GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering (Part Time)
Subject Code: 2970608

Subject Name: DESIGN OF HYDRAULIC STRUCTURES
Semester – VII

Type of course: Professional Elective Course-V

Rationale:
Design of Hydraulic structures forms an integral part of water resources engineering projects. It includes selection of site for a particular type of dam, design and constructional features of Gravity dam, Embankment dams, and Rock fill dams. A hydraulic engineering has to develop understanding of principles of design of earth dam, gravity dam, spillways and energy dissipation devices.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	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	**Module 1:** **Types of Dams and Foundation Treatment:** Classification of Dams, Investigations for Dam Sites, Selection of site for Dams, Selection of Type of Dam, Merits and demerits of all types of dam, Importance of Subsurface Exploration, Foundation Treatment Methods, Materials and Techniques.	**04**
2	**Module 2:** **Gravity Dams:** Definition, Forces acting on the Dam, Combinations of load on the Dam, Causes of failure of Dams, Design criteria for Gravity Dams, Principal and Shear stresses, Elementary and Practical Profile of a Gravity Dam, High and Low Dam, Stability Analysis of a Gravity Dam, Design of Gravity Dams, Control of Temperature in Dams, Construction of dam, and joints in Dams, Galleries in Dams.	**12**
3	**Module 3:** **Earth and Rock-fill Dams:** Introduction, Earth Dam Definitions, Classification of Non – Rigid Dams, Causes of failure of Earth dams, Design Principles of Earth Dams, Profile of an Earth Dam, Side slopes and Protection Measures for Earth Dams, Core and Casing for Earth Dams, Construction Materials for Earth Dams, Cut off and Seepage Control Measures in Earth Dams, Drainage system for Earth Dams, Typical Sections of Earth Dams, Selection of Dam section, Construction of Earth Dams, Determination of Phreatic line, Stability of Slopes, Stability of Foundation against Shear, Design considerations in Earthquake Regions, Design of Earth Dams, Rock fill Dams.	**13**

4	**Module 4: Spillways, Sluices and Crest Gates** Definition and Types of Spillway, Components of Spillway, Chute Spillway, Side Channel Spillway, Shaft Spillway, Siphon Spillway, Design of Ogee Spillway, Profile of Ogee Spillway, Cavitation Erosion of Spillway Surface, Design of Chute spillway, Aeration Galleries, Spillway crest Gates, Sluices in dam	**10**
5	**Module 5:** **Energy Dissipators:** Energy Dissipation below Overflow Spillways, Energy Dissipation by Hydraulic Jump, Location of hydraulic jump, Design criteria for Stilling Basins and their design, IS Standardized Basins, Various methods of Energy Dissipation and their design.	**06**

Course Outcomes: At the end of the course, Student will be able to

Sr. No.	CO statement	Marks % weightage
CO-1	Choose suitable type of Dam and its sites for construction.	10
CO-2	Calculate forces, stresses on gravity dam and check various factor of safety.	30
CO-3	Locate phreatic line and carryout seepage and stability analysis of Embankment dam under various hydraulic conditions.	30
CO-4	Explain and Design Ogee and Chute spillway	15
CO-5	Explain and Design energy dissipation devices.	15

Note: Term work shall be based on above mentioned syllabus.

Suggested Specification table with Marks (For BE only):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15%	**20%**	**20%**	**20%**	**15%**	**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 by S R Sahasrabudhe
2. Irrigation Engineering and Hydraulic Structures by Dr. V C Agarwal
3. Irrigation and Water Power Engineering by Dr. B.C.Punamia,

4. Irrigation Engineering and Hydraulic Structures by S K Garg
5. Irrigation and Water Resources Engineering by G L Asawa
6. Irrigation Water Resources and water power Engineering by Dr.P.M.Modi
7. Theory and Design of Hydraulic Structures Vol. 1 and 2 by R.S.Varshney, S.C. Gupta, R.L. Gupta
8. Irrigation Engineering and Hydraulic Structures by S K Sharma
9. Irrigation and Hydraulic Structures: Theory, Design and Practice by Iqbal Ali
10. Hydraulic Engineering of Dams by Willi H. Hager, Robert M. Boes, Michael Pfister, Anton J. Schleiss
11. Hydraulics of Spillways and Energy Dissipators by Rajnikant M. Khatsuria

List of Open Source Software/learning website:

nptel.ac.in