



POWER PLANT ENGINEERING (ME721PE)

COURSE PLANNER

I. COURSE OVERVIEW:

Power Plant Engineering basically focuses on power generation principles for real world applications. More specifically this course is focused on application of energy principles and power generation cycles. The main purpose of implementing this course in curriculum is to learn about how the power is generated in a power plant and its applications.

II. PRE REQUISITES:

The knowledge of following subjects is essential to understand Power Plant Engineering

- Thermal Engineering
- Heat Transfer
- Fluid Mechanics & Hydraulic Machines
- Electrical Engineering
- Plant Economics

III. COURSE OBJECTIVES:

1.	Basic knowledge of Different types of Power Plants, site selection criteria of each one of them.
2.	Understanding of Thermal Power Plant Operation, turbine governing, different types of high pressure boilers including supercritical and supercharged boilers, Fluidized bed combustion systems.
3.	Design of chimney in thermal power plants, knowledge of cooling tower operation, numerical on surface condenser design.
4.	Basic knowledge of Different types of Nuclear power plants including Pressurized water reactor, Boiling water reactor, gas cooled reactor, liquid metal fast breeder reactor.
5.	Understanding of Power Plant Economics, Energy Storage including compressed air energy and pumped hydro etc.
6.	Discussing environmental and safety aspects of power plant operation

IV. COURSE OUTCOMES:

S.No.	Description	Bloom's Taxonomy Level
1.	Able to get the basics of Power Plants.	Knowledge, Understand (Level1, Level2)
2.	Able to get the idea about the power generation by renewable and non-renewable energy resources.	Knowledge, Understand (Level1, Level2)
3.	Able to know about the different types of cycles and natural resources used in power plants and their applications.	Knowledge, Understand, Apply (Level1, Level2)

V. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (PO)		Level	Proficiency assessed by
PO1	Engineering knowledge: Graduates will demonstrate the ability to use basic knowledge in mathematics, science and engineering and apply them to solve problems specific to mechanical engineering.	2	Assignments and Exams

Program Outcomes (PO)		Level	Proficiency assessed by
PO2	Problem analysis: Graduates will demonstrate the ability to design and conduct experiments, interpret and analyze data, and report results.	2	Assignments and Exams
PO3	Design/development of solutions: Graduates will demonstrate the ability to design any mechanical system or thermal that meets desired specifications and requirements.	2	Assignments and Exams
PO4	Conduct investigations of complex problems: Graduates will demonstrate the ability to identify, formulate and solve mechanical engineering problems of a complex kind.	--	--
PO5	Modern tool usage: Graduates will be familiar with applying software methods and modern computer tools to analyze mechanical engineering problems.	--	--
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.	--	--
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	--	--
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	--	--
PO9	Individual and team work: Graduates will demonstrate the ability to function as a coherent unit in multidisciplinary design teams, and deliver results through collaborative research.	--	--
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	--	--
PO11	Project management and finance: Graduate will be able to design a system to meet desired needs within environmental, economic, political, ethical health and safety, manufacturability and management knowledge and techniques to estimate time, resources to complete project.	2	Assignments and Exams
PO12	Life-long learning: Graduates should be capable of self-education and clearly understand the value of life-long learning.	--	--

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

-- : None

VI. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED

Program Specific Outcomes (PSO)		Level	Proficiency assessed by
PSO1	Foundation of mathematical concepts: To use mathematical methodologies to crack problem using suitable mathematical analysis, data structure and suitable algorithm.	--	--
PSO2	Foundation of Mechanical System: The ability to interpret the fundamental concepts and methodology of Mechanical systems. Students can understand the functionality of different machine, men and material.	3	Lectures, Assignments
PSO3	Layout of plant: The ability to grasp the knowledge of plant layout and material handling along with the systematic allocation of all the facilities.	3	Guest Lectures

1: Slight (Low) **2: Moderate (Medium)**

3: Substantial (High)

- : None

VII. SYLLABUS

UNIT – I

Introduction to the Sources of Energy – Resources and Development of Power in India. Steam Power Plant: Plant Layout, Working of different Circuits, Fuel and handling equipments, types of coals, coal handling, choice of handling equipment, coal storage, Ash handling systems.

COMBUSTION PROCESS: Properties of coal – overfeed and underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and draught system, cyclone furnace, design and construction, Dust collectors, cooling towers and heat rejection. Corrosion and feed water treatment.

UNIT II

INTERNAL COMBUSTION ENGINE PLANT: Diesel Power Plant-Introduction – IC Engines, types, construction– Plant layout with auxiliaries – fuel supply system, air starting equipment, lubrication and cooling system – super charging.

GAS TURBINE PLANT: Introduction – classification - construction – Layout with auxiliaries – Principles of working of closed and open cycle gas turbines. Combined Cycle Power Plants and comparison.

DIRECT ENERGY CONVERSION: Solar energy, Fuel cells, Thermo electric and Thermo ionic, MHD generation.

UNIT – III

HYDRO ELECTRIC POWER PLANT: Water power – Hydrological cycle / flow measurement – drainage area characteristics – Hydrographs – storage and Pondage – classification of dams and spill ways.

