

GUJARAT TECHNOLOGICAL UNIVERSITY

BE (CIVIL & INFRASTRUCTURE ENGINEERING)

DESIGN OF HYDRAULIC STRUCTURES

SUBJECT CODE: 2184004

8th Semester

Type of course: Department Elective

Prerequisite: NIL

Course Objectives:

- To make the students understand the advanced methods used in the analysis and design of hydraulic structures.
- To make the students familiar with the use of computer software used for hydrologic and hydraulic design

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE	PA(M)	Viva	PA (I)	
3	2	0	5	70	30	30	20	150

Contents:

Sr. No	Topics	Hrs.	% Weightage
1	Synthetic design storms & Estimation of peak discharge	03	7.5
2	Urban storm drainage design, Culvert design, Detention storage design,	05	12.5
3	Watershed modeling	02	5
4	Flood frequency analysis and hydrologic design under uncertainty	02	5
5	Design of water distribution network	03	7.5
6	Analysis and design of rigid boundary channels	04	10
7	Tractive force concepts in channel design	02	5
8	Design of canal headworks, distribution works, and cross-drainage works	05	12.5

9	Investigation for dam-site, Different types of dams, selection of types of dams, Selection of site for dam	02	5
10	Design of gravity dams, earthen dams, spillways, and energy dissipators	06	15
11	Computer aided design (application of CAD)	06	15
	Total	40	100

Course Outcome:

After learning the course the students should be able:

Students will be able to design various water resources infrastructure

- Water distribution network,
- Canal headworks,
- Distribution works, drainage system design,
- Gravity dam, earthen dam, spillways etc.
- They will also be able to design the energy dissipation work.

List of Experiments: Nil

Design based Problems (DP)/Open Ended Problem:

- Water distribution network design by Hardy Cross method and validation through Water Hammer (Bentley Software)
- Canal network design
- Drainage system design
- Calculation of forces acting on gravity dam as per IS-6512
- Stability analysis of gravity dam
- Design of Gravity dam
- Design of Spillway
- Preliminary section of earth dam and design of earth dam
- Filter design for earth dam
- Stability analysis of earth dam
- Location of phreatic line in earth dam section with horizontal filter and without filter

Textbooks:

1. Irrigation Water Resources - Dr.P.N.Modi
2. Irrigation – Dr. B. C. Punamia
3. Irrigation and Hydraulic Structures – S. K. Garg
4. Theory and Design of Hydraulic Structures – Varshney & Gupta
5. Applied Hydrology by V. T. Chow, David Maidment, and Larry Mays, Tata McGraw Hill, New Delhi, India.

- Hydraulic Design Handbook by Larry W. Mays, McGraw Hill.

Reference Books:

- Hydrologic Analysis and Design by Richard H. McCuen, Prentice Hall, New Jersey, USA.
- Design text books in Civil Engineering -Serge Leliavsky.
- C.B.I. Publication No.12 of Government of India
- Irrigation Engineering – Bharat singh
- Relevant Indian standards
- Water Resources Engineering- Larry Mays
- Hydraulic Structure –Novak
- Irrigation Engineering –G. L. Asawa

Specialized Infrastructure requirement:

Related computer software (ESRI ArcGIS/QGIS, Matlab/Octave, and Bentley’s Haestad Methods). Some of the tutorials have been designed and will be conducted in the computer lab.

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N	E Level	C
10	15	20	20	25	10

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above

Active Learning Assignments

Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.