

PEL7G001 POWER STATION ENGINEERING & ECONOMY

Module-I: [10 Hours]

University Portion (80%):

1. Introduction (1 hour) Introduction to different sources of energy and general discussion on their application to generation, Indian Energy Scenario. (Nag-1.5)

2. Prediction of Load (2 hours)

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. (Nag-1.2)

3. Economics of power generation (5 hours)

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. (Nag-1.4, Deshpande-2.2, 2.3, 2.6, 2.7, 2.8, 2.9)

College/Institute Portion (20%): (2 hours)

Tariff or Charge to Consumer, Specific Economic Energy Problems (Deshpande-2.9, Vopat-33.1, 33.2, 33.3, 33.4, 33.5) or related advanced topics as decided by the concerned faculty teaching the subject.

Module-II: [8 Hours]

University Portion (80%):

Nuclear power station (6 hours)

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. (Nag- 9.5, 9.6, 9.13, 9.15 - 9.21, Deshpande-6.2, 6.3, 6.4, 6.5, 6.6, 6.9, 6.13)

College/Institute Portion (20%): (2 hours)

Different types of generators and Exciters, earthing of a power system (Deshpande-10.2, 10.3) or related advanced topics as decided by the concerned faculty teaching the subject.

Module-III: [10 Hours]

University Portion (80%):

Hydro Electric power station: (2 hours)

Selection of site for hydro-electric power plant. (Nag-10.4)

Hydrology:

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. (Deshpande-7.2, 7.3, 7.4, 7.5, 7.6, Nag - 10.5 - 10.7)

Types of Turbines: (3 hours)

Operational principle of Kaplan and Francis Turbine and Pelton wheel, Speed and Pressure Regulation, Work done and Efficiency. (Nag- 10.10 - 10.15, 10.24 - 10.25, Deshpande-8.3)

Arrangement and location of Hydroelectric Station: (3 hours)

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. (**Deshpande-7.7, Nag-10.8, 10.9**). Governors, Plant auxiliaries. (**Nag – 10.21**)
College/Institute Portion (20%): (2 hours)

Types of Hydroelectric Plant and their fields of use, characteristics of generators, Power station control (**Deshpande-7.8, 8.8, 8.9**) or related advanced topics as decided by the concerned faculty teaching the subject.

Module-IV:

[10 Hours]

University Portion (80%):

Thermal power station: (3 hours)

Selection of site for thermal power plant. (**Nag-1.3**)

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. (**Vopat – 7.4, Chap-8, Chap-10, Nag-2.15, 6.3.1, 6.3.2, 6.4-6.6, 6.8, 6.12 - 6.15**)

Draft System: (3 hours)

Natural, Induced Forced and Balance Draft, PA fan, FD fan, ID fan, Chimney. (**Vopat – 9.1, 9.4, Nag- 4.14.1, 4.14.3, 4.15**)

Condensers, Feed water heaters, Evaporators, Make-up water, bleeding of steam, cooling water system. (**Vopat- 14.1, 14.6, 18.2, 18.13, Nag – 8.1- 8.6**)

Electrostatic Precipitator: (2 hours)

Basic working Principle and constructional details Governors, Plant auxiliaries. (**Nag- 6.10, Vopat- 12.14**)

College/Institute Portion (20%): (2 hours)

Brief idea about national grid and its operational problems or related advanced topics as decided by the concerned faculty teaching the subject.

Text Books:

1. P. K. Nag, "Power Plant Engineering", 3rd Edition, Tata McGraw Hill Publication.
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.

References:

1. Arora & Domkundwar, "A Course in Power Plant Engineering", Dhanpat Rai and sons.
2. R. K. Rajput, "A Text Book of Power Plant Engineering", 3rd Edition, Laxmi Publishing.