

<b>GOVT POLYTECHNIC BOLANGIR</b>
<b>Department of Mechanical Engineering</b>
<b>LESSON PLAN: 2025-26</b>
<b>Name of the Faculty: Rasmi Ranjan Jena (Lecturer Stage-I)</b>
<b>Subject: Power Station Engineering-TII3</b> <b>Program: Diploma in Mechanical Engineering Semester: 6th Total Contact Hours: 60</b> <b>Total Marks: 100 Assessment: Progressive –20, End Term – 80</b> <b>Credits: 4</b>

#### **COURSE OBJECTIVES:**

After completion of the course, the students will be able to

1. Understand the generation of power by utilizing various energy sources.
2. Understand the use of steam, its operation in thermal power stations.
3. Understand the nuclear energy sources and power developed in nuclear power station.
4. Understand the basics of diesel electric power station and hydroelectric power station.
5. Understand the basics of gas turbine power station.

<b>UNIT-I: Introduction to Power Generation (5 Classes)</b>				
<b>Class No.</b>	<b>Topic</b>	<b>Sub topics to be Covered</b>	<b>Teaching Aids / Activities</b>	<b>COs</b>
<b>1</b>	Sources of Energy	Definition of energy, Conventional energy sources, Non-conventional energy sources, Renewable vs non-renewable	Chalk & board	CO1
<b>2</b>	Power Stations – Basic Concepts	Definition of power station, Central power station, Captive power station, Advantages and examples	PPT, Chalk & board	CO1
<b>3</b>	Classification of Power Plants	Thermal power plant, Hydroelectric power plant, Nuclear power plant, Diesel & gas turbine power plants	PPT, Chalk & board	CO1
<b>4</b>	Importance of Electrical Power	Role of electricity in domestic life, Industrial applications, Transportation & communication, National development	PPT, Chalk & board	CO1
<b>5</b>	Overview of Electrical Power Generation	Basic principle of power generation, Energy conversion stages, Block diagram of power generation system	PPT, Chalk & board	CO1 & CO4

## UNIT-II: Thermal Power Stations (20 Classes)

6	Introduction to Thermal Power Stations	Definition of thermal power station, Importance, Capacity range & applications	PPT, Chalk & board	CO2
7	Layout of Steam Power Station	Main components, Block diagram, Energy conversion stages	PPT, Chalk & board	CO2
8	Steam Power Cycles – Overview	Need of power cycles, Vapour power cycle concept	Chalk & board	CO2
9	Carnot Vapour Power Cycle	Carnot cycle processes, P-V diagram, T-S diagram	Chalk & board	CO2
10	Carnot Cycle – Performance	Thermal efficiency derivation, Limitations of Carnot cycle	Chalk & board	CO4
11	Rankine Cycle – Introduction	Rankine cycle processes, Comparison with Carnot cycle	Chalk & board	CO1
12	Rankine Cycle Diagrams	P-V diagram, T-S diagram, H-S diagram	PPT, Chalk & board	CO2 & CO3
13	Rankine Cycle – Performance	Thermal efficiency, Work done, Work ratio	PPT, Chalk & board	CO2
14	Rankine Cycle – SSC & Problems	Specific steam consumption, Simple numerical problems	PPT, Chalk & board	CO2
15	Thermal Power Stations in the State	List of thermal power stations, Installed capacities	PPT, Chalk & board	CO2 & CO3
16	Boiler Accessories – I	Air preheater – operation, Economiser – operation	PPT, Chalk & board	CO2
17	Boiler Accessories – II	Super heater – operation, Electrostatic precipitator – operation	PPT, Chalk & board	CO2
18	Boiler Mountings	Need of boiler mountings, Safety & control aspects	PPT, Chalk & board	CO2
19	Draught Systems – I	Natural draught, Forced draught	PPT, Chalk & board	CO2
20	Draught Systems – II	Balanced draught, Advantages & disadvantages	PPT, Chalk & board	CO2
21	Steam Prime Movers	Steam turbine – advantages & disadvantages, Elements of steam turbine	PPT, Chalk & board	CO2
22	Governing of Steam Turbines	Need of governing, Methods of governing	PPT, Chalk & board	CO2

