

Automation in Water Resources and Hydropower Plant

Course Contents

Sl. No.	Particulars	Contact Hours
1.	INTRODUCTION: Sources and forms of energy, types of power plants, elements of hydropower scheme, hydropower development in India, Hydro Powerhouse structures-substructure and superstructure Layout and dimensions, Hydropower plants classification: Surface and underground power stations, Low, medium and high head plants-layout and components, microhydel units, Different curves: Load curves, load duration curve, Connected load, maximum load, peak load, base load and peak load power plants, load factor, plant capacity factor, plant use factor, demand factor, diversity factor.	5
2.	CIVIL STRUCTURES: (Limited only to the introduction of each term), civil engineering works: dams, earth fill, water conduits, spillways, and other open channels, surge tanks, general construction, hydraulic structure for power plants: Control of water delivery to turbines, control gates, Pumped storage installations. Penstocks; discharge tubes for hydraulic turbines, head losses, energy losses and efficiency.	6
3.	Water resources	
4.	HYDRAULIC TURBINES: Turbines for electric power generation, basics of Pelton wheel impulse units, Francis mixed flow, Propeller, Kaplan and Cross flow, power and efficiency; high, medium and low head applications,	6
5.	Control of frequency and power loading, turbine instrumentation: speed calculation, Valve actuation, auto-start-up, thermal stress control, condition monitoring and power distribution instrumentation.	3
6.	MONITORING regulation and monitoring: Hydroelectric power generation, automatic regulation and monitoring of voltage and frequency, modelling & Simulation: Computerized modeling & simulation of Electric Machines, data acquisition and logging.	7
7.	PROTECTION: Principles of power system protection: system Vs apparatus protection, analog Vs digital protection, protection system components: potential and current sensors, relays, fuses, circuit breakers, Computerized status monitoring, zone protection, back up schemes, protective relays: Type and classification of relays, different types of relays: differential and percentage differential relay, impedance, admittance, reactance relays, distance protection concept, Carrier and	8

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	pilot wire systems, Significance of computerized protection systems. power circuit breakers: Arc characteristics, arc interruption, arc gaps, types of circuit breakers: air, oil, vacuum, SF6, automatic circuit re-closers, Apparatus protection: generator, transformer, transmission lines protection systems.	