HYDRO PROJECTS AND PLANT: Classification – Typical layouts – plant auxiliaries – plant operation pumped storage plants.

POWER FROM NON-CONVENTIONAL SOURCES: Utilization of Solar- Collectors- Principle of Working, Wind Energy – types – HAWT, VAWT -Tidal Energy.

UNIT -IV

NUCLEAR POWER STATION: Nuclear fuel – breeding and fertile materials – Nuclear reactor – reactor operation.

TYPES OF REACTORS: Pressurized water reactor, Boiling water reactor, sodium-graphite reactor, fast Breeder Reactor, Homogeneous Reactor, Gas cooled Reactor, Radiation hazards and shielding – radioactive waste disposal.

UNIT – V

Power Plant Economics and Environmental Considerations: Capital cost, investment of fixed charges, operating costs, general arrangement of power distribution, Load curves, load duration curve. Definitions of connected load, Maximum demand, demand factor, average load, load factor, diversity factor– related exercises. Effluents from power plants and Impact on environment – pollutants and pollution standards – Methods of Pollution control.

TEXT BOOKS:

1. Power Plant Engineering – P.C.Sharma / S.K.Kataria Pub
2. A Course in Power Plant Engineering: / Arora and S. Domkundwar.

REFERENCE BOOKS:

1. A Text Book of Power Plant Engineering / Rajput / Laxmi Publications
2. Power plant Engineering/ Ramalingam/ Sciotech Publishers
3. Power Plant Engineering: P.K.Nag/ II Edition /TMH.
4. An Introduction to Power Plant Technology / G.D. Rai.
5. Power plant Engg - Elanchezhian- I.K. International Publications.

NPTEL Web Course:

1. <http://nptel.ac.in/courses/112106133/1>
2. <http://nptel.ac.in/courses/112106133/2>
3. <http://nptel.ac.in/courses/112106133/3>
4. <http://nptel.ac.in/courses/112106133/4>
5. <http://nptel.ac.in/courses/112106133/5>

NPTEL Video Course:

1. <http://nptel.ac.in/courses/108105058/8>
2. <http://nptel.ac.in/courses/108105058/9>
3. <http://nptel.ac.in/courses/108105058/10>

GATE SYLLABUS: NOT APPLICABLE

IES SYLLABUS:NOT APPLICABLE

Lecture No.	Unit No.	Topics to be covered	Content to be covered under each topic	Link for PPT	Link for PDF	Link for Small Projects/ Numeric als(if any)	Course learning outcomes	Teaching Methodology	Reference
1	I	Preamble to the course	Introduction to Sources of Energy, Resources and Development of Power in India.	https://tinyurl.com/zt6s6bc5	https://tinyurl.com/zt6s6bc5	https://tinyurl.com/zt6s6bc5	Understand	PPT, CHALK BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill

2	Steam Power Plant Layout,	Layout of Steam Power Plant Working of different Circuits.	https://tinyurl.com/4rmdmfcu	https://tinyurl.com/3cxmh7wt	https://tinyurl.com/458w5kcj	Explain	PPT, CHALK N BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
3	Fuel and handling equipments	Different Fuel and handling equipments,	https://tinyurl.com/4rmdmfcu	https://tinyurl.com/3cxmh7wt	https://tinyurl.com/458w5kcj	Understand	PPT, CHALK N BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
4	Types of coals.	Coal handling, choice of handling equipment. Coal storage,	https://tinyurl.com/4rmdmfcu	https://tinyurl.com/3cxmh7wt	https://tinyurl.com/458w5kcj	Explain	PPT, CHALK N BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
5	STUDENT PPT	STUDENT PPT	https://tinyurl.com/4rmdmfcu	https://tinyurl.com/3cxmh7wt	https://tinyurl.com/458w5kcj	Study	PPT, CHALK N BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
6	Ash handling systems.	Different Ash handling systems.	https://tinyurl.com/4rmdmfcu	https://tinyurl.com/3cxmh7wt	https://tinyurl.com/458w5kcj	Application	PPT, CHALK N BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill

7	Combustion Process- Properties of coal.	Concept of Combustion Process- Properties of coal.	https://tinyurl.com/4rmdmfcu	https://tinyurl.com/3cxmh7wt	https://tinyurl.com/458w5kcj	Understand	PPT, CHALK N BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
8	Overfeed and underfeed fuel beds.	Working of Overfeed and underfeed fuel beds and its diagrams	https://tinyurl.com/4rmdmfcu	https://tinyurl.com/3cxmh7wt	https://tinyurl.com/458w5kcj	Understand	PPT, CHALK N BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
9	Traveling grate stokers, spreader stokers, retort stoker.	Working of Traveling grate stokers, spreader stokers, retort stoker with diagrams	https://tinyurl.com/4rmdmfcu	https://tinyurl.com/3cxmh7wt	https://tinyurl.com/458w5kcj	Understand	PPT, CHALK N BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
10	STUDENT PPT	STUDENT PPT	https://tinyurl.com/4rmdmfcu	https://tinyurl.com/3cxmh7wt	https://tinyurl.com/458w5kcj	Application	PPT, CHALK N BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
11	Pulverized fuel burning system	Working of Pulverized fuel burning system and its components.	https://tinyurl.com/4rmdmfcu	https://tinyurl.com/3cxmh7wt	https://tinyurl.com/458w5kcj	Study	PPT, CHALK N BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill

