



SARVAJANIK UNIVERSITY
Sarvajnik College of Engineering and Technology
Bachelor of Technology



Mechanical Engineering Department
Semester VI

Course Name: Power Plant Engineering **Course Code:** BTME13603

Type of course: Professional Core Course

Prerequisite: Fluid Mechanics and Basic Mechanical Engineering

Course outline: The goal of this course is to provide students with a fundamental understanding of the construction and operation of various types of thermal power plants, including steam turbines, gas turbines, nuclear power plants, and others. This course will describe the role of mechanical engineers in the operation and maintenance of various power plants, in addition to providing a general overview of power plants.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	100
3	0	0	3	60	25	15	00	00	

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests) **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Course Contents:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	<p>Coal Based Thermal Power Plant:</p> <p>Layout of modern coal based power plant. Components of coal based power plant. Site selection criteria. Rankine cycle and its improvisations. Supercritical, High Pressure Boilers, FBC Boilers. Steam Nozzles, Steam Turbines, Steam Condensers, Cooling Towers. Steam & Heat rate. Combined Cycle Power Plant: Binary Cycles and Cogeneration systems. Subsystems of thermal power plants – Draught system, Fuel and ash handling, Feed water treatment. Environmental and safety aspects of steam turbine power plant operation</p>	12	26%



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Sr. No.	Topics	Teaching Hrs.	Module Weightage
2.	Gas Turbine Power Plant: Layout of gas turbine power plant. Components of gas turbine power plant. Classification: Open and closed cycle. Gas turbine fuels. Actual Brayton cycle. Optimum pressure ratio for maximum thermal efficiency. Work ratio, Air rate and effect of operating variables on the thermal efficiency. Importance and method of cooling for gas turbine blades. Combined steam and gas turbine plant. Environmental and safety aspects of Gas turbine power plant operation	7	16%
3.	Nuclear Power Plant: Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working of Nuclear Reactors : Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), Canada Deuterium- Uranium reactor (CANDU), Breeder, Gas Cooled and Liquid Metal Cooled Reactors. Brief about the Nuclear program in India, Safety measures for Nuclear Power plants. Environmental and safety aspects of nuclear power plant operation	7	16%
4.	Hydro Power Plant: Need of Renewable energy. Hydro Electric Power Plants – Classification, Typical Layout and all the associated components of Hydro power plant. Concept of Pump as Turbine and Pump storage power plant. Environmental, safety aspects and challenges of hydro power plant operation. About small hydro energy and overview about Ministry of New and renewable energy (MNRE) and various hydro projects in India.	7	16%
5.	Wind Power Plant: Concept of wing energy and Wind farm or Wind park. Elements of Wind power plant. Available energy and site selection. Types of wind turbines with its advantages and disadvantages. Environmental, safety aspects and challenges of wind energy. Overview about the Wind energy program and various projects in India.	7	16%



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Sr. No.	Topics	Teaching Hrs.	Module Weightage
6.	<p>Power Generation from other Renewable Resources:</p> <p>Principle, Construction and working of - Tidal, Ocean thermal energy conversion (OTEC), Solar Photovoltaic (SPV), Solar Thermal, Geo-thermal, Bio energy, waste to energy and Fuel Cell power systems. Environmental, safety aspects and challenges of these renewable resources.</p>	5	10%

Percentage Distribution of Marks as per Bloom’s Taxonomy (Theory/Practical):

% Distribution of Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	20	20	20	10	10

Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **E:** Evaluate **C:** Create
Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

Sr. no.	Title of book /article	Author(s)	Publisher	Publication year	Publication edition
1.	Power Plant Engineering	Domkundwar, Arora Domkundwar	Dhanpat Rai & Co. (P) Limited	2017	4th
2.	Power Plant Engineering	P.K. Nag	McGraw-Hill Education	2007	3rd
3.	Thermal Engineering	R. K. Rajput	Laxmi Publication	2000	1st
4.	Gas Turbines	V. Ganeshan	McGraw-Hill Education	2015	1st
5.	Power Station Engineering and Economy	Bernhardt Skrotzki & William Vopat	McGraw Hill Education	2001	1st



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Course Outcomes (CO's):

CO No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-1	Examine the various power plants and its application	20
CO-2	Explain the layout, construction and working principles of power plants and its components.	20
CO-3	Analyze all the essential components of power plants.	20
CO-4	Explain the significance of power plants and justify the need for efficient systems.	20
CO-5	Discuss environmental, safety aspects and challenges of various power plant operation	20

Mapping of CO's with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	2	1	1	1	1	1	1	1	2	1	1	1	3	2	1
CO-2	2	2	2	2	1	1	1	1	2	2	2	2	3	2	1
CO-3	3	3	3	2	3	3	2	1	2	3	1	2	2	3	2
CO-4	2	2	2	2	2	3	2	1	2	3	2	1	3	3	1
CO-5	0	0	2	1	0	3	3	1	2	1	1	0	1	1	0
Ratio nale*	9	8	10	8	7	11	9	5	10	10	7	6	12	11	5

Rationale - Mapping of CO's with PO's and CO's with PSO's:

CO-PO's: As per CO's and PO's mapping, this course will provide students a thorough grasp of engineering related to different power plants and its key elements. This course will assist students in operating and maintaining a variety of power plants, either alone or in groups, enabling them to increase the efficiency of key components that will benefit both society and the environment.

CO-PSO's: According to the above CO's and PSO's mapping, students will be able examine and explain different power plants and all the essential components. As students can perform their own study on key power plant components, they will be able to build and analyse systems more effectively, in future. Also they will be able to explore various opportunities in the field of power generation

Assignments to be given as per the requirement of the course.

List of Open learning websites: <https://nptel.ac.in/courses/112107291>



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