

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME54d – POWER PLANT ENGINEERING

(Professional Elective – I)

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Course Objectives: The objectives of the course are to make the students learn about

- Familiarize the sources of energy, power plant economics and environmental aspects.
- Outline the working components of different power plant.
- Explain renewable energy sources; characteristics, working principle, classify types, layouts, and plant operations.
- Impart types of nuclear power plants, and outline working principle and advantages and hazards.

UNIT I

12 Hours

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 Outcomes:

At the end of this unit, the student will be able to

- Outline sources of energy, compare and selection of types of power plants. L2
- Explain cost factors, load and power distribution factors. L2
- Select tariff based on load and demand factors. L3
- Summarize the impact of power plant on the environment, pollution mitigation and regulations. L2

UNIT II

10 Hours

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, Travelling 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

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Learning Outcomes:

At the end of this unit, the student will be able to

- Demonstrate latest high pressure boilers, power plant cycles and their improvements. L2
- Explain various types of coals, coal handling operations and associated systems. L2
- Outline and compare types of feeders, stokers, combustion systems. L2
- Illustrate draught, dust collector, furnace, cooling tower and heat rejection systems. L2
- Evaluate pollution levels from power plants, pollution control methods, and application of pollution recorders. L4

UNIT III**8 Hours**

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

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain working principle, and compare types of diesel power plant. L2
- Outline the diesel power plant layout with its supporting equipment. L2
- Illustrate the working principle of open cycle and closed cycle gas turbine. L2
- Demonstrate combined cycle power plants with benefits and shortcomings. L2

UNIT IV**8 hours**

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:

At the end of this unit, the student will be able to

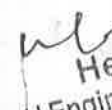
- Explain hydrological cycle, infer flow measurements from hydrographs. L2
- Summarize working principle of hydro electric power plant. L2
- Illustrate typical layout of hydro electric power plant, and its auxiliary equipments. L2

UNIT V**8 Hours**

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.


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Learning Outcomes:

At the end of this unit, the student will be able to

- Demonstrate working principle of power generation from non-conventional energy sources. L2
- Explain working principle of Nuclear power plants, nuclear fuels, and reactor operations. L2
- Outline the various types of nuclear reactors, their applications and limitations. L2
- Summarize the hazards of nuclear reactors and significance of nuclear waste disposal. L2

Text Books:

1. P.K. Nag, Power Plant Engineering, 3/e, TMH, 2013.
2. Arora and S. Domkundwar, A course in Power Plant Engineering, Dhanpat Rai & Co (P) Ltd, 2014

Reference Books:

1. Rajput, A Text Book of Power Plant Engineering, 4/e, Laxmi Publications, 2012.
2. Ramalingam, Power plant Engineering, Scietech Publishers, 2013
3. P.C. Sharma, Power Plant Engineering, S.K. Kataria Publications, 2012.

Course Outcomes:

At the end of this Course the student will be able to

- Outline sources of energy, power plant economics, and environmental aspects. L2
- Explain power plant economics and environmental considerations. L2
- Describe working components of a steam power plant. L2
- Illustrate the working mechanism of Diesel and Gas turbine power plants. L2
- Summarize types of renewable energy sources and their working principle. L4



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