



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3174020

Semester – VII

Subject Name: Analysis and Design of Hydraulic Structures

Type of course: Professional Elective Course

Prerequisite: Water Resource Engineering and Hydrology

Rationale: To develop understanding about irrigation engineering works like weir/barrage, storage and outlet works, distribution works, regulating and cross drainage works and importance of drainage in irrigated areas. To learn how to design irrigation structures, such as headworks (weirs, barrages), canals, falls, cross drainage works and gravity & embankment dams.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	Synthetic design storms & Estimation of peak discharge	03
2	Urban storm drainage design, Culvert design, Detention storage design,	04
3	Watershed: management, modeling, system approach, structure, hydrologic models, SCS-CS method, etc.	04
4	Design of water distribution: network-analysis, optimization, Hazen William formula, Hardy Cross method, etc.	03
5	Design of canal head works, distribution works, diversion headworks-weir, barrage, and cross-drainage works	05
6	Investigation for dam-site, Different types of dams, selection of types of dams, Selection of site for dam	03
7	Concrete Dam Engineering: Loading-Concepts and criteria, Gravity dams analysis design features, galleries, joints, keys, water seals, control of cracking, Arch and buttress dams.	05
8	Dam and outlet works: Design of spillways, energy dissipaters, etc	03
9	Canal falls: types, principles of design, design procedures, etc.	05
10	Computer aided design (application of CAD).	07
	Total	42



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Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	15	20	20	20	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. Irrigation Engineering and Hydraulic Structures- Dr S. K. Sharma, S Cahnd Publication
2. Dr.P.N.Modi, Irrigation Water Resources.
3. Dr. B. C. Punmia, Pande B B, Ashok kumar Jain, Arun Kumar Jain, Irrigation & Water Power Engineering, .
4. S. K. Garg, Irrigation and Hydraulic Structures.
5. Varshney & Gupta, Theory and Design of Hydraulic Structures.
6. V. T. Chow, David Maidment, and Larry Mays, Applied Hydrology, Tata McGraw Hill, New Delhi, India.
7. Larry W. Mays, Hydraulic Design Handbook, McGraw Hill.
8. Richard H. McCuen, Hydrologic Analysis and Design, Prentice Hall, New Jersey, USA.
9. Serge Leliavsky, Design text books in Civil Engineering.
10. C.B.I. Publication No.12 of Government of India
11. Bharat singh, Irrigation Engineering.
12. Relevant Indian standards
13. Larry Mays, Water Resources Engineering.
14. Novak, Hydraulic Structure.
15. G. L. Asawa, Irrigation Engineering.

Course Outcomes: After studying this subject, students will be able to design

Sr. No.	CO statement	Marks % weightage
CO-1	Water distribution network	30
CO-2	Canal head works, Distribution works, Drainage system	30
CO-3	Gravity dam, Earthen dam, Spillways and Energy dissipation work	40



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List of Experiments:

- Water distribution network design by Hardy Cross method and validation through Water Hammer (Bentley Software)
- 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
- Design of canal falls
- Design of diversion headworks

List of Open Source Software/learning website:

- ESRI ArcGIS/QGIS,
- Matlab/Octave,
- Bentley's Haestad Methods
- NPTEL