23	Performance of Steam Turbine	Thermal efficiency, Stage efficiency, Gross efficiency	PPT, Chalk & board	CO2
24	Steam Condenser & Cooling System	Function & classification of condenser, Condenser auxiliaries, Cooling towers & spray ponds	PPT, Chalk & board	CO2
25	Site Selection of Thermal Power Station	Factors affecting site selection, Revision & recap	PPT, Chalk & board	CO2
<b>UNIT-III: Nuclear Power Stations (10 Classes)</b>				
26	Introduction to Nuclear Energy	Need of nuclear power, Basic concept of nuclear energy, Advantages & limitations	PPT, cut-section images	CO3
27	Classification of Nuclear Fuels	Fissile materials, Fertile materials, Examples of nuclear fuels	PPT, Chalk & board	CO3
28	Nuclear Reactions	Nuclear fission reaction, Nuclear fusion reaction, Comparison of fission & fusion	PPT, Chalk & board	CO3
29	Nuclear Power Plant – Overview	Layout of nuclear power plant, Block diagram, v	PPT, discussion	CO3
30	Nuclear Reactor – Introduction	Function of nuclear reactor, Main parts of reactor	PPT, Chalk & board, Models	CO2
31	Nuclear Reactor – Working	Working principle, Moderator, control rods, coolant, shielding	Real component / PPT	CO3
32	Nuclear vs Thermal Power Plant	Comparison based on fuel, efficiency, cost, safety & pollution	PPT, Chalk & board	CO3
33	Nuclear Waste Disposal	Types of nuclear waste, Disposal methods, Safety measures	PPT, Chalk & board	CO3
34	Site Selection for Nuclear Power Station	Factors affecting site selection, Safety & environmental considerations	PPT, Chalk & board	CO3
35	Nuclear Power Stations	List of nuclear power stations, Installed capacities, Revision	PPT, Chalk & board	CO3
<b>UNIT-IV: Diesel Electric Power Stations (10 Classes)</b>				
36	Introduction to Diesel Electric Power Stations	Definition of diesel electric power station, Applications, Capacity range	PPT, Chalk & board	CO4
37	Advantages & Disadvantages	Advantages of diesel power stations, Disadvantages of diesel power stations, Comparison with thermal stations	PPT, Chalk & board	CO4



38	Fuel Storage & Fuel Supply System	Fuel storage system, Fuel transfer and filtration, Fuel supply system	PPT, Chalk & board	CO4
39	Fuel Injection System	Fuel injection pump, Injectors, Function and importance	Chalk & board	CO4
40	Air Supply & Exhaust System	Air intake system, Supercharging (brief), Exhaust system	Chalk & board	CO4
41	Cooling System	Need for cooling, Types of cooling systems, Components	Chalk & board	CO4
42	Lubrication & Starting System	Lubrication system, Types of starting systems, Importance	PPT, Chalk & board	CO4
43	Governing System	Need of governing, Types of governing systems, Speed control	PPT, discussion	CO4
44	Site Selection	Factors affecting site selection, Practical considerations	PPT, Chalk & board	CO4
45	Performance & Thermal Efficiency	Performance parameters, Thermal efficiency, Simple numerical problems, Revision	PPT, Chalk & board	CO4
<b>UNIT-V:Hydel Power Stations (10 Classes)</b>				
46	Introduction to Hydel Power Stations	Definition and importance, Advantages and disadvantages	PPT, Chalk & board	CO4
47	Classification of Hydel Projects	Storage type, Run-of-the-river type, Pumped storage type	PPT, Chalk & board	CO4
48	General Arrangement of Storage Type Plant	Components: Dam, reservoir, penstock, powerhouse, Flow of water Operation of plant	PPT, Chalk & board	CO4
49	Site Selection	Factors affecting site selection, Practical considerations	PPT, Chalk & board	CO4
50	List of Hydel Power Stations	Hydel power stations in the state, Installed capacities	PPT, Chalk & board	CO4
51	Turbines Used	Types of turbines: Pelton, Francis, Kaplan, Applications based on head and discharge	Chalk & board	CO4
52	Generators	Type of electrical generators used, Coupling with turbine	PPT, Chalk & board	CO4
53	Operation of Hydel Plant	Flow control, Load handling, Start-up and shutdown procedure	PPT, Chalk & board	CO4

54	Simple Numerical Problems	Calculation of power developed, Efficiency, Discharge & head	Chalk & board	CO4
55	Revision & Summary	Recap all topics, Q&A session, Short test	PPT, Chalk & board	CO4
<b>UNIT-VI: Gas Turbine Power Stations (5 Classes)</b>				
56	Introduction to Gas Turbine Power Station	Definition and importance, Comparison with other power plants	PPT, Chalk & board	CO5
57	Site Selection	Factors affecting site selection, Practical considerations	PPT, Chalk & board	CO5
58	Fuels for Gas Turbine	Types of fuels: natural gas, diesel, kerosene, LPG, Fuel properties & selection criteria	PPT, Chalk & board	CO5
59	Elements of Gas Turbine Power Plant	Compressor, Combustion chamber, Turbine, Generator, Layout of plant	PPT, Chalk & board	CO5
60	Merits, Demerits & Applications	Advantages & disadvantages, Applications in industry & power generation	Chalk & board	CO5

Signature of Faculty

Signature Of

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H.O.D.

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