

POWER PLANT ENGINEERING (PROFESSIONAL ELECTIVE-II)

Course Code: 19ME1157

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student will be able to

CO1: Explain the energy conversion from steam and various methods of coal handling, burning of coal and ash handling

CO2: Explain the concept of hydro power plants and non-conventional energy sources

CO3: Analyze the energy conversion from diesel oil and gas based power plants

CO4: Explain nuclear fission reaction and nuclear reactors

CO5: Describe various costs applicable to power plants and study about pollution effects

UNIT- I

10 Lectures

Thermal Power Plants: Introduction to sources of energy, plant layout. Selection of site, fuel handling – grades of coal, coal handling system. Advantages and disadvantages of steam power plant.

Combustion: Combustion equipment for solid fuels – burning of coal (over feed stoker and under feed stoker). Pulverized coal firing system, fluidized bed combustion system. Ash handling systems, dust collectors (mechanical collectors and electrostatic precipitator), cooling ponds, cooling towers, methods of feed water treatment.

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

1. describe working of a thermal power plant (L2)
2. discuss various fuel handling equipment (L2)
3. differentiate among various combustion systems (L2)

UNIT- II

10 Lectures

Hydro-electric Power Plants: Water power – hydrological cycle, hydrograph, flow duration curve, mass curve, classification of hydro-electric power plants – Run-of-river plant with or without pondage, classification of dams and spillways. Plant layout, hydro-plant auxiliaries, pumped storage plants.

Non-conventional Energy Sources: Utilization of solar energy - collectors – principle of working, Wind energy – types – HAWT, VAWT. Tidal energy. Direct energy conversion – Solar cell, fuel cell and MHD generation.

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

1. explain the working of hydro-electric power plant (L2)
2. differentiate among various types of dams and spillways (L2)
3. discuss various types of non-conventional energy sources (L2)

UNIT- III

10 Lectures

Diesel Power Plant: Introduction – I.C. engines, types, construction – plant layout with auxiliaries. Fuel supply system, engine starting system, lubrication and cooling system, supercharging. Site selection.

Gas Turbine Power Plant: Introduction – classification – plant layout - components of gas turbine power plant, site selection, combined gas and steam power plants, combined gas and diesel power plants –advantages and disadvantages.

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

1. discuss various auxiliary systems in a diesel power plant (L2)
2. explain various components in gas turbine power plant (L2)
3. describe various methods to improve performance of gas turbine power plant (L2)

UNIT- IV

10 Lectures

Nuclear Power Plants: Nuclear fuel – fertile materials, fission of nuclear fuel. Nuclear reactor - types of reactors – boiling water reactor, pressurized water reactor, CANDU reactor, gas-cooled reactor, liquid metal cooled reactor and breeder reactor, advantages of nuclear power plant, application of nuclear power plant, safety measures for nuclear power plant. Nuclear power plants in India.

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

1. explain the fission reaction in a nuclear reactor (L2)
2. explain the working of boiler reactor (L2)
3. discuss the safety measures for nuclear power plant (L2)

UNIT- V

10 Lectures

Economics of Power Generation: Introduction – terms and definitions - capital cost, investment of fixed charges, operating cost, load curves, load duration curves, connected load, maximum demand, demand factor, average load, load factor, diversity factor, cost analysis, power generation cost and depreciation.

Impact on Environment: Introduction – Pollution from thermal power plants – removal of sulphur dioxide and emission of NO_x, pollution from nuclear power plants and pollution from hydro-electric power plants.

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

1. determine various cost involved in power plant economics (L3)
2. calculate cost per unit generation in various power plants (L3)
3. explain the effect of pollution on environment due to various power plants (L2)

Text Book:

Domkundwar, Arora, Domkundwar, *Power Plant Engineering*, 8th Edition, Dhanpat Rai & Co, 2016.

Reference Books:

1. P.K. Nag, *Power Plant Engineering*, 4th Edition, Tata McGraw-Hill, 2017.
2. Manoj Kumar Gupta, *Power Plant Engineering*, 1st Edition, Prentice Hall Inc., 2012.
3. R.K. Rajput, *A Text book of Power Plant Engineering*, 5th Edition, Laxmi Publications, 2016.