GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Civil (Water Resource Engineering)

Subject Code: ME02033051

Subject Name: Hydropower Engineering

w. e. f. Academic Year:	2024-2025
Semester:	2
Category of the Course:	Professional Elective Course

Prerequisite:	Knowledge of hydropower scheme and its components, types of hydropower plant. Idea about penstock, surges in canal, Knowledge of turbine and draft tube
Rationale:	Hydropower is most environmental friendly and economical resource for energy. Study of Principles and design of hydropower plant, design of intake, water hammer theories, hydraulic design of surge tank and design and principles of turbine is very much required for water resources engineers.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Prepare a layout of Hydropower plant and Design Hydropower plant components	U,C
02	Classify , select and design Penstocks	U, N,A
03	Analyze and Evaluate the effect of Water hammer	R, A,E
04	Select Hydraulic turbine for Hydropower plant	R, U,
05	Design of air vent	N, 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

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Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Introduction: Sources and forms of energy, types of power plants, and elements of hydropower scheme, hydropower development in India. Power house structures-substructure and superstructure Layout and dimensions, design considerations. Hydropower plants classification: Surface and underground power stations, Low medium-high head plants-layout and components, pumped storage plants, tidal power plants, micro-tidal units. Load and power studies: load curve, load factor, load duration curve, firm capacity, reservoir capacity, capacity factor.	14	30
2.	Penstocks and power canals: Classification of penstocks, Design of Penstocks, economic diameter, bends, anchor blocks, surges in canals, design criteria of power canals. Intake structures: Location function and types of intakes, energy losses at intake trash rack, design of intakes.	9	20
3.	Water hammer and surge tanks: Rigid and elastic water column theories, water hammer pressure. Behavior of surge tanks, types of surge tanks, hydraulic design, design of simple surge tank-stability	9	20
4.	Hydraulic turbines, types and classification, constructional features, hydraulic analysis, selection, characteristic curves, governing of turbine, drafts tubes-types, hydraulic principles, and design. Gates and valves- types. Design of air vent	13	30
	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**
20	**20**	**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. Water power Development : Mosonyi
2. Hydroelectric hand book: Creagar, W.P. and Justin, J.D., John Wiley & Sons, New York.
3. Davis' Handbook of applied hydraulics : Zipparro, V. J. and Hasen H., Mc-Graw Hill, Inc., New York
4. Hydropower structures : R.S.Varshiray, Nem Chand and Bros. Roorkee
5. Water Power Engineering: M.M.Desmukh, Dhanpat rai and Sons.
6. Water Power Engineering: M.M. Dnadeker and K.L.Sharma, Vikas Publishing house

(b) Open source software and website:

1. https://archive.nptel.ac.in/content/storage2/courses/108108078
2. https://archive.nptel.ac.in/courses/112/107/112107291
3. https://kristujayanti.digimat.in/nptel/courses/video/108105058…

Suggested Course Practical List: If any

1. Prepare a layout of Hydropower plant
2. Design of Penstocks
3. Design of Intake structure
4. Classification of turbines
5. Calculating water hammer pressure
6. Design of surge tanks
7. Design of air vent

List of Laboratory/Learning Resources Required:

Modes of turbines

Models of Gates and valves

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