

IV B.Tech II Semester

15AME83-POWER PLANT ENGINEERING

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Course Objective:

- To understand the student present day energy demand.
- To make the student to aware of components of power plants that run using conventional and non- conventional methods, factors affecting the site selection for a power plant and concept of base load plant and peak load plant.
- To make the student aware of Pros and Cons of various power plants.
- To enable the student to recognize the importance of secondary energy source.

UNIT I

Introduction To The Sources Of Energy - Resources and Development of Power in India. Layouts of Steam, Hydel, Diesel, MHD, Nuclear and Gas Turbine Power Plants - Combined Power Cycles - Comparison and Selection.

Power Plant Economics and Environmental Considerations: Capital Cost, Investment of Fixed Charges, Operating Costs, General Arrangement of Power Distribution, Load Curves, Load Duration Curve. Definitions of Connected Load, Maximum Demand, Demand Factor, Average Load, Load Factor, Diversity Factor - Tariff - Related Exercises. Effluents from Power Plants and Impact on Environment - Pollutants and Pollution Standards - Methods of Pollution Control. Inspection And Safety Regulations.

Learning outcome & Suggested Student Activities:

Student can recognize the importance of power production suited to the demand. Student can have an idea of various power plants. Student can understand economics of power distribution, Power Tariff, Load Factor and other related terms. Student can know the impact of power plants on the environment. Students are advised to visit various power plants.

UNIT II

Steam Power Plant : Modern High Pressure and Supercritical Boilers - Analysis of Power Plant Cycles - Modern Trends in Cycle Improvement - Waste Heat Recovery, Fluidized Bed Boilers., Fuel and Handling Equipments, Types of Coals, Coal Handling, Choice of Handling Equipment, Coal Storage, Ash Handling Systems.

Steam Power Plant : Combustion Process : Properties of Coal - Overfeed and Under Feed Fuel Beds, Traveling Grate Stokers, Spreader Stokers, Retort Stokers, Pulverized Fuel Burning System And Its Components, Combustion Needs and Draught System, Cyclone Furnace, Design and Construction, Dust Collectors, Cooling Towers And Heat Rejection. Analysis of Pollution from Thermal Power Plants - Pollution Controls.CO₂ Recorders

Learning outcome & Suggested Student Activities:

Student is able to understand the latest high pressure boilers, concept of fluidized bed combustion and importance of handling and storage. Student can able to learn the waste heat recovery methods. In addition; student can know various cooling towers and its application. Student is advised to visit the cogeneration plants to under the waste heat recovery concept.

UNIT III

Diesel Power Plant: Diesel Power Plant: Introduction - IC Engines, Types, Construction- Plant Layout with Auxiliaries - Fuel Storage

GAS TURBINE PLANT : Introduction - Classification - Construction - Layout With Auxiliaries

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- Principles of Working Closed and Open Cycle Gas Turbines. Advantages And Disadvantages Combined Cycle Power Plants.

Learning outcome & Suggested Student Activities:

Student can grasp concepts of diesel power plant and gas turbine plants. Student can distinguish open cycle and closed cycle gas turbine cycles. Normally, every college will be equipped with diesel power plant. Students are suggested to visit near by diesel power plant and gas turbine plant. The students have already studied these units in Thermal Engineering-I & II. The student can make uses of these notes of thermal engineering.

UNIT IV

Hydro Electric Power Plant: Water Power - Hydrological Cycle / Flow Measurement - Drainage Area Characteristics - Hydrographs - Storage and Pondage - Classification of Dams and Spill Ways.

Hydro Projects And Plant: Classification - Typical Layouts - Plant Auxiliaries - Plant Operation Pumped Storage Plants.

Learning outcomes & Suggested Students Activities:

Student can have knowledge on water power. Student can able to understand the methods of storing water and can have an idea over constructions of dams and spill ways. Student can enable to draw the layout of hydel power plant. Student s are advised to visit nearby hydel power plants.

UNIT V

Power From Non-Conventional Sources: Utilization of Solar Collectors- Principle of its Working, Wind Energy - Types of Turbines - HAWT & VAWT-Tidal Energy. MHD power Generation.

Nuclear Power Station: Nuclear Fuel - Nuclear Fission, Chain Reaction, Breeding and Fertile Materials - Nuclear Reactor -Reactor Operation.

Types Of Reactors: Pressurized Water Reactor, Boiling Water Reactor, Sodium-Graphite Reactor, Fast breeder Reactor, Homogeneous Reactor, Gas Cooled Reactor, Radiation Hazards and Shielding - Radioactive Waste Disposal.

Learning outcome & Suggested Student Activities:

After the completion of the chapter, student can be familiar with the power generation through secondary energy sources. Student can able to understand the power generation through solar energy, wind energy, MHD and Nuclear energy. Student can enable to distinguish various nuclear reactors. Also, student can know the methods of dumping radiation waste and can discern the impact of radiation effect on human living. Student is suggested to visit any nuclear power station.

TEXT BOOKS:

1. Power plant Engineering, P.K. Nag, TMH, 3rd Edition, 2013.
2. A course in power plant Engineering, Arora and S. Domkundwar.

REFERENCE BOOKS:

1. A Text Book of Power Plant Engineering, Rajput, Laxmi Publications, 4th edition, 2012.
2. Power plant Engineering, Ramalingam, Sciotech Publishers
3. Power plant engineering P.C. Sharma, S.K. Kataria Publications, 2012.

SUGGESTED LINKS:

- <http://www.nprcet.org/e%20content/Misc/e-Learning/EEE/II%20YEAR/EE2252%20-%20Power%20Plant%20Engineering.pdf>

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