

Hydel Power and Wind Energy

Module I:

Elements of hydropower scheme, hydropower development in India. Power house structures and Layout. Hydropower plants classification: Surface and underground power stations, Low- medium-high head plants-layout and components, pumped storage plants. Load and power studies: load curve, load factor, load duration curve, firm capacity, reservoir capacity, capacity factor

Module II:

Hydraulic turbines and types and classification, constructional features, selection, characteristic curves, governing of turbine, drafts tubes-types, hydraulic principles. Gates and valves types. Penstock and surge tanks.

Wind machine types, classification, parameters. Wind measurements, data presentation, power in the wind. Wind turbine aerodynamics, momentum theories, basic aerodynamics, airfoils and their characteristics

Module III:

Horizontal Axis Wind Turbine (HAWT) - Blade Element Theory, wake analysis, Vertical Axis Wind Turbine (VAWT) aerodynamics.

HAWT rotor design considerations, number of blades, blade profile, 2/3 blades and teetering, coning, power regulation, yaw system, tower.

Wind turbine loads, aerodynamic loads in steady operation, wind turbulence, static - dynamic - fatigue analysis, yawed operation and tower shadow, WECS control system, requirements and strategies.

Wind Energy Conversion System (WECS) siting, rotor selection, Annual Energy Output (AEO).

Synchronous and asynchronous generators and loads, integration of wind energy converters to electrical networks, inverters. Testing of WECS.

Text Books

Water Power Engineering: M.M.Desmukh, Dhanpat rai and Sons

Wind Energy Conversion Systems, Freris L.L., Prentice Hall 1990.

Reference Books

Water power Development : Mosonyi

Hydroelectric hand book: Creagar, W.P. and Justin, J.D., John Wiley & Sons, New York.

Davis' Handbook of applied hydraulics : Zipparro, V. J. and Hasen H., Mc-GrawHill, Inc.,

Hydropower structures : R.S.Varshiray, Nem Chand and Bros. Roorkee

Water Power Engineering: M.M.Dandekar and K.N.Sharma, Vikas Pub

Spera D.A., Wind Turbine Technology: Fundamental Concepts of Wind Turbine Engineering, ASME Press, NY 1994.

Johnson, G.L., Wind Energy Systems, Prentice Hall, 1985.

Elective II: