

**FOR ENGINEERING DIPLOMA LEVEL ELECTIVE SUBJECT**

**For the branches in Electrical, Instrumentation, Electronics**

1. **Subject Code:** \_\_\_\_\_ **Course Title: Hydro Power Engineering**

2. **Contact Hours: L: T: P:**

3. **Examination Duration (Hrs.): Theory :** \_\_\_\_\_ **Practical :** \_\_\_\_\_

4. **Relative Weightage : CWS PRS MTE ETE**  
**PRE**

5. **Credit:** \_\_\_\_\_ 6. **Semester:**     
**Autumn Spring**

**Both**

7. **Pre-requisite: NIL** 8. **Subject Area:** \_\_\_\_\_

9. **Details of Course:**

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Sl. No.	Particulars	Contact Hours
1.	Introduction to Hydro Power Energy: Introduction to non-conventional energy. Types of energy – solar energy, wind energy, biomass energy, ocean & geothermal energy and hydrogen energy etc. What is hydropower energy? Need for hydropower energy and its power estimation. Law of conservation of energy, Route of energy conversion.	
2.	Types of Hydro Projects, Planning & Management: Government Hydropower policies, environmental issues, SWOT-(Strength weakness opportunity threatening) of hydropower projects, type of clearance required for Hydropower project, master plan, topography, catchments area, types of streams, allotment of site-(Open bid, Mou, Joint venture). Survey & investigation, PFR-(Pre-feasibility report), DPR (Detailed Project Report), Process of development of site (announcement, allotment, clearance, agreement, commissioning).Types of survey- Topographical, metrological, hydrological, ecological, geological. Arial Rainfall Measurement, Type of flow measurement Devices-(Notch, weir, flume), dilution method, and Flow duration curve (important), flood – discharge estimation kripitech formula, dickens formula, English formula, hydrograph, unit hydrograph. Financial institution, SOI Map, Cost / Estimation – wheeling charges, Banking, Moratorium, PPA-(Power purchase agreement), SERC-(State electricity regulatory commission) Hydrological cycle.	9
3.	Description of main parts of Hydropower Station: Block diagram of Small Hydro Power Station. Dam, Details of desilting tank. Storage & Balancing reservoir. Pen Stock, Pipe Line & Tunneling.	10

Sl. No.	Particulars	Contact Hours
	Surge Tank, Valve House, Turbines. Synchronous Generator. Protection & Control equipment. Governors (Mechanical, electro-mechanical). Synchronous Generator & its Construction, Types of Synchronous Generator -Self excited, separately excited, self-excited with carbon brush, self excited brush less. Operational principle of Synchronous Generator. Speed frequency relationship.	
4.	Earthing and grounding: e.m.f. equation for generator, Characteristics of Synchronous Generator (V-I Characteristics). Voltage regulation, open circuits charges, Short circuits charges, phase diagram short circuit ratio, parallel operation of generator or synchronizing of generators (Dark & Bright lamp and Synchronoscope method) synchronizing-Current, Torque, Power, Load sharing between two alternator running in parallel, Effect of change in excitation on terminal voltage. Induction generator – Construction & Working Principle, slip speed, Self-excited Induction generator or standalone generator. Power factor-pf, Most economical power factor, Real power factor, operant power factor, leading & lagging power factor, pf correction methodologies. Switchyards- A Transformer – its types, construction, rating, Star & Delta Connection, parallel operation, phase group of 3Φ transformer. B Protection -Circuit Breakers, Short circuit current, Base KVA, Method of short circuit current, KVA calculation, fuse element, current carrying capacity of fuse element, Instrumental transformer, Current transformer, Basic Principle of operation of circuit breaker, types of circuit breaker, oil circuit breaker, oil less circuit breaker, relay-its types – electromagnetic induction type, electromagnetic attraction, thermal, moving, static, Directional, Over Voltage & Over Current. C Power transformer – differential protection, over current earth fault protection, SCADA- Supervisory control and data acquisition, ICCS- Integrated computer control system.	
5.	Costing & Estimation	4

**Suggested Readings:**