and an average of two will be considered as a part of a 15% overall evaluation.
- 5 At the end of each unit/topic, an assignment based on the course content shall be given to the students which shall carry 5% weightage for timely completion and submission of the assigned work.
- 6 The assignments/tutorials/technical visits are planned in such a way that they cover the practical aspects of the course contents

Supplementary Resources:

- 1 <https://eopcw.com/find/course/736/courses>