GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3171910
Semester –VII
Subject Name: Power Plant Engineering

Type of course: Professional Core

Prerequisite: Thermodynamics& Heat Transfer

Rationale: Providing an overview of Power Plants and detailing the role of Mechanical Engineers in their operation and maintenance and to address the underlying concepts, methods and application of different Thermal Power Plants.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	0	3	70	30	0	0	100

Content:

Sr. No.	Content	Total Hrs
1	**Coal Based Thermal Power Plant:** Layout of modern coal 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,	14
2	**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, Effect of operating variables on the thermal efficiency and work, Cooling of gas turbine blade, Combined steam and gas turbine plant.	10
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	08
4	**Power from Renewable Energy:** Hydro Electric Power Plants – Classification, Typical Layout and associated components including Turbines. Principle, Construction and working of Wind, Tidal, Solar Photovoltaic (SPV), Solar Thermal, GeoThermal and Fuel Cell power systems	08
5	**Energy, Economic and Environmental issues of Power plants:** Power tariff types, Load distribution parameters, load curve, Comparison of site selection criteria, relative merits & demerits, Capital & Operating Cost of different power plants. Pollution control technologies including Waste Disposal Options for Coal and Nuclear Power Plants	05

Suggested Specification table with Marks (Theory):

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Distribution of Theory % Marks					
R Level	U Level	A Level	N Level	E Level	C Level
25	**25**	**30**	**20**	**0**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

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:

1. Power Plant Engineering, P.K. Nag, McGraw-Hill Education
2. Power Plant Technology, M.M. El-Wakil, McGraw-Hill Education
3. Thermal Engineering, R.K.Rajput, Laxmi Publication
4. Gas Turbines by V.Ganeshan, McGraw Hill Education
5. Steam Turbine Theory and Practice, William J. Kearton, CBS Publication

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Explain the layout, construction and working of the components of thermal, Diesel, Gas and Combined cycle power plants.	55
CO-2	Explain the layout, construction and working of the components of Nuclear power plants.	17
CO-3	Explain the layout, construction and working of the components of Renewable Energy power plants.	18
CO-4	Explain the applications of power plants while extending their knowledge to power plant economics and environmental hazards and estimate the costs of electrical energy production.	10

List of Open Source Software/learning website:

1. http://nptel.ac.in/
2. http://npti.in/default.aspx

Industrial Visit: It is strongly suggested and recommended to arrange a visit to Thermal Power Plant/Hydro Power Plant / Nuclear Power Plant /Solar Power Plant.