SARVAJANIK UNIVERSITY

Sarvajanik College of Engineering and Technology

Bachelor of Technology

Mechanical Engineering Department

Semester VI

Course Name: **Power Plant Engineering** **Course Code: BTME15604**

Type of course: **Open Elective Course**

Prerequisite: Fluid Mechanics and Basic Mechanical Engineering

Course Outline: The course's objective is to give students a fundamental understanding of the construction and operation of many types of thermal power plants, such as steam turbine, gas turbine, nuclear, and others. In addition to providing a general overview of power plants this course will also give an overview on all the operation and maintenance of various 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.	**Coal Based Thermal Power Plant:** 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. Subsystems of thermal power plants – Draught system, Fuel and ash handling, Feed water treatment. Environmental and safety aspects of steam turbine power plant operation	12	26%
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. Work ratio, Air rate and effect of operating variables on the thermal efficiency. Combined steam and gas turbine plant. Environmental and safety aspects of Gas turbine power plant operation	7	16%

Sr. No.	Topics	Teaching Hrs.	Module Weightage
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). 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%**
6.	**Power from Renewable Energy:** 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.	**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**	**25**	**10**	**5**

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	2003	2nd
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

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)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	2	1	1	1	1	1	1	1	2	1	1	1
CO-2	2	2	2	2	1	1	1	1	2	2	2	2
CO-3	3	3	3	2	3	3	2	1	2	3	1	2
CO-4	2	2	2	2	2	3	2	1	2	3	2	1
CO-5	0	0	2	1	0	3	3	1	2	1	1	0
Rationale*	**9**	**8**	**10**	**8**	**7**	**11**	**9**	**5**	**10**	**10**	**7**	**6**

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

As per CO's and PO's mapping, this course will provide students a overview of engineering related to different power plants and its key elements. This course will assist students to understand various operating and maintaining in variety of power plants. Therefore either alone or in groups, this will help them to find opportunities in all power plant sectors which will benefit both society and the environment.

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

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