12		Draught system,	Working of Draught system, cooling towers.	https://tinyurl.com/4rmdmfcu	https://tinyurl.com/3cxmh7wt	https://tinyurl.com/458w5kcj	Explain	PPT, CHALK N BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
13		Dust collectors, Plant	Working of Dust collectors, Feed water treatment, Corrosion.	https://tinyurl.com/4rmdmfcu	https://tinyurl.com/3cxmh7wt	https://tinyurl.com/458w5kcj	Explain	PPT, CHALK N BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
			Plant: Introduction, classification,	inyurl.com/jxu3zk48			and	CHALK N BOARD, VIDEOS	Plant Engineering/ P. K. Nag / Mc Graw Hill
14		Cyclone furnace,	Working of Cyclone furnace, Combustion needs and heat rejection.	https://tinyurl.com/4rmdmfcu	https://tinyurl.com/3cxmh7wt	https://tinyurl.com/458w5kcj	Study	PPT, CHALK N BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
15		STUDENT PPT		https://tinyurl.com/4rmdmfcu	https://tinyurl.com/3cxmh7wt	https://tinyurl.com/458w5kcj	Explain	PPT, CHALK N BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill

16	II	Internal Combustion Engine Plant	Introduction to Internal Combustion Engine Plant, Diesel Power Plants	https://tinyurl.com/jxu3zk48	https://tinyurl.com/7kx782hw	https://tinyurl.com/nkyeeuzv	Understand	PPT, CHALK BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
17		Introduction to IC Engines	Introduction, IC Engines, Types, Construction	https://tinyurl.com/jxu3zk48	https://tinyurl.com/7kx782hw	https://tinyurl.com/nkyeeuzv	Explain	PPT, CHALK BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
18		Plant layout with auxiliaries	Plant layout with auxiliaries, fuel supply system, super charging	https://tinyurl.com/jxu3zk48	https://tinyurl.com/7kx782hw	https://tinyurl.com/nkyeeuzv	Study	PPT, CHALK BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
19		Air starting equipment, lubrication, Cooling system,	Air starting equipment, lubrication, Cooling system,	https://tinyurl.com/jxu3zk48	https://tinyurl.com/7kx782hw	https://tinyurl.com/nkyeeuzv	Explain	PPT, CHALK BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
20		STUDENT PPT	STUDENT PPT	https://tinyurl.com/jxu3zk48	https://tinyurl.com/7kx782hw	https://tinyurl.com/nkyeeuzv	Explain	PPT, CHALK BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
21		Gas Turbine	Gas Turbine	https://tinyurl.com/jxu3zk48	https://tinyurl.com/7kx782hw	https://tinyurl.com/nkyeeuzv	Underst	PPT,	Power

22		Construction, Layout with auxiliaries	Details of Construction, Layout with auxiliaries of Gas Turbine	https://tinyurl.com/jxu3zk48	https://tinyurl.com/tenupr96	https://tinyurl.com/2rpexpdm	Application	PPT, CHALK BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / McGraw Hill
23		Principles of working of closed and open cycle gas turbines	Principles of working of closed and open cycle gas turbines with neat diagrams	https://tinyurl.com/jxu3zk48	https://tinyurl.com/tenupr96	https://tinyurl.com/2rpexpdm	Explain	PPT, CHALK BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / McGraw Hill
24		Combined Cycle Power Plants and comparison.	Detailed layouts of Combined Cycle Power Plants and comparison.	https://tinyurl.com/jxu3zk48	https://tinyurl.com/tenupr96	https://tinyurl.com/2rpexpdm	Study	PPT, CHALK BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / McGraw Hill
25	III	STUDENT PPT		https://tinyurl.com/27a4t7ew	https://tinyurl.com/tenupr96	https://tinyurl.com/2pn7vyj4	Explain	PPT, CHALK BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / McGraw Hill
26		Hydro Electric Power Plant:	Concept of Water power, Hydrological cycle	https://tinyurl.com/27a4t7ew	https://tinyurl.com/nztzz5hv	https://tinyurl.com/2pn7vyj4	Explain	PPT, CHALK BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / McGraw Hill

27		Flow measurement,	Details of drainage area characteristics Hydrographs,	https://tinyurl.com/27a4t7ew	https://tinyurl.com/nztzz5hv	https://tinyurl.com/2pn7vyj4	Explain	PPT, CHALK BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
28		Storage and pondage,	classification of dams and spill ways.	https://tinyurl.com/27a4t7ew	https://tinyurl.com/nztzz5hv	https://tinyurl.com/2pn7vyj4	Application	PPT, CHALK BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
29		Hydro	Classification	https://tinyurl.com/27a4t7ew	https://tinyurl.com/nztzz5hv	https://tinyurl.com/2pn7vyj4	Application	PPT,	Power
30		STUDENT PPT	STUDENT PPT	https://tinyurl.com/27a4t7ew	https://tinyurl.com/nztzz5hv	https://tinyurl.com/2pn7vyj4	Explain	PPT, CHALK BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
31		Plant auxiliaries,	plant operation pumped storage plants.	https://tinyurl.com/27a4t7ew	https://tinyurl.com/nztzz5hv	https://tinyurl.com/2pn7vyj4	Explain	PPT, CHALK BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
32	IV	NUCLEAR POWER STATION:	Concept of Nuclear fuel, breeding and Fertile Material	https://tinyurl.com/253594hd	https://tinyurl.com/6kxm6d6c	https://tinyurl.com/kxk2kpu5	Explain	PPT, CHALK BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill

