

Course Name: Power Plant Engineering

Course Code: EE 704B

Credit: 3

Prerequisites:

Sl. No.	Subject	Description	Level of Study
01	Engineering Thermodynamics	Concept of thermodynamic states and thermodynamic equilibrium	2nd sem
02	Thermal Power Engineering	Boilers, Thermodynamic devices, IC engines	4th sem
03	Machine I & II	Transformer, Alternator	4th sem, 5th sem

Course Objective:

- To introduce students to different aspects of power plant engineering.
- To familiarize the students to the working of power plants based on different fuels.
- To expose the students to the principles of safety and environmental issues.

Course Outcomes:

At the end of the course, a student will be able to:

1. **Describe** and **analyze** different types of sources and mathematical expressions related to thermodynamics and various terms and factors involved with power plant operation.
2. **Analyze** the working and layout of steam power plants and the different systems comprising the plant and discuss about its economic and safety impacts
3. Combine concepts of previously learnt courses to **define** the working principle of diesel power plant, its layout, safety principles and compare it with plants of other types.
4. **Describe** the working principle and basic components of the nuclear power plant and the economic and safety principles involved with it.
5. **Discuss** the working principle and basic components of the hydro electric plants and the economic principles and safety precautions involved with it.
6. **Discuss** and **analyze** the mathematical and working principles of different electrical equipments involved in the generation of power.

CO- PO mapping:

EE704 B.	1	2	3	2	3	2	2	-	2	1	2	1	3
EE704 B.	2	2	-	3	1	-	2	2	-	1	-	1	2
EE704 B.	3	2	-	2	1	-	1	2	-	1	-	1	2
EE704 B.	4	2	-	3	1	-	1	3	2	1	-	1	2
EE704 B.	5	2	-	2	1	-	1	2	-	1	-	1	2
EE704 B.	6	2	2	1	2	1	2	1	1	1	2	1	3
EE704B.		2	2.5	2.166 667	1.5	1.5	1.5	2	1.666 667	1	2	1	2.333 333
		0.666 667	0.833 333	0.722 222	0.5	0.5	0.5	0.666 667	0.555 556	0.333 333	0.666 667	0.333 333	0.777 778
Indire ct Attain ment	2.7 08	1.805 353	2.256 691	1.955 799	1.354 015	1.354 015	1.354 015	1.805 353	1.504 461	0.902 676	1.805 353	0.902 676	2.106 245
Direct Attain ment	2.6 65	1.776 642	2.220 803	1.924 696	1.332 482	1.332 482	1.332 482	1.776 642	1.480 535	0.888 321	1.776 642	0.888 321	2.072 749
Overall I Attain ment	2.6 736	1.782 384	2.227 981	1.930 916	1.336 788	1.336 788	1.336 788	1.782 384	1.485 32	0.891 192	1.782 384	0.891 192	2.079 448
		<p>* Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium)3: Substantial (High) and It there is no correlation, put “-”</p>											

Syllabus Indicating CO:

