

**OBJECTIVES:**

To make the student learn about:

- Structure, essential components and their layout in thermal power station
- Selection of site for thermal power station
- Selection of site for hydro power generation
- Various aspects and issues involved in Nuclear power generation
- Electric power generation from renewable energy sources as sun, wind and ocean
- Cost of generation and tariff methods

**UNIT-I: THERMAL POWER GENERATING SYSTEMS**

Block Diagram of Thermal Power Station (TPS) showing paths of Coal, Steam, Water, Air, Ash and Flue Gasses - Brief Description of TPS Components: Economizers, Boilers, Super Heaters, Turbines, Condensers, Chimney and Cooling Towers.

**UNIT-II: HYDRO & NUCLEAR POWER GENERATING SYSTEMS**

**Hydro Power:** Selection of Site, Classification, Layout, Description of Main Components.

**Nuclear Power:** Nuclear Fission and Chain Reaction.- Nuclear Fuels.- Principle of Operation of Nuclear Reactor.-Reactor Components: Moderators, Control Rods, Reflectors and Coolants.- Radiation Hazards: Shielding and Safety Precautions.- Types of Nuclear Reactors and Brief Description of PWR, BWR and FBR.

**UNIT -III: SOLAR & WIND POWER GENERATING SYSTEMS**

**Solar Power Generation:** Role and Potential of Solar Energy Options, Principles of Solar Radiation, Flat Plate and Concentrating Solar Energy Collectors, Different Methods of Energy Storage – PV Cell- V-I Characteristics.

**Wind Power Generation:** Role and potential of Wind Energy Option, Horizontal and Vertical Axis Wind Mills- Performance Characteristics- Power- Speed & Torque- Speed Characteristics- Pitch & Yaw Controls – Power Electronics Application – Economic Aspects.

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**UNIT-IV: BIOGAS & GEOTHERMAL POWER GENERATING SYSTEMS**

**Biogas Power Generation:** Principles of Bioconversion, Types of Biogas Digesters – Characteristics of Bio-Gas- Utilization- Economic and Environmental Aspects.

**Geothermal and Ocean Power Generation:** Principle of Geothermal Energy Methods of Harnessing-Principle of Ocean Energy-Tidal and Wave Energy- Mini Hydel Plants- Economic Aspects.

**UNIT-V: ECONOMIC ASPECTS OF POWER GENERATION**

Load Curve, Load Duration and Integrated Load Duration Curves-Load Demand, Diversity, Capacity, Utilization and Plant Use Factors- Numerical Problems. Costs Of Generation and their Division Into Fixed, Semi-Fixed and Running Costs. Tariff Methods: Desirable Characteristics of a Tariff Method.- Flat Rate, Block-Rate, Two-Part, Three –Part, and Power Factor Tariff Methods and Numerical Problems.

**OUTCOMES:** After completing the course, the student should be able to do the following:

- Estimate the coal requirement, cost per kWh generation and number of units generated for thermal power station
- Estimate the required flow of river water, cost of generation and number of units generated in hydel power generation
- Ensure safe operation of nuclear power plants
- Compute various factors like, load factor, driving factor, plant factor
- Evaluate the tariffs to be changed for the consumers
- Plot the load curve, load duration curve and hence determine the load capacity of the plant

**TEXT BOOKS:**

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakraborti, Dhanpat Rai & Co. Pvt. Ltd., 1999.
2. Electric Power Generation Distribution and Utilization by C.L Wadhwa, New Age International (P) Ltd., 2005.
3. Non Conventional Energy Sources by G.D. Rai, Khanna Publishers, 2000.

**REFERENCE BOOKS:**

1. Renewable Energy Resources – John Twidell and Tony Weir, Second Edition, Taylor and Francis Group, 2006.
2. Electrical Power Generation, Transmission and Distribution by S.N.Singh., PHI, 2003.
3. Principles of Power Systems by V.K Mehta and Rohit Mehta S.CHAND& COMPANY LTD., New Delhi 2004.
4. Wind Electrical Systems by S. N. Bhadra, D. Kasta & S. Banerjee – Oxford University Press, 2013.

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