

Subject Code: 01ME0505

Subject Name: Power Plant Engineering

B. Tech. III Year – (Sem-5) Mechanical Engineering

Type of course: Core

Prerequisite: Engineering Thermodynamics, Fluid Mechanics

Rationale: To impart basic knowledge of various types of power plants & components with required equations.

Teaching and Examination Scheme:

| Teaching Scheme (Hours) | | | Credits | Evaluation Scheme | | | | | Total Marks |
|-------------------------|----------|-----------|---------|-------------------|----|-----|-----------------|----------------|-------------|
| Theory | Tutorial | Practical | | Theory Marks | | | Practical Marks | | |
| | | | | ESE (E) | IA | CSE | Viva (V) | Term Work (TW) | |
| 3 | 0 | 2 | 4 | 50 | 30 | 20 | 25 | 25 | 150 |

COURSE OUTCOME

Students will be able to

| | |
|----------|--|
| 1 | Understand basics of power plant including thermodynamic cycles, site selection criteria and modern power plant concept. |
| 2 | Understand working of different types of steam generators and different material handling system for power plant. |
| 3 | Analyze functioning of condensers and cooling systems. |
| 4 | Analyze working and performance parameters of different draught systems. |
| 5 | Understand various types of feed water treatment. |
| 6 | Understand nuclear power plants with basic physics and new concepts. |

| SR NO | CONTENTS | TOTAL HOURS | WEIGHTAGE |
|-------|--|-------------|-----------|
| 1 | INTRODUCTION: Thermodynamic cycles related to power plant, structure and working of modern power plant, site selection criteria and current scenario of power generation in India. | 4 | 10 |
| 2 | STEAM GENERATORS: Pressure ranges for boilers, Advantages of high pressure boilers. Various high pressure boilers, super critical boilers. | 6 | 14 |

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|---|--|---|----|
| 3 | Coal and Ash Handling Systems: Coal storage, Burning systems, Types of stokers and their working, Pulverized fuel handling systems, Pulverized mills, Pulverized coal burners, Oil burners, Necessity of ash disposal, types of ash handling systems, Dust collection and its disposal, Mechanical dust collector, Electrostatic precipitator. | 8 | 20 |
| 4 | CONCEPT OF CONDENSERS AND COOLING TOWERS: Introduction, types of condensers, Air leakage & its effect on performance, Dalton's law of partial pressure, vacuum & condenser efficiency and methods to improve them, requirement of quantity of cooling water, Edward air pump, necessity of cooling towers & ponds and types. | 8 | 16 |
| 5 | INTRODUCTION TO DRAUGHT SYSTEM: Working principle of natural draught & chimney height formula with maximum discharge condition, types of artificial draught systems, and power requirement of blowers. | 4 | 10 |
| 6 | FEED WATER TRETMENT: Requirement of feed water treatment, various impurities & its effects, effect of PH on corrosion and scale formation and different types of water treatment processes. | 4 | 10 |
| 7 | NUCLEAR POWER PLANTS: Types of nuclear processes, Fission- fuels, chain reaction, components of fission reactors, various reactors, current scenario in India, Fusion- comparison of fusion-fission, introduction of plasma state, types of plasma confinement, tokamak. | 8 | 20 |

Distribution of Theory Marks

| R Level | U Level | A Level | N Level | E Level |
|---------|---------|---------|---------|---------|
| 20 | 35 | 25 | 20 | 10 |

Legends: R: Remembrance; **U:** Understanding; **A:** Application, **N:** Analyze, **and E:** Evaluate

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
6. Veatch & Black, "Power Plant Engineering", CBS Publishers & Distributors New Delhi

List of the Experiment

- 1 Study of Modern Thermal Power Plant.
- 2 Study of Steam Generators.
- 3 Study of Coal and Ash handling system.
- 4 Study of condenser and cooling tower.
- 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 Gas and Steam Turbine Combined Cycles.
- 10 Study of Nuclear Power Plant.

List of Open Source Software/learning website:

1. <http://nptel.ac.in/>
2. [https://en.wikipedia.org/wiki/Plasma_\(physics\)](https://en.wikipedia.org/wiki/Plasma_(physics))
3. <https://en.wikipedia.org/wiki/Tokamak>
4. <https://www.wartsila.com/>
5. <http://www.oegindia.com/>
6. <https://aerb.gov.in/index.php/english/>
7. <http://www.vitkovice.cz/>