GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Civil (Water Resource Engineering)

Subject Code: ME02033021

Subject Name: Design of Hydraulic Structures

w. e. f. Academic Year:	2024-25
Semester:	2
Category of the Course:	PCC

Prerequisite:	Advanced Hydraulics
Rationale:	Students will be able to understand various forces necessary to be considered in the design of gravity dam, earthen dam, spillways etc. They will also be able to understand the elementary design of energy dissipation works.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Describe the significance of various hydraulic structures	R, U
02	Design the embankment dams and analyse its stability	U, N, A
03	Compute various forces acting on the gravity dam and perform stability analysis.	U, N, A
03	Design Spillways and energy dissipation works.	U, N, A
04	Perform dimensional analysis and analyse hydraulic models	N, A, C

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Introduction:** Hydraulic structures for water resources projects.	3	6
2.	**Embankment Dams:** Types, Selection criteria, design considerations, seepage analysis and control, stability analysis, construction techniques.	8	18
3.	**Gravity Dams:** Forces acting on a gravity dam, stress analysis, elementary profile, design of gravity dam, Stability analysis, other functional features of a gravity dam.	9	20
4.	**Dam Outlet Works:** Types of outlet structures, ogee spillway and its design criteria, chute spillway and its design criteria, syphon spillway, side channel spillway, Labyrinth and Piano key weir.	8	18
5.	**Terminal Structures:** Hydraulic jump types, Measures adapted for energy dissipation based on the location of jump, stilling basin and its design criteria, roller bucket, ski jump basin, baffled spillway, drop structure.	8	18
6.	**Hydraulic Modelling:** Basic principles, dimensional analysis, modelling free-surface flows, design of physical models.	9	20
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
10	10	20	20	20	20

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Peterka, A.J, "Hydraulic Design of Stilling Basins and Energy Dissipators", USBR Engineering Monographs No. 25"
2. "Design of Small Dams", Third Edition, Water Resources Technical Publication – US Bureau of Reclamation.
3. Singh, B., and Varshney, R.S., "Embankment Dam and Engineering", Nem Chand and Brothers.

4. Chanson, H., "The Hydraulics of Open Channel Flow : An Introduction", Elsevier Scientific Publications.
5. Novak, P. and Nalluri, C., "Hydraulic Structures", Edition 4, Taylor & Francis.
6. Creager, Justin and Hinds, "Engineering for Dams", Vol. I and II, John Wiley.

(b) Open source software and website:

1. NPTEL

* * * * * * *