Faculty of Engineering and Technology

Bachelor of Technology
Effective from Academic Year: 2019-20

Branch Name:	Mechanical Engineering
Semester/Year:	Semester VIII / Forth Year
Subject Title:	Power Plant Engineering
Subject Code:	1ET1010802
Pre-requisite:	Engineering Thermodynamics

Course Objectives:

1. To study fundamentals of various types of thermal power plants i.e. steam turbine, gas turbine, nuclear etc.
2. To study boilers, boiler mountings and accessories.
3. To study utilization of thermal energy.
4. To study gas turbine and its applications
5. Study power plant economics.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
				Theory (Marks)		Practical (Marks)		Total (Marks)
Lecture (L)	Tutorial (T)	Practical (P)	Credit	University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	01	00	04	70	30	-	20	120

Subject Contents			
Sr. No	Topic	Total Hours	Weightage (%)
1	**Thermal Power Plant:** General layout of modern thermal power plant, Site selection. **Steam Generators:** Fire tube and Water tube boiler, high pressure boilers (La-Mont, Benson, Velox, Loeffler and Schmidt-Hartmann boilers), important features of HP boilers, Layout of a modern HP boiler, supercritical boilers, Supercharged and fluidized bed combustion, Methods of superheat control.	7	15
2	**Steam Nozzles:** Types of nozzles, velocity of steam, discharge through nozzle, critical pressure ratio and condition for maximum discharge, physical significance of critical pressure ratio, effect of friction and nozzle efficiency, general relationship between area, velocity and pressure in nozzle flow, supersaturated flow.	8	20
3	**Steam turbine:** Principle of operation, types of steam turbines, compounding of steam turbines, impulse turbine- velocity diagram, calculation of work, power and efficiency, condition for maximum efficiency, Reaction turbines – velocity diagram , degree of reaction, Parson turbine, work, power, efficiencies, blade height, condition for maximum blade efficiency for Parson turbine, reheat factor, governing of steam turbine- throttle, nozzle and bypass governing, regenerative feed heating, reheating of steam, binary vapour cycle.	8	20
4	**Gas turbine:** Open and closed cycle, actual brayton cycle, optimum pressure ratio for maximum thermal efficiency, work ratio, air rate, effect of operating variables on the thermal efficiency, work ratio and air rate, open cycle gas turbine with regeneration, reheating and Inter-cooling, combined steam and gas turbine plant.	8	20

	Jet Propulsion: Turbojet Engine, thrust, thrust power, propulsive efficiency, thermal efficiency, turboprop, ramjet and pulsejet engines, and rocket engines.		
5	**Nuclear Power Plants:** Principles of nuclear energy, basic nuclear reactions, nuclear reactors-PWR, BWR, CANDU, Sodium graphite, fast breeder, homogeneous; gas cooled. Advantages and limitations, nuclear power station, waste disposal.	7	15
6	**Power Plant Economics:** Load curve, different terms and definitions, cost of electrical energy, tariffs methods of electrical energy, performance & operating characteristics of power plants- incremental rate theory, input-output curves, efficiency, heat rate, economic load sharing.	4	10

Course Outcomes:

The student will be able to

1. Comprehend various equipments/systems utilized in power plants.
2. Differentiate impulse and reaction turbines.
3. Analyze performance of turbines.
4. Discuss types of reactors, waste disposal issues in nuclear power plants.
5. Illustrate power plant economics.

List of Reference Books:

1. Black and Veatch, "Power Plant Engineering", Kluwer Academic Publishers, Boston / London
2. Nag P. K., "Power Plant Engineering", McGraw-Hill Education.
3. Rathore M. M., "Thermal Engineering", McGraw-Hill Education
4. Rajput R. K., "Thermal Engineering", Laxmi Publication.
5. Yadav R., "Steam and gas turbines and power plant engineering", Central Publishing House, Allhabad.
6. Ganeshan V., "Gas Turbines", McGraw Hill Education.

List of Tutorial:
Students are required to submit tutorials based on the above subject contents. It is desirable to visit thermal 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/