33	Nuclear reactor, reactor operation.	Working of Nuclear reactor, reactor operation.	https://tinyurl.com/253594hd	https://tinyurl.com/6kxm6d6c	https://tinyurl.com/kxk2kpu5	Study	PPT, CHALK BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
34	TYPES OF REACTORS	Working of Pressurized water reactor,	https://tinyurl.com/253594hd	https://tinyurl.com/6kxm6d6c	https://tinyurl.com/kxk2kpu5	Explain	PPT, CHALK BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
35	STUDENT PPT	STUDENT PPT	https://tinyurl.com/253594hd	https://tinyurl.com/6kxm6d6c	https://tinyurl.com/kxk2kpu5	Understand	PPT, CHALK BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
36	Boiling water reactor, sodium-graphite reactor, Fast Breeder Reactor	Working of Boiling water reactor, sodium-graphite reactor, Fast Breeder Reactor	https://tinyurl.com/253594hd	https://tinyurl.com/6kxm6d6c	https://tinyurl.com/kxk2kpu5	Explain	PPT, CHALK BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
37	Homogeneous Reactor, Gas cooled Reactor	Working of Homogeneous Reactor, Gas cooled Reactor	https://tinyurl.com/253594hd	https://tinyurl.com/6kxm6d6c	https://tinyurl.com/kxk2kpu5	Study	PPT, CHALK BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill

		Projects And Plant:	of Typical layouts,	inyurl.com/27a4t7ew	/tinyurl.com/nztzz5hv	nyurl.com/2pn7vj4	tion	CHALK N BOARD, VIDEOS	Plant Engineering/ P. K. Nag / Mc Graw Hill
38		Radiation hazards and shielding,	Concept of Radiation hazards and shielding,	https://tinyurl.com/253594hd	https://tinyurl.com/6kxm6d6c	https://tinyurl.com/kxk2kpu5	Explain	PPT, CHALK N BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
39		Radioactive	Concept of	https://t	https://	https://ti	Explain	PPT,	Power
40		STUDENT PPT	STUDENT PPT	https://tinyurl.com/253594hd	https://tinyurl.com/6kxm6d6c	https://tinyurl.com/kxk2kpu5	Explain	PPT, CHALK N BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
41	V	Power Plant Economics	Power Plant Economics and Environmental Considerations	https://tinyurl.com/b9ajajrd	https://tinyurl.com/8jtrphcc	https://tinyurl.com/stmmwyvp	Explain	PPT, CHALK N BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
42		Capital cost	Deffinations of Capital cost, investment of fixed charges, Operating costs	https://tinyurl.com/b9ajajrd	https://tinyurl.com/8jtrphcc	https://tinyurl.com/stmmwyvp	Understand	PPT, CHALK N BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill

43	power distribution	general arrangement of power distribution,	https://tinyurl.com/b9ajajrd	https://tinyurl.com/8jtrphcc	https://tinyurl.com/stmmwyvp	Application	PPT, CHALK N BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
44	Load curves, load duration curve.	Details of Load curves, load duration curve.	https://tinyurl.com/b9ajajrd	https://tinyurl.com/8jtrphcc	https://tinyurl.com/stmmwyvp	Explain	PPT, CHALK N BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
45	STUDENT PPT	STUDENT PPT	https://tinyurl.com/b9ajajrd	https://tinyurl.com/8jtrphcc	https://tinyurl.com/stmmwyvp	Study	PPT, CHALK N BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
46	connected load, Maximum demand, demand factor, Average load,	Definitions of connected load, Maximum demand, demand factor, Average load and its derivations	https://tinyurl.com/b9ajajrd	https://tinyurl.com/8jtrphcc	https://tinyurl.com/stmmwyvp	Explain	PPT, CHALK N BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
47	Load factor, diversity factor,	Concept of Load factor, diversity factor and its Related exercises.	https://tinyurl.com/b9ajajrd	https://tinyurl.com/8jtrphcc	https://tinyurl.com/stmmwyvp	Application	PPT, CHALK N BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill

