

Branch Name:	Mechanical Engineering
Program Code:	ET101
Course Name:	Power Plant Engineering
Course Code:	2ET1010505T
Pre-requisite Course:	Engineering Thermodynamics

Course Objectives:

1. To understand the types and classification of power plants and basic energy conversion cycles.
2. To learn the components and operation of coal-based thermal power plants.
3. To analyze gas turbine and combined cycle power plant systems.
4. To study nuclear and hydroelectric power plant technologies and safety measures.
5. To explore renewable energy systems and evaluate economic and environmental aspects of power generation.

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								
					Theory (Marks)				Practical (Marks)				Total (Marks)
	SEE		CCA		SEE		CCA						
	L	T	P	Total	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	3	-	-	3	24	60	16	40	-	-	-	-	100

Subject Contents

Sr. No	Topic	Total Hours	Weightage (%)
1.	Introduction: Power plants – types and classification based on energy sources.	02	10
2.	Coal based Thermal Power Plants: Basic Rankine cycle and its modifications; Layout of modern coal power plant; Super critical boilers, FBC boilers; Turbines, condensers, steam and heating rates; Subsystems of thermal power plants; Fuel and ash handling; Draught system; Feed water treatment; Binary cycles and cogeneration systems.	10	20
3.	Gas Turbine and Combined Cycle Power Plants: Brayton cycle analysis and optimization; Components of gas turbine power plants; Combined cycle power plants; Integrated Gasifier based Combined Cycle (IGCC) systems	08	20
4.	Nuclear Power Plants: Basics of nuclear energy conversion; Layout and subsystems of nuclear power plants; Boiling Water Reactor (BWR); Pressurized Water Reactor (PWR); CANDU Reactor; Pressurized Heavy Water Reactor (PHWR); Fast Breeder Reactors (FBR); Gas cooled and liquid metal cooled reactors; Safety measures for nuclear power plants.	06	15
5.	Hydroelectric Power Plants: Classification; Typical layout and components.	04	15
6.	Renewable Power Systems: Principles of wind, tidal, solar photo-voltaic, solar thermal, geothermal, biogas and fuel cell power systems.	06	10
7.	Energy Economics and Environment: Economic and environmental issues; Power tariffs; Load distribution parameters; Load curve; Capital and operating cost of different power plants; Pollution control technologies including waste disposal options for coal and nuclear plants.	06	10

List of Reference Books:

1. Nag, P. K. Power plant engineering. New Delhi, India: Tata McGraw-Hill, 2017.
2. M.M.Ei-Wakil, Power plant Technology, McGraw Hill Education, New Delhi, 2017.
3. Elliot T.C., Chen K and Swanekamp R.C., Power Plant Engineering, 2nd ed., McGraw Hill, 1998.
4. Drbal, Larry, Kayla Westra, and Pat Boston, eds. Power plant engineering. Springer Science & Business Media, 2012.
5. Arora & Domkundwar, Power plant engineering, Dhanpat Rai& Sons, New Delhi, 2016.
6. Rathore, Mahesh M., Thermal Engineering Vol I&II , McGraw-Hill Education, 2018
7. Rajput, R. K. Thermal engineering. Laxmi Publication, 2020.
8. Yadav, Rk. "Steam and gas turbines and power plant engineering." Central Publication House-Allahabad, 2011.
9. Ganeshan V., Gas Turbines, McGraw Hill Education, 2018.

Note: Students are required to submit tutorials based on the above subject contents. It is desirable to visit Power Plant.

E-Resources:

1. <https://nptel.ac.in/courses/112106200/>
2. <https://nptel.ac.in/courses/112103243/>
3. <https://nptel.ac.in/courses/112107216/>

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Classify different types of power plants based on energy sources and explain their basic working principles.	2 Understanding
CLO2	Analyze the Rankine and Brayton cycles and their modifications used in thermal and gas turbine power plants.	4 Analyze
CLO3	Describe the layout, components, and subsystems of coal-based, gas-based, and combined cycle power plants.	2 Understanding
CLO4	Explain the construction, operation, and safety aspects of various nuclear reactors such as BWR, PWR, and PHWR.	2 Understanding
CLO5	Compare the working principles and components of renewable energy systems including wind, solar, tidal, geothermal, and biogas.	5 Evaluating
CLO6	Assess economic and environmental factors affecting power generation and apply knowledge of tariffs, costs, and pollution control.	3 Applying

Mapping of CLOs with POs & PSOs:

Course Learning Outcomes	Program Outcomes(POs)												Program Specific Outcomes(PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CLO1	M											L		M
CLO2		M	H	M									M	
CLO3	M	H			M	L							H	
CLO4	M					M		L				L		L
CLO5		M	M		M								M	
CLO6	M	H										L		M

H: High, M: Medium, L: Low