

**4/4 B.Tech. EIGHTH SEMESTER**

**ME8T1**

**POWER PLANT ENGINEERING**

**Credits: 4**

**Lecture:- 4 periods/week**

**Internal assessment: 30marks**

**Tutorial: -**

**Semester end examination: 70 marks**

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**Objectives:**

1. List the various sources of energy
2. Acquire the knowledge of power generation from steam, diesel, gas, hydro, nuclear and non- conventional energies.
3. Define power plant economics and environmental considerations

**Learning outcomes:**

At the end of course the students will be able to:

1. Explain various energy sources and combustion processes in steam power plants.
2. Memorize diesel and gas turbine power plants layout with auxiliaries.
3. Discuss hydro electric power plant layout.
4. Interpret the concepts of power from non-conventional sources and direct energy conversion techniques
5. Describe the fusion and fission reactions in nuclear power plants and types of reactors.
6. Summarize concepts of power plant economics and impact of its effluents on environment.

**Prerequisite**

IC Engines and gas turbines

**UNIT – I**

**INTRODUCTION TO THE SOURCES OF ENERGY –**

Resources and Development of Power in India.

STEAM POWER PLANT : Plant Layout, Working of different Circuits, Fuel and handling equipments, types of coals, coal handling, choice of handling equipment, coal storage, Ash handling systems.

## **UNIT II**

### **STEAM POWER PLANT : COMBUSTION PROCESS :**

Properties of coal – overfeed and underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and draught system, Dust collectors, cooling towers and heat rejection, deaeration. Corrosion and feed water treatment.

## **UNIT – III**

### **INTERNAL COMBUSTION ENGINE PLANT: DIESEL POWER PLANT:**

Introduction – IC Engines, types, construction– Plant layout with auxiliaries – fuel supply system, air starting equipment, lubrication and cooling system – super charging, application and comparison with other plants.

## **UNIT IV**

### **GAS TURBINE PLANT:**

Introduction – classification - construction – Layout with auxiliaries – Principles of working of closed and open cycle gas turbines. Combined Cycle Power Plants and comparison, Permanence evaluation of the gas turbine plant.

## **UNIT – V**

### **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 – Site selection of hydro plant - plant auxiliaries – plant operation pumped storage plants.

## **UNIT VI**

### **POWER FROM NON-CONVENTIONAL SOURCES:**

Utilization of Solar- Collectors- Principle of Working, Wind Energy – types – HAWT, VAWT - OTEC: ocean thermal energy conversion systems.

DIRECT ENERGY CONVERSION: Solar cell, Fuel cells, Thermo electric and Thermo ionic, MHD generation.

## **UNIT – VII**

### **NUCLEAR POWER STATION:**

Fusion and fission Reactions, Nuclear fuel – breeding and fertile materials – Nuclear reactor – reactor operation, Fuel moderator and coolant.

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.

## **UNIT – VIII**

### **POWER PLANT ECONOMICS AND ENVIRONMENTAL CONSIDERATIONS:**

Capital cost, investment of fixed charges, operating costs, cost per KWh, general arrangement of power distribution, Load curves, load duration curve. Definitions of connected load, Maximum demand, demand factor, average load, load factor, diversity factor – related exercises. Effluents from power plants and Impact on environment – pollutants and pollution standards – Methods of Pollution control.

### **Learning resources**

#### **Text book :**

1. A Text Book of Power Plant Engineering, by R K Rajput, Laxmi Publications, 2008.
2. Power Plant Engineering, by P.C.Sharma, S.K.Kataria Publications,2009.

#### **References books :**

1. Power Plant Engineering, by P.K.Nag, TataMcHill-2008.
2. Power plant Engineering, by Ramalingam, Scietech Publishers-2010.
3. A Course in Power Plant Engineering, by Arora and S. Domkundwar, Dhanpat Rai & Sons-1975.
4. Power station Engineering, by ElWakil, TataMcHill-1985.
5. An Introduction to Power Plant Technology, by G.D. Rai, Khanna publications-1996.
6. Power plant Engg, by Elanchezhian, I.K. International Pub-2007.