48	Effluents from power plants	Concepts of Effluents from power plants	https://tinyurl.com/b9ajajrd	https://tinyurl.com/8jtrphcc	https://tinyurl.com/stmmwyvp	Application	PPT, CHALK N BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
49	Impact on environment, pollutants.	Impact on environment, pollutants, Pollution standards,	https://tinyurl.com/b9ajajrd	https://tinyurl.com/8jtrphcc	https://tinyurl.com/stmmwyvp	Understand	PPT, CHALK N BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
	waste disposal.	Radioactive waste disposal.	tinyurl.com/253594hd	/tinyurl.com/6kxm6d6	nyurl.com/kxk2kpu5		CHALK N BOARD, VIDEOS	Plant Engineering/ P. K. Nag / Mc Graw Hill
50	STUDENT PPT	STUDENT PPT	https://tinyurl.com/b9ajajrd	https://tinyurl.com/8jtrphcc	https://tinyurl.com/stmmwyvp	Explain	PPT, CHALK N BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill
51	Methods of Pollution control.	Different Methods of Pollution controlling adopted by in india	https://tinyurl.com/b9ajajrd	https://tinyurl.com/8jtrphcc	https://tinyurl.com/stmmwyvp	Explain	PPT, CHALK N BOARD, VIDEOS	Power Plant Engineering/ P. K. Nag / Mc Graw Hill

IX. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

CO's	Program Outcomes												Program Specific Outcomes			
	P O1	P O2	P O3	P O4	P O5	P O6	P O7	P O8	P O9	P O10	P O11	P O12	PSO 1	PSO 2	PSO 3	

			3	4	5										
CO1	2	2	2	--	--	--	--	--	--	--	2	--	1	2	2
CO2	2	2	2	--	--	--	--	--	--	--	2	--	1	2	--
CO3	2	2	2	--	--	--	--	--	--	--	2	--	--	2	2

SUGGESTED BOOKS:

TEXT BOOK:

1. A Course in Power Plant Engineering: / Arora and S. Domkundwar.
2. Power Plant Engineering – P.C.Sharma / S.K.Kataria Pub

REFERENCES:

3. Power Plant Engineering: P.K.Nag/ II Edition /TMH.
4. Power plant Engineering/ Ramalingam/ Sciotech Publishers
5. A Text Book of Power Plant Engineering / Rajput / Laxmi Publications
6. An Introduction to Power Plant Technology / G.D. Rai.

QUESTION BANK: (JNTUH)

DESCRIPTIVE QUESTIONS:

UNIT-I

Short Answer Questions-

S.No.	Question	Blooms Taxonomy Level	Course Outcome
1	What are the methods used for handling of coal?	Understand	2
2	State the advantages and disadvantages of pulverized coal firing.	Knowledge	1
3	What is the function of cooling tower?	Understand	2
4	What are the requirements of a modern surface condenser?	Understand	2
5	What is drift? How is the drift eliminated in the cooling towers?	Understand	2
6	What is pulverization?	Understand	2
7	What are the methods used in ash handling system?	Understand	2
8	What is meant by overfeed and underfeed principles of coal firing?	Understand	2
9	How the air is produced important in the selection of thermal power plant site?	Understand	2
10	What are the requirements of a modern surface condenser?	Understand	2
11	Indicate the types of burner employed for pulverized coals in the thermal power plants.	Understand	2

Long Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
1	Draw an explanatory line diagram of an ash handling system employed in steam power	Apply	

	plants and also explain the difficulties encountered in the handling of ash in a thermal power station?		3
2	Explain the difficult types of coal handling process?	Understand	2
3	Explain the principle involved in preparation of coal and what are the methods of preparation?	Understand	2
4	What are the different types of dust collectors used?	Understand	2
5	What are the different types of pulverizing mills? Explain with its neat sketch.	Understand	2
6	How ash is handled in the power plant? Explain the ash handling system.	Understand	2
7	What are the methods used for pulverized fuel burning?	Understand	2
8	Explain the various draught systems with a neat sketch.	Understand	2
9	What are the different types of cooling towers? Explain with a neat sketch.	Understand	2
10	Explain the analysis of pollution from thermal power plants.	Understand	2
11	What are the methods used for control the pollutants.	Understand	2
12	Differentiate between forced draught and induced draught system in cooling tower.	Analysis	3
13	Draw a neat line diagram of in plant coal handling and indicate the equipments used at different stages.	Apply	3
14	Explain the advantages of pulverized coal burning.	Understand	2
15	Discuss the principle used in forced and induced draught. Why balanced draught is preferred over forced or induced draught?	Understand	2
16	What is the function of a cooling tower in a modern steam power plant? Describe with a neat sketch the working of a mechanical type cooling tower.	Understand	2
17	Describe different type of over feed stokers and discuss the merits and demerits of each over others.	Understand	2
18	Draw a neat sketch of unit system of pulverized fuel firing with various components in the system and explain. What are the advantages of pulverized fuel firing?	Apply	3

UNIT-2

Short Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
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1	What are the applications of diesel electric power plants?	Understand	1
2	What are the methods used for starting a diesel engine?	Understand	2
3	What are the components present in the diesel electric power plants	Understand	2
4	What is the commonly used fuel injection system in a diesel power station?	Understand	2
5	What are the methods of cooling in a diesel engine power plant?	Understand	2
6	Discuss the effect of inter cooling in a gas turbine plant.	Understand	2
7	What is the difference between open cycle and closed cycle gas turbine plant?	Understand	2
8	How are the gas turbine blades cooled?	Understand	2
9	Why is the maximum cycle temperature of gas turbine plant much lower than that of diesel power plant?	Understand	2
10	Define mean effective pressure as applied to gas power cycles. How it is related to the indicated power of an I.C. engine?	Knowledge	1
11	Mention the various process of the Brayton cycle? Draw the p-V and T-s diagram of Brayton cycle.	Apply	3
12	What is the principle of operation of simple jet propulsion system?	Understand	2
13	Sketch the schematic arrangement of open cycle gas turbine plant and name the components.	Apply	3