Module No.	Content	Relevant CO's
1	<p>Introduction: Power and energy, sources of energy, review of thermodynamic cycles related to power plants, fuels and combustion calculations. Load estimation, load curves, various terms and factors involved in power plant calculations. Effect of variable load on power plant operation, Selection of power plant.</p> <p>Power plant economics and selection: Effect of plant type on costs, rates, fixed elements, energy elements, customer elements and investor's profit; depreciation and replacement, theory of rates. Economics of plant selection, other considerations in plant selection.</p>	CO1,
2	<p>Steam power plant: General layout of steam power plant, Power plant boilers including critical and super critical boilers. Fluidized bed boilers, boilers mountings and accessories, Different systems such as coal handling system, pulverizes and coal burners, combustion system, draft, ash handling system, Dust collection system, Feed water treatment and condenser and cooling towers and cooling ponds, Turbine auxiliary systems such as governing, feed heating, reheating, flange heating and gland leakage. Operation and maintenance of steam power plant, heat balance and efficiency, Site selection of a steam power</p>	CO1,CO2
3	<p>Diesel power plant: General layout, Components of Diesel power plant, Performance of diesel power plant, fuel system, lubrication system, air intake and admission system, supercharging system, exhaust system, diesel plant operation and efficiency, heat balance, Site selection of diesel power plant, Comparative study of diesel power plant with steam power plant. Gas turbine power plant: Layout of gas turbine power plant, Elements of gas turbine power plants, Gas turbine fuels, cogeneration, auxiliary systems such as fuel, controls and lubrication, operation and maintenance, Combined cycle power plants, Site selection of gas turbine power plant .</p>	CO3
4	<p>Nuclear power plant: Principles of nuclear energy, Lay out of nuclear power plant, Basic components of nuclear reactions, nuclear power station, Nuclear waste disposal, Site selection of nuclear power plants.</p> <p>Hydro electric station Hydrology, Principles of working, applications, site selection, classification and arrangements, hydro-electric plants, run off size of plant and choice of units, operation and maintenance, hydro systems, interconnected systems.</p> <p>Non Conventional Power Plants Introduction to non conventional power plants (Solar, wind, geothermal, tidal)etc.</p>	CO3,CO4
5	<p>Electrical system: Generators and their cooling, transformers and their cooling.</p> <p>Instrumentation Purpose, classification, selection and application, recorders and their use, listing of various control rooms. Pollution due to power generation.</p>	CO6

Lecture Plan:

Sl. No.	Date	Topics	Remarks
1		Power and energy, sources of energy	
2		Review of thermodynamic cycles related to power plants, fuels and combustion calculations	Problems to be solved
3&4		Load estimation, load curves, various terms and factors involved in power plant calculations	Problems to be solved
5		Effect of variable load on power plant operation,	
6		Selection of power plant.	
7 & 8		Effect of plant type on costs, rates, fixed elements, energy elements, customer elements and investor's profit; depreciation and replacement, theory of rates.	
9 & 10		Economics of plant selection, other considerations in plant selection.	
11		General layout of steam power plant. Power plant boilers including critical and super critical boilers.	
12		Fluidized bed boilers, boilers mountings and accessories	
13		Different systems such as coal handling system, pulverizers and coal burners.	
14		Combustion system, draft, ash handling system, Dust collection system.	
15		Feed water treatment and condenser and cooling towers and cooling ponds,	
16		Turbine auxiliary systems such as governing, feed heating, reheating, flange heating and gland leakage.	
17		Operation and maintenance of steam power plant, heat balance and efficiency, Site selection of a steam power plant	
18& 19		General layout, Components of Diesel power plant, Performance of diesel power plant	
20&21		Diesel power plant fuel system, lubrication system.	
22		Diesel power plant air intake and admission system, supercharging system, exhaust system.	
23		Diesel plant operation and efficiency, heat balance, Site selection of diesel power plant, Comparative	

		study of diesel power plant with steam power plant.	
24		Layout of gas turbine power plant, Elements of gas turbine power plants, Gas turbine fuels, cogeneration	
25		Gas turbine power plant auxiliary systems such as fuel, controls and lubrication, operation and maintenance.	
26		Combined cycle power plants, Site selection of gas turbine power plant .	
27		Principles of nuclear energy, Lay out of nuclear power plant	
28		Basic components of nuclear reactions, nuclear power station	
29		Nuclear waste disposal	
30		Site selection of nuclear power plants	
31		Hydrology, Principles of working, applications	
32		Hydro electric plant site selection, classification and arrangements.	
33		Hydro-electric plants, run off size of plant and choice of units.	
34		Hydro electric operation and maintenance.	
35		Hydro systems, interconnected systems.	
36		Introduction to non-conventional power plants (Solar, wind, geothermal, tidal)etc.	
37		Generators and their cooling.	
38		Transformers and their cooling.	
39		Instrumentation Purpose, classification, selection and application, recorders and their use.	
40		Listing of various control rooms. Pollution due to power generation.	

Recommended Books:

1. Power Plant Engineering, P.K. Nag, Tata McGraw Hill.
2. Power Plant Engineering, F.T. Morse, Affiliated East-West Press Pvt. Ltd, New Delhi/Madras
3. Power Plant Technology El-Vakil, McGraw Hill.