

**Short Term Training Course on  
“Hydro Power Plant (Mechanical)” for Teachers of Polytechnics in Uttarakhand  
June 05-09, 2007**

<b>Time</b> <b>Day</b>	<b>0900-1015</b>	<b>1015-1130</b>	<b>1130-1200</b>	<b>1200-1315</b>	<b>1315-1430</b>	<b>1430-1545</b>	<b>1545-1600</b>	<b>1600-1700</b>
<b>June 05, 2007</b>	Registration	L1	<b>TEA BREAK</b>	L1	<b>LUNCH</b>	L2	<b>TEA BREAK</b>	L3
		DKS		DKS		AK		SKS
<b>June 06, 2007</b>	L9	L2		L2		L2	RPS	L2
	SKS	AK		AK		RPS	RPS	RPS
<b>June 07, 2007</b>	L4	L4		L10		<b>Visit to Site (Pathri Power House) Virbhadra Barrage RPS</b>		
	RPS	RPS		RPS		L8		L10
<b>June 08, 2007</b>	L5	L7-B	L7-B	RPG	RPG	<b>TEA BREAK</b>	MKS	
	RPG	RPG	RPG	L7-A				
<b>June 09, 2007</b>	L6	L6	Test	AKB		Valedictory Function		
	AKB	AKB						

Lecture: CCE Lecture Room

Stay, Breakfast, Lunch & Dinner : : Continuing Education Guest House

**Faculty:**

AK	Shri Arun Kumar, Head, AHEC	RPG	Shri R.P. Goyal, Ex AGM, BHEL
AKB	Shri A.K. Bhargava, SVS Engineering Services, Noida	RPS	Dr. R.P. Saini, SSO, AHEC
DKS	Dr. D.K. Srivastava, Professor, DOH	SKS	Shri S.K. Singal, SSO, AHEC
MKS	Shri M.K. Singhal, SSO, AHEC		

**(R.P. SAINI)**  
Course Coordinator

**(ARUN KUMAR)**  
Course Director

S. No.	<i>Particulars</i>	<b>Contact Hours</b>
L-1	HYDROLOGY : Introduction The hydrological cycle, Measurement of run off, Hydrograph, flow duration curve, mass curve, Numerical Problems. Flood – discharge estimation kripitech formula, dickens formula, English formula, hydrograph, unit hydrograph.	2
L-2	Essential Elements of Hydro Power Plants: Catchment area, Reservoir, dams, Spillways, conduits, Surge Tank, Prime movers, Draft tubes, powerhouse equipment. 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). Financial institution, SOI Map, Cost / Estimation – wheeling charges, Banking, Moratorium, PPA-(Power purchase agreement), SERC-(State electricity regulatory commission) Hydrological cycle.	5
L-3 & L-9	Types of Hydro Power Plants: High, medium and low head plants, Base load and peak load plants, Run-or-river plant with pondage, Run-of-river plant without pondage, Storage type plant and pump storage plants, Mini and microhydro plants, Under ground hydropower plants.  Lay out of Hydro Power Plant: Types of layouts on the basis of types of plants. Schematic arrangement of different elements in a hydropower plant.	2
L-4	Hydraulic Turbines: Classifications of water turbines, principles of working. Impulse turbine – constructional details, velocity triangles power and $\eta$ calculations, governing of impulse turbines. Reaction Turbines --, Francis turbines, propeller and Kaplan turbines, construction details, velocity triangles, power and $\eta$ calculations, degree of reaction, draft tubes, sp speed of turbine, cavitation and methods of prevention, principle of similarity, unit and sp. Quantity, selection of turbines, governing of reaction turbines.	2
L-5	Auxiliaries of Hydro Power Plants: Exciter, governor oil system, lubricating oil system, coolant pumps, air compressors, drainage pump, cranes, gate hoists, valves etc.	1
L-6	Control of Hydraulic Power Plants: Hydraulic control-different types, Machine control-starting and stopping of voltage control of generators and system. Protection of machine against break down. Automatic and remote control of hydro plants-fully automatic plants, partially automatic plant, remote control of plants.	2
L-7A	Electrical and Mechanical Equipment in Hydro Power Plant: Electrical Equipment-Generator, exciter, voltage regulators, transformers, switch gears, control room equipments.	3
L-7B	Mech. Equipments—Compressors, air duets, shafts, couplings, bearings, braking equipment's for generator, oil circuits and pumps, cranes and other lifting devices, ventilation's and cooling system, equipment for water supply and drainage equipment for power house lighting.	
L-8	Safety Measures in Hydro Power Plants: Surge tanks, screens, sand traps, jets dispersers, pressure regulators, Preventative maintenance, erosion of blades and prevention.	1
L-10	Cost of Hydro Power : Calculations of hydropower, cost of hydro plant economics of hydro power generation (fixed cost, running cost, transmission cost) etc.	2