Long Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
1	Draw and explain the layout of a modern diesel power plant showing the following systems. a). Air Intake system b). Cooling system c).Fuel supply system d).Lubrication system and e). Exhaust system.	Apply	3
2	Describe the auxiliary equipments of a diesel engine power plant. What are the disadvantages of this plant?	Understand	2
3	Explain the various types of cooling system used in diesel power plant. Name and explain briefly the various types of fuel injection system.	Understand	2
4	Give the layout of diesel engine power plant. What are the advantages and disadvantages of diesel power plants?	Understand	2
5	Describe briefly the commonly used starting system in large and medium size engines.	Understand	2

6	Derive an expression for air standard efficiency of Brayton cycle in terms of: (i) Compression ratio and (ii) the pressure ratio.	Create	3
7	Bring out the difference between the closed cycle and open cycle gas turbine power plants	Understand	2
8	Draw a neat diagram of a regenerative gas turbine and re-heater and also explain it working with a help of a p-v diagram.	Apply	3
9	What are the methods used for improving the efficiency of a gas turbine plant?	Understand	2
10	Sketch the Brayton cycle. Air enters the compressor of the cycle at 1 bar and 250c. Pressure after compression is 3 bar. Temperature at turbine inlet is 6500c. Determine per kg of air the (i) cycle efficiency (ii) heat supplied to air, (iii) work available (iv) heat rejected in the cooler and (v) Temperature of air leaving the turbine.	Apply	3
11	With PV and TS diagram explain the effect of inter cooling, reheating and regeneration in a gas turbine plant	Understand	2
12	Discuss the materials that are used for gas turbine and compressors. What properties should the blade materials possess?	Analysis	3
13	Describe the auxiliary equipments of a diesel engine are the disadvantages of this plant?	Understand	2
14	What are the methods used for improving the efficiency of a gas turbine plant? Explain the working of any one type of combustion chamber used Maximum demand.	Understand	2

UNIT-3

Short Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
1	On what a factor does the selection of a water turbine for hydro electric power plants depends upon?	Understand	1
2	Enumerate the advantages and disadvantages of hydropower plants.	Understand	2
3	What is surge tank?	Understand	2
4	Mention the merits of hydro electric power plants.	Understand	2
5	Classify the hydro electric turbines with respect to high medium and low head.	Understand	2
6	What are the three main factors of power output of hydroelectric plant?	Understand	2
7	What are the main parts of pelton wheel?	Understand	2
8	What is the function of spear & nozzle?	Understand	2

9	What do you understand by water hammer?	Understand	2
10	What is the basis of classification of turbines?	Understand	2
11	What is a solar cell?	Understand	2
12	What are the advantages and limitations of tidal power plant?	Understand	2
13	What are the components of Tidal power plants?	Understand	2
14	What is a fuel cell?	Understand	2
15	What is geothermal energy?	Understand	2
16	What are the applications of geothermal energy?	Understand	2
17	What are the different types of geothermal fluid and give its temperature range.	Understand	2

Long Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
1	Explain in detail about surge tank used in hydro electric power plant. Also explain about the classification and selection of dams.	Understand	2
2	What are the factors to be considered while selecting the site of a hydro power plant?	Understand	2
3	3. How are the turbines classified? Explain anyone with a suitable sketch.	Understand	2
4	Explain the construction and working of Geo thermal power plant.	Understand	2
5	What are the different types of Tidal power plants?	Understand	2
6	Explain the Solar thermal central receiver system.	Understand	2
7	What are the different types of ocean thermal energy conversion system?	Understand	2
8	Explain with a neat diagram of wind electric generating power plant.	Understand	2
9	Explain in detail about the various types of Wind energy system.	Understand	2
10	Write a brief note on HAWT & VAWT?	Understand	2

UNIT-4

Short Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
1	What are the advantages of nuclear power plant?	Understand	2
2	Explain the function of moderator?	Understand	2
3	Explain the function of nuclear reactor	Understand	2
4	List down the basic factors to be considered for the design of a nuclear power reactor?	Understand	2
5	What is “half life” of nuclear fuels?	Understand	2
6	List down the nuclear waste disposal method?	Understand	2
7	Define the term “Breeding”	Knowledge	1
8	What factors control the selection of a particular type of a reactor?	Understand	2
9	What are the components of pressurized water	Understand	2

	reactor nuclear power plant?		
10	10. Give an example for a low head turbine a medium head turbine and a high head turbine.	Understand	2
11	What are reaction turbines? Give example.	Understand	2
12	Differentiate the impulse and reaction turbine.	Analyze	3
13	Define unit speed of turbine.	Knowledge	1
14	Write the function of draft tube in turbine outlet?	Understand	2
15	What is a draft tube? In which type of turbine it is mostly used?	Understand	2
16	List down the different types of nuclear reactors commonly used in power plants.	Understand	2
17	What are breeder reactors?	Understand	2

