EEPE3006 POWER STATION ENGINEERING (3-0-0)

Course Learning Objectives: This course will enable students to:

- To understand the student present day energy demand.
- To make the student to aware of components of power plants that run using conventionaland non-conventional methods, factors affecting the site selection for a power plant andconcept of base load plant and peak load plant.
- To expose the students to the principles of safety and environmental issues.
- To enable the student to recognize the importance of secondary energy source.

Module I (05 Hours)

Introduction to different sources of energy and general discussion on their application to generation, Indian Energy Scenario.

Prediction of Load: Connected Load, Maximum Load, Demand Factor, Average load, Load Factor, Load duration curves, Diversity Factor, Choice of Type of Generation, Capacity Factor, Reserve Factor, Plant Use Factor, Base Load, Intermediate Load and Peak Load Plants.

Economics of power generation: Cost of Electrical Energy, Construction costs, Fixed cost, Costs for Energy, Depreciation of Plant, Fuel cost, Economic scheduling principle, Annual Operating Costs, Effect of Load Factor on cost per kWh, Tariff or Charge to Consumer.

Module II (08 Hours)

Hydro electric power station: Selection of site for hydro-electric power plant. Hydrological cycle, precipitation, run-off and its measurement, hydrograph, flow duration and mass curves, Estimation of amount stored by a dam across the river, Storage and Pondage, Elementary idea about Earthen and Concrete Dam. Operational principle of Kaplan and Francis Turbine and Pelton wheel, Speed and Pressure Regulation, Work done and Arrangement and location of Hydroelectric Station: Catchment area, Reservoir, Dam, Head Gate, Spillways, Pen stock, Surge Tanks, Scroll case, Draft tubes and Tail Race, Power House, Classification of Hydroelectric Power Plants. Governors, Plant auxiliaries.

Module III (08 Hours)

Thermal power station: Selection of site for thermal power plant Main Parts and Working of a Steam Station: Overall Block Diagram indicating the air circuit, coal and ash circuit, water and steam circuit, various types of steam turbines, ash and coal handling system, High Pressure and High-capacity water tube boilers, Economizer, Superheaters, De-Superheater, Re-heater, Air Pre-heater. Natural, Induced Forced and Balance Draft, PA fan, FD fan, ID fan, Chimney. Condensers, Feed water heaters, Evaporators, Make-up water, bleeding of steam, cooling water system. Electrostatic Precipitator: Basic working Principle and constructional details Governors, Plant auxiliaries.

Module IV (06 Hours)

Nuclear power station: Introduction to fission & fusion, Principle of Nuclear Energy, Reactor Construction, Controlled Chain Reaction, Brief study of various Types of Power Reactor, Operational Control of Reactors, Location and layout of nuclear power plant, Economics of Nuclear Power Station.

Module V (03 Hours)

Non Conventional Power Plants: Introduction to non conventional power plants (Solar, wind, geothermal, tidal, biogas) etc.

Course Outcomes: On completion of this course, students are able to:

CO1: Present a sound knowledge about performance parameters in power plant economics and able to carry out tariff calculations.

CO2: Summarize the general layout, components and operation of different conventional and non-conventional power plant.

CO3: Describe various control systems of different power plants.

CO4: Describe energy conversion in power plants.
CO5: Realise the detrimental effects of power plants, causes of pollution and know about the preventive measures to be carried out to have a sustainable environment.

Text Book(s):

1. Power plant Engineering, P.K. Nag, TMH, 3rd Edition, 2013.
2. A Text Book of Power Plant Engineering, Rajput, Laxmi Publications, 4th edition, 2012

Reference Book(s):

1. Power plant engineering , P.C. Sharma, S.K., Kataria Publications,2012.
2. M. V. Deshpande, “Elements of Electrical Power Station Design”, PHI
3. Bernhardt G. A. Skrotzki, William A. Vopat, :Power Station Engineering and Economy”, 2nd Edition, Tata McGraw Hill Publication.
4. Arora &Domkundwar , “A Course in Power Plant Engineering”, Dhanpat Rai and sons.