

COURSE NAME: DIPLOMA IN MECHANICAL ENGINEERING

COURSE CODE: ME/MH/MI

SEMESTER: FIFTH FOR ME AND SIXTH FOR MH/MI

SUBJECT TITLE: POWER PLANT ENGINEERING

SUBJECT CODE:

Teaching & Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
03	-	02	03	100	--	--	25@	125

Abbreviations:

TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Termwork, SW- Sessional Work.

- External

@ - Internal

* On Line Examination

NOTE:

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- Total of tests marks for all theory subjects are to be converted out of 100 and to be entered in mark sheet under the head Sessional Work. (SW)

Rationale:

The consumption of electrical energy per capita is universally accepted as a scale for measuring the living standard of a country. The demand for energy is increasing day by day and existing power generation capacity is inadequate to meet this increasing demand. Industries are expected to generate their own power and supply the excess power to national grid. Alternate energy sources are also harnessed to meet the increasing demand. Diploma engineers should know the layout, components of different power plants and economic aspects of power plants.

General Objectives:

The Student will be able to:

1. Get familiar with present and future power scenario of India.
2. Describe the major electrical equipments in power plants
3. Explain working of high pressure boilers, coal and ash handling systems of power plant.
4. Draw layout, explain the working and compare different power plants.

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5. Understand the concept energy management and energy audit.

Learning Structure:

Application :

Understanding, analyzing and applying various aspects of Thermal and Power Engineering in practical application area of different power plant in relation with operation of devices like high pressure boiler, gas turbine, steam turbine.

Procedures :

Draw layout of different power plants, site selection understand working principle of different components of various power plants, working of high pressure boilers, economic and operational aspects.

Principles :

Laws of conservation of energy Second law of thermodynamics

Steady flow energy equation, steam power cycle, gas turbine cycle,

Concept :

Properties of steam, pressure, volume, enthalpy,

Fusion and fission reaction, efficiency, waste heat recovery.

Facts :

Steam power plant, nuclear power plant, gas turbine and diesel engine power plant

Theory:

Topic and content	Hrs.	Marks
<p>1. Introduction To Power Plant 16Marks</p> <p>Specific objectives</p> <ul style="list-style-type: none"> ➤ Explain power scenario of India and appreciate selection of generator. ➤ Describe major electrical equipments in power plants. <p>1.1 Power scenario in India, Types of power plants – Hydro, Nuclear, Thermal, and Future trends in power sector. Introduction to Indian boiler act, Boiler Inspection.</p> <p>1.2 Major electrical equipments in power station- generator, step-up transformer, switch gear, electrical motors (types, purpose & importance).</p>	06	16
<p>2. Steam Power Plant 24 Marks</p> <p>Specific objectives:</p> <ul style="list-style-type: none"> ➤ Explain criteria for site selection of steam power plant. ➤ Explain boiler feed water treatment and environmental aspects of steam power plant. <p>2.1 Layout of steam power plant, general features of selection of site, <input type="checkbox"/> High pressure boilers -special features ,efficiency and heat losses, Construction and working and applications of Sub-critical and Super-critical boilers</p> <p><input type="checkbox"/> 2.2 Coal and ash handling system- equipments for in plant handling of coal such as belt conveyor, screw conveyor, bucket elevator, Coal crushing, Pulverized fuel handling system, Ball mill, Pulverized fuel and their advantages, Multi retort stoker, Pulverized fuel burner, Hydraulic and pneumatic ash handling, Electrostatic precipitator.</p> <p>2.3 <input type="checkbox"/> Boiler Feed water treatment.</p>	14	24
<p>3. Nuclear Power Plant 20Marks</p> <p>Specific objectives</p> <ul style="list-style-type: none"> ➤ Explain components of nuclear power plant . 	08	20

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<p>➤ Appreciate fusion, fission safety precautions and waste disposal.</p> <p>3.1 Elements of nuclear power station, layout, general criteria for selection of site.</p> <p>3.2 □ Fusion and fission reaction, types of nuclear reactors, Nuclear fuels, coolant & moderators.</p> <p>3.3 Working of PWR, BREEDER type reactor, Safety precautions and waste disposals.</p>		
<p>4. Gas Turbine Power Plant 16Marks</p> <p>Specific objectives</p> <p>➤ Explain components of gas turbine power plant.</p> <p>➤ Appreciate environmental aspects.</p> <p>4.1 General Layout, selection of site, Gas turbine power plants in India, Components of gas turbine plants, gas turbine Fuels.</p> <p>4.2 Combined cycle with heat recovery boilers, Environmental impact of gas turbine power plant.</p>	06	16
<p>5. Waste Heat Recovery 12Marks</p> <p>Specific objectives:</p> <ul style="list-style-type: none"> • List the sources of waste heat and heat recovery methods. • Explain application of waste heat recovery. <p>5.1 Sources of waste heat, Heat recovery forms & methods – Sensible and latent Heat recovery.</p> <p>5.2 Use of waste heat- Agricultural, green house, Animal shelter, Aquacultural uses, process heating, Waste Heat recovery boilers</p>	06	12
<p>6. Energy Management 12Marks</p> <p>Specific objectives:</p> <ul style="list-style-type: none"> • Explain principles of energy management and energy audit. <p>6.1 Energy auditing , energy survey, energy balance and energy management</p> <p>6.2 energy monitoring, accounting and conservation, key element for maximum efficiency in thermal power plant and energy storage system.</p>	08	12
	48	100

Practical:

Skills to be developed:

Intellectual Skills:

1. Understand working of various power plants
2. Understand economical and operational aspects of power plants

Motor Skills:

1. List technical details of components and subsystems of power plants
2. Draw layouts of different power plants

List of Assignments:

1. Visit to steam power plants/nuclear power plants/wind power plants/ Hydro power plants and prepare a report.
2. Collect information & Technical details of nuclear power plants and prepare a report.
3. Collect information & Technical details of Steam power plants and prepare a report.
4. Study of economic and operational aspects of power plants.
5. Assignment on layout and devices of Coal & Ash Handling system.
6. Assignment on Waste Heat recovery systems.
7. Collect information & Technical details of Gas Turbine power plants and prepare a report.
8. In addition to individual assignments mentioned above, seminar shall be arranged as follows.
 - Prepare 07 groups, distribute the above (one to seven assignments) assignments among the group, each group should prepare PowerPoint presentation and deliver seminar.

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Learning Resources:

1.Books:

Sr. No.	Author	Title	Publisher
01	P.K. Nag	Power plant engineering	Tata McGraw Hill 3 rd edition
02	K.K.Ramalingam	Power plant engineering	Scitech publication
03	A. Chkrabarti and M. L.Soni	A text book of Power System Engineering	Dhanpat Rai and Co
04	M.M.El-Wakil	Power plant technology	Tata McGraw Hill
05	Arora and Domkundwar	A course in power plant engineering	Dhanpat Rai and Co

2. Computer Based Training Packages/Computer Aided Instructions Packages/CDs:

1. Power Plant Familiarization Vol-I to IV.

- Ash Handling System.
- Gas Turbine and combined cycle power plant.
- Power Station Safety.
- Environmental pollution & pollution control.
- Pulverizers and feeders.
- Renewable energy sources,

(Developed by National Power Training Institute, South Ambazari Road, Nagpur)

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