Long Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
1	What is chain reaction? How it is maintained? What is the difference between controlled and uncontrolled chain reaction? Explain with neat sketches and with examples.	Understand	2
2	Describe the boiling water reactor with the help of neat sketch and explain its chief characteristics.	Understand	2
3	Write short notes on nuclear waste disposal? Discuss the salient features of the nuclear waste disposal method?	Understand	2
4	What is a chain reaction? How it is controlled? Explain with a neat sketch a boiling water reactor.	Understand	2
5	Explain the working of a typical fast breeder nuclear reactor power plant, with the help of neat diagram	Understand	2
6	Write a brief note on types of reactors with the help of neat sketch?	Understand	2
7	What are the difference between a pressurized water reactor nuclear power plant and boiling water reactor nuclear power plant?	Understand	2
8	What are the desirable properties of a good moderator?	Understand	2
9	What are the advantages and disadvantages of nuclear power plant?	Understand	2
10	Explain with a neat sketch the indirect gas cooled reactor	Understand	2

UNIT-5

Short Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
1	Define demand factor.	Understand	2

2	Define load factor.	Understand	2
3	What is load curve?	Understand	2
4	Draw the load duration curve.		2
5	What is tariff?	Understand	2
6	How can we calculate the cost of electricity?	Understand	2
7	What is two part tariff?	Understand	2
8	How to improve the power factor?	Remember	3
9	What is the capital cost of power plant?	Understand	2
10	What is financing cost?	Understand	2
11	What is operating cost?	Understand	2
12	What is meant by depreciation?	Understand	2
13	What are the various operating costs of coal fired steam power plant?	Understand	2
14	What is meant by depreciation?	Understand	2
15	What are the waste disposal options for Coal Power Plant?	Understand	2
16	List the components of fixed cost.	Remember	3
17	What is the significance of two part tariff and three part tariff?	Understand	2
18	What are the criteria for site selection of power plant?	Understand	2
19	What does the word pollution standards mean and what is the impact on environment?	Understand	2
20	What are the methods of pollution control?	Understand	2

Long Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
1	Find the cost of generation per kW-hr from the following data: Capacity of the plant is 120 MW, Capital cost is Rs.1, 200 per kW installed, Interest and depreciation is 10% on capital, Fuel consumption is 1.2 kg/kW-hr, and Fuel cost is Rs. 40 / tone. Salaries, wages, repairs and maintenance costs are Rs. 6, 00, 000 / year. The maximum demand is 80 MW and load factor is 40 %.	Apply	3
2	A power station has two 60MW units each running for 1500 hours a year. The energy produced per year is 700×10^6 kW-hr. Calculate the plant load factor and plant use factor.	Apply	3
3	A central power station has annual factors as follows: Load factor = 60%, Capacity factor = 40%, Use factor = 45%, Power station has a maximum demand of 15,000 kW. Determine: Annual energy production, Reserve capacity over and above peak load, Hours per year not in service.	Apply	3

4	What do you understand by power plant economics? Explain the fixed costs and operating costs of a power station.	Understand	2
5	What is meant by load factor and diversity factor?	Understand	2
6	What are the elements which contribute to the cost of the electricity? How can the cost power generation be reduced?	Understand	2
7	What do you understand by power plant economics? Explain the fixed and operating cost of a power station.	Understand	2
8	Discuss the generating cost per unit of 80 MW power with the following data: Capital Cost = Rs 160×10^7 Annual Cost of fuel = Rs 32×10^6 Annual wages and taxes = 10% of Capital cost Annual load factor = 45%.	Understand	2

XI. OBJECTIVE QUESTIONS:

UNIT-1

- Mention the one which is secondary source of energy
(a) coal (b) uranium (c) electricity (d) diesel
- Energy consumption of Nuclear Power in terms of percentage of total power is
(a) 20 % (b) 5 % (c) 2.4 % (d) 50 %
- Which one is renewable source of Energy
(a) coal (b) uranium (c) wind (d) Hydro
- Ash content of Indian coal is approximately
(a) 10 % (b) 5 % (c) 40 % (d) 80 %
- The calorific Value of the coal is highest for
(a) Anthracite (b) Bituminous (c) Sub Bituminous (d) Lignite
- Conveyor belt transfers coal safely up to the angle of _____.
- Bucket elevator conveys coal in _____ direction
- The per capita energy consumption in India presently is approximately _____.
- Wagon Tippler is an equipment used for _____.
- Fixed carbon and volatile matter is part of _____ analysis of coal.
- The secondary air requirement for coal based Thermal Power Plant is approximately
(a) 10 % (b) 20 % (c) 40 % (d) 70 %
- Pulverized fuel firing system consumes excess Air for combustion which is
(a) Maximum (b) minimum (c) normal (d) none
- The example of under feed stoker firing system is _____.
- The equipment placed between the Electrostatic Precipitator and Chimney is _____.
- Pulverized coal is transported to coal burner by _____.
- Super heater is required for _____.
- A device used to heat feed water by utilizing the heat in the exhaust flue gases before leaving the chimney, is known as _____.
- Rankine cycle efficiency of a good steam power plant may be in the range of _____.

