

# GUJARAT TECHNOLOGICAL UNIVERSITY

## CIVIL (WATER RESOURCES ENGINEERING) (33)

### HYDROPOWER ENGINEERING

**SUBJECT CODE:** 2713305

**SEMESTER:** I

**Type of course:** Hydraulic energy and machines

**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:** Principles and design of hydropower plant, design of intake, water hammer theories, hydraulic design of surge tank, design and principles of turbine

#### Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks		Practical Marks				
			ESE (E)	PA (M)	PA (V)		PA (I)			
ESE	OEP	PA			RP					
3	2	2	5	70	30	20	10	20	0	150

#### Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	Introduction: Sources and forms of energy, types of power plants, 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, microtidal units. Load and power studies: load curve, load factor, load duration curve, firm capacity, reservoir capacity, capacity factor.	12	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 rock, 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 and 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	12	30

#### Reference 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

**Course Outcome:**

After learning the course the students should be able to: Understand hydropower plant and its components. Flow of water through penstock. Design of surge tank. Hydraulic analysis of turbine and draft tube.

**List of Experiments:** Field visit of hydropower plants and preparing the report for the same

**List of Tutorial:**

1. Sources and form of energy
2. Lay out of power hours and design consideration
3. Features of Hydro power plants
4. Detail of penstocks and power canal
5. Water hammer and surge tank problems
6. Hydraulic turbine and main types of governing of turbine

**Open Ended Projects:**

1. Design of inlet
2. Design of penstock
3. Design of surge tank

**Major Equipments:**

Model of hydropower plant

**List of Open Source Software/learning website**

<http://www.usbr.gov/power/edu/pamphlet.pdf>