

COURSE TITLE	POWER PLANT ENGINEERING
COURSE CODE	01ME1505
COURSE CREDITS	4

Objective:

- 1 To impart basic knowledge of various types of power plants & components with required equations
- 2 To impart basic knowledge of various types of power plants & components with required equations.

Course Outcomes: After completion of this course, student will be able to:

- 1 Utilize the concepts of thermodynamic cycles, site selection criteria and modern power plant systems to solve basic operational problems
- 2 Use the principles of steam generator operation and material handling systems to select appropriate equipment for different power plant applications
- 3 Examine the working principles, classification, and operational aspects of condensers and cooling tower systems used in power plants.
- 4 Interpret the working principles, types, and functional characteristics of natural and artificial draught systems used in power plants.
- 5 Apply appropriate feed-water treatment methods based on impurities, operational requirements, and boiler limitations.
- 6 Differentiate between various types of nuclear reactors and interpret their operational features and suitability for power generation.

Pre-requisite of course:Engineering Thermodynamics, Fluid Mechanics

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	INTRODUCTION Classification of power plant, Thermodynamic cycles related to power plant, Rankine Cycle, General Layout of a modern power plant, Site selection criteria, current scenario of power generation in India	4
2	STEAM GENERATORS Introduction and unique features of high pressure boilers, Advantages of high pressure boilers, construction and working of La-Mont boiler, construction and working of Loeffler and Benson boiler, construction and working of Schmidt Hartmann and Velox Boiler, Boiler Mountings and accessories	8

Contents : Unit	Topics	Contact Hours
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	10
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, requirement of quantity of cooling water, Edward air pump, necessity of cooling towers & ponds and types	8
5	INTRODUCTION TO DRAUGHT SYSTEM Working principle of natural draught, chimney height formula with maximum discharge condition, types of artificial draught systems, power requirement of blowers	4
6	FEED WATER TREATMENT Requirement of feed water treatment, various impurities & its effects, different types of water treatment processes	6
7	NUCLEAR POWER PLANTS Nuclear fusion and fission, comparison of fusion-fission, nuclear fuels, chain reaction, components of nuclear reactors, pressurized water reactor, boiling water reactor, gas cooled reactor, CANDU reactor, liquid metal cooled reactor, fast breeder reactor, nuclear waste and its disposal, Site selection for nuclear reactor, current scenario of nuclear power generation in India	8
Total Hours		48

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	To find out efficiency of Rankine cycle To find out efficiency of Rankine cycle	2
2	To find the efficiency of boiler by direct method To find the efficiency of boiler by direct method	2
3	To find the efficiency of boiler by indirect method To find the efficiency of boiler by indirect method	2
4	To prepare heat balance sheet for given boiler To prepare heat balance sheet for given boiler	2
5	To find the condenser efficiencies To find the condenser efficiencies	2
6	To find the cooling tower efficiencies To find the cooling tower efficiencies	2
7	To find the efficiency of furnace To find the efficiency of furnace	2

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
8	To do the energy performance assessment of textile industry To do the energy performance assessment of textile industry	2
9	To do the energy performance assessment of pump To do the energy performance assessment of pump	2
10	To do the energy performance assessment of thermal power station To do the energy performance assessment of thermal power station	2
11	To do the energy performance assessment of steel industry To do the energy performance assessment of steel industry	2
12	To do the energy performance assessment of cement industry To do the energy performance assessment of cement industry	2
Total Hours		24

Textbook :

- 1 Power Plant Engineering, P.K. Nag, McGraw-Hill Education, 2014
- 2 Power Plant Engineering, Larry Drbal, Kayla Westra, and Pat Boston, Taylor & Francis, 2012

References:

- 1 Gas Turbines, Gas Turbines, V Ganeshan, McGraw-Hill Education, 2010
- 2 Power Plant Technology, Power Plant Technology, M.M. El-Wakil, McGraw-Hill Education, 2005
- 3 Power Plant Engineering, Power Plant Engineering, R.K.Rajput, Laxmi Publication, 2010
- 4 Power Plant Engineering and Design, Power Plant Engineering and Design, Frederick T. Morse, John Wiley & Sons, 2014
- 5 Thermal Power Plant: Design and Operation, Thermal Power Plant: Design and Operation, Dipak Sarkar, CRC Press, 2015
- 6 Power Plant Engineering, Power Plant Engineering, Amiya Ranjan Mallick and Amitava Bhattacharya, PHI Learning Private Limited, 2016

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
20.00	35.00	25.00	20.00	10.00	0.00

Instructional Method:

- 1 PPT

Supplementary Resources:

- 1 <http://nptel.ac.in/>
- 2 <https://en.wikipedia.org/wiki/Tokamak>
- 3 <https://www.wartsila.com/>
- 4 <http://www.oegindia.com/>