UNIT-II

1. The working cycle of 4 stroke engine is completed in the following number of revolutions of crank shaft
(a) $\frac{1}{2}$ (b) 1 (c) 2 (d) 4
2. In a Diesel Engine, the fuel is ignited by_____.
3. The air standard efficiency of a Otto cycle compared to Diesel cycle for the given compression ratio is _____.
4. The pressure and temperature at the end of compression stroke in a petrol engine are of the order of _____.
5. The cetane number of the fuel used for Diesel engine in India in the range of
(a) 60- 70 (b) 40-45 (c) 80-90 (d) None
6. A closed cycle Gas turbine works on
(a) Carnot's cycle (b) Joule cycle (c) Atkinson cycle (d) Rankine cycle
7. The blades of Gas turbine rotor are made up of
(a) C.I (b) Steel (c) carbon steel (d) High Nickel alloy
8. In the gas Power plant, the temperature of gas increases, the efficiency of the plant _____.
9. Gas Turbine for power generation is normally used to supply _____.
10. The mechanical efficiency of a gas turbine as compared with IC engine is _____.
11. The maximum combustion pressure in a Gas turbine is _____ as compared to Diesel Engine.

UNIT-III

1. The annual depreciation of a Hydro power plant is about
(a) 5-10 % (b) 0.5-1.5 % (c) 10-15 % (d) 15-20 %
2. Water Hammer is developed in
(a) Turbine (b) Surge tank (c) Penstock (d) Dam
3. Location of the surge tank in a Hydro electric station is near to the
(a) Turbine (b) Tail Race (c) Reservoir (d) None
4. Pelton Turbine is suitable for high head and low _____.
5. The ratio of net work output to the total work developed in the turbine is called as _____.
6. Most widely used material for Solar cell is
(a) Steel (b) cadmium (c) Silicon (d) Copper
7. The conversion efficiency of a fuel cell in the range of
(a) 40 % (b) 50 % (c) 55 % (d) 70 %
8. The principle involved in thermo electric generator is
(a) See beck (b) Hall (c) Faraday (d) All
9. The main by product of Bio gas plant is _____.
10. Which type of wind mill is simple in design _____.

UNIT -IV

1. In India the first Nuclear plant was started at
(a) Narora (b) Kota (c) Tarapur (d) Kalpakkam
2. In which unit nuclear energy is measured
(a) Joule (b) Curie (c) MW (d) MeV

3. Reflectors of Nuclear Reactor are made up of _____.
4. The conversion Ratio of Breeder Reactor is _____.
5. Fast breeder reactor is best suited for India because India has the large amount of _____.
6. The commonly used fuels in nuclear reactor _____.
7. Nuclear energy is obtained is by _____.
8. Nuclear reactor is used to convert _____.
9. Moderators are used to slow down _____.
10. Breeder reactor is defined as _____.
11. Gamma radiations do not possess any _____.
12. Binding energy is the energy required to _____.

UNIT –V

1. The load factor of a power station is generally about
(a) Equal to unity (b) less than unity (c) more than unity (d) None
2. Diversity of a power plant is always _____.
3. The ratio of Average load by Peak load is known as _____.
4. If the operating time is complete 1 Year, the plant use factor is _____ capacity factor.
(a) Greater (b) lower (c) equal (d) None
5. Utilization factor is reciprocal of _____.
6. Heat rate is defined as _____.
7. Load curve represents _____.
8. Cost of electricity can be calculated by _____.
9. Site selection is based on availability of resources like _____.
10. Combustion of fuels releases _____.

XII. WEBSITES:

1. www.power-eng.com
2. www.rwe.com
3. www.plantengineering.com
4. www.iaea.org
5. www.powerplantengineering.com
6. www.powermag.com

XIII. EXPERT DETAILS:

1. Dr. B.SudheerPrem Kumar, Professor & HOD (Mech), JNTU, Hyderabad
2. Dr. A. V. S. S. K. S Guptha, Professor (Mech), JNTU, Hyderabad
3. Dr. E.Ramjee, Associate Professor (Mech), JNTU, Hyderabad
4. Dr. M.V.Ramana Murthy, Associate Professor (Mech), OU, Hyderabad
5. Dr. Raja Banerjee, Associate Professor, IIT, Hyderabad

XIV. JOURNALS:

Name of the Journals related to Power Plant Engineering

1. International Journal of Energy Engineering
2. Power Engineering
3. Journal of Engineering for Gas Turbines and Power, American Society of Mechanical Engineers
4. Nuclear Engineering and Design: An International Journal devoted to all aspects of Nuclear Fission Energy
5. Journal of Energy Engineering
6. Journal of Power Technologies

XV. LIST OF TOPICS FOR STUDENT SEMINARS:

1. Indian Energy Scenario and World Energy resources
2. Clean Coal Technology
3. Combined cycle Gas Turbine for efficient Energy Production
4. Super charging and Turbo charging for Diesel Power Plant
5. Optimization of Solar Power Plant
6. Safety in Nuclear Power Plants
7. Design of Wind Power Turbines
8. Economics and Environmental issues of Power Plants

XVI. CASE STUDIES / SMALL PROJECTS

- Case study on combined cycle power plant with cogeneration
- Study and Analysis of Small Hydro Projects
- Case studies on Interconnection Barriers for Distributed Renewable Power Projects
- Case Studies on Renewable Energy sources