

**Short Term Training Course on
“Hydropower Development Engineering (Electrical)” for Teachers of Polytechnics in Uttarakhand
July 14-18, 2007**

12.07.2007

Time Day	0900-1015	1015-1130	1130-1200	1200-1315	1315-1430	1430-1545	1545-1600	1600-1700
July 14, 2007 (Saturday)	Registration	L42-1 SNS	T E A B R E A K	L23-1 SKS	L U N C H	Visit to Simulator Lab and Turbine lab	TEA BREAK	L21-3 AK
July 15, 2007 (Sunday)	L32-1 RPS	L21-3 AK		L21-3 AK				Visit to site (Pathri Power House)
July 16, 2007 (Monday)	L31-2 MKS	L11-1 MPS		L31-2 MKS		L33-2 SNS	TEA BREAK	L33-2 SNS
July 17, 2007 (Tuesday)	L41-2 YSJ	L41-2 YSJ		L22-1 DKS		L44-1 BG		L43-3 YSJ
July 18, 2007 (Wednesday)	L43-3 YSJ	L43-3 YSJ		Test		L51-1 SNS		Valedictory Session

Lecture: CCE Lecture Room

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

Faculty:

AK Shri Arun Kumar, Head, AHEC
BG Shri Bharat Gupta, Asst. Prof., EED
DKS Dr. D.K. Srivastava, Professor, DOH
MKS Shri M.K. Singhal, SSO, AHEC
MPS Dr. M.P. Sharma, Assoc. Prof., AHEC

RPS Dr. R.P. Saini, Assoc. Prof., AHEC
SKS Shri S.K. Singal, SSO, AHEC
SNS Shri S N Singh, SSO, AHEC
YSJ Shri Y.S. Jadaun, Ex. CE, UP Electricity Board

(S N SINGH)
Course Coordinator

(ARUN KUMAR)
Course Director

FOR ENGINEERING DIPLOMA LEVEL ELECTIVE COURSE
For the branches in Electrical, Instrumentation, Electronics Engg.

Lecture No.	<i>Contents</i>	Faculty
L11-1	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.	MPS
L21-3	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). PPA-(Power purchase agreement), SERC-(State electricity regulatory commission) PFR-(Pre-feasibility report), DPR (Detailed Project Report), Process of development of site (announcement, allotment, clearance, agreement, commissioning), Financial institution, SOI Map, Cost / Estimation – wheeling charges, Banking, Moratorium	AK
L23-1	Survey & investigation, 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)	SKS
L22-1	Hydrological cycle, flood – discharge estimation kripitech formula, dickens formula, English formula, hydrograph, unit hydrograph.	DKS
L31-2	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. Surge Tank, Valve House,	MKS
L32-1	Turbines. Governors (Mechanical, electro-mechanical).	RPS
L33-2	Synchronous Generator. Protection & Control equipment. 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.	SNS
L41-2	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.	YSJ
L42-1	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.	SNS
L43-3	Switchyards- A Transformer – its types, construction, rating, Star & Delta Connection, parallel operation, phase group of 3 Φ 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.	YSJ
L44-1	C Power transformer – differential protection, over current earth fault protection, SCADA- Supervisory control and data acquisition, ICCS- Integrated computer control system.	BG
L51-1	Costing & Estimation	SNS