FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: **Bachelor of Technology (Mechanical Engineering)**

Semester: **VII**

Course Code: **202090703**

Course Title: **Power Plant Engineering**

Course Group: **Professional Core Course-XVIII**

Course Objectives: The course is to study and understand fundamentals knowledge of construction and working of various types of power plants and various components.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Theory		J/V/P*		Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	
3	0	2	4	50 / 18	50 / 17	25 / 9	25 / 9	150 / 53

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	**Thermal Power Plant:** General layout of modern thermal power plant, Site selection, Presents status of power generation in India, Rankine cycle – improvisations, High Pressure and Super Critical Boilers, FBC Boilers, Turbines, Condensers and cooling towers, Steam & Heat rate, Subsystems of thermal power plants – Fuel and ash handling, Electrostatic Precipitator, Draught system, Feed water treatment. Binary Cycles and Cogeneration systems.	18
2	**Diesel, Gas turbine and combined cycle power plants:** Diesel & Brayton Cycle – Analysis & Optimization. Components of Diesel and Gas Turbine power plants. Combined Cycle Power Plants. Integrated Gasifier based Combined Cycle systems.	10
3	**Nuclear power plants:** Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working of Nuclear Reactors, Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), Canadian Deuterium-Uranium reactor (CANDU), Breeder, Gas Cooled and Liquid Metal Cooled Reactors. Safety measures for Nuclear Power plants. Nuclear Materials, Nuclear Waste & Its Disposal	10

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4	**Economics of power Generation:** Load curves, load duration curve, Different types of loads, load factor, plant capacity factor, plant use factor, demand and diversity factor, cost of power plant, performance and operating characteristics of power plant, tariff for electric energy.	**7**
5	**Total**	**45**

List of Practicals / Tutorials:

1	Study of Modern Steam Power Plant.
2	Study of Steam Turbines. (Impulse, Reaction and governing).
3	Study of Gas and Steam Turbine Combined Cycles.
4	Study of Nuclear Power Plant.
5	Study of various draught system.
6	Study of different feed water treatment plants.
7	Study of different types of steam nozzle and design a nozzle.
8	Comparative study of different types of high-pressure boilers.
9	Study of Coal and Ash handling system.
10	Study of condenser and cooling tower.

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

Supplementary learning Material:	
1	NPTEL resources

Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment
- Interactive methods
- Seminar/Poster Presentation
- Industrial/ Field visits

Internal Evaluation:

The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

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Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						**R**: Remembering; **U**: Understanding; **A**: Applying; **N**: Analyzing; **E**: Evaluating; **C**: Creating
R	**U**	**A**	**N**	**E**	**C**	
15%	15%	15%	25%	25%	5 %	

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.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	To Understand the different power generation methods, its economics and global energy situation.	**25**
CO-2	Apply the basic thermodynamics and fluid flow principles to different power generation methods.	**20**
CO-3	Analyze thermodynamic cycles of steam power plant and understand construction, working and significance of its various systems.	**20**
CO-4	To understand the basic concepts, terminologies and kinematics of gears and gear trains.	**20**
CO-5	Analyze thermodynamic cycles of gas turbine power plant, nuclear power plant and jet propulsion systems.	**15**

Curriculum Revision:	
Version:	2
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	--
Next Review on (Month-Year):	June-2025

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