



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

ELECTRICAL AND ELECTRONICS ENGINEERING

TUTORIAL QUESTION BANK

Course Title	POWER PLANT CONTROL AND INSTRUMENTATION				
Course Code	AEE516				
Program	B.Tech				
Semester	VII	EEE			
Course Type	Professional Elective				
Regulation	IARE - R16				
Course Structure	Theory			Practical	
	Lectures	Tutorials	Credits	Laboratory	Credits
	3	-	3	-	-
Chief Coordinator	Dr. Mule Laxmidevi Ramanaiah, Associate Professor				
Course Faculty	Dr. Mule Laxmidevi Ramanaiah, Associate Professor				

COURSE OBJECTIVES:

I	Assess different methods of power generation.
II	Discuss measurement of electrical and non-electrical parameters involved in power generation Plants.
III	Illustrate the different types of devices used for data acquisition and analyze in power plants.
IV	Describe control system and control loops applied in power plants.
V	Integrate monitoring of different parameters like speed, vibration of turbines and their control.

COURSE OUTCOMES (COs):

CO 1	Knowledge of the available sources of energy for electricity generation along with the working principle of the different power plants and cogeneration.
CO 2	Describe the measurement of electrical parameters and non-electrical parameters.
CO 3	Determine the importance of analyzers in power plants.
CO 4	Educate on boiler and advanced boiler control techniques.
CO 5	Discuss the turbine control techniques and cooling methods.

COURSE LEARNING OUTCOMES (CLOs):

AEE516.01	Describe power generation from non-renewable and renewable sources: Thermal, Hydel, nuclear, solar and wind power plants.
AEE516.02	Examine the importance of instrumentation in power generation.
AEE516.03	Interpret the importance of cogeneration in power production.
AEE516.04	Discuss the measurement of electrical quantities.
AEE516.05	Discuss the measurement of non-electrical quantities.
AEE516.06	Recognize the environment related factors such as radiation, smoke and dust.
AEE516.07	Examine the concept of gas analyzer.
AEE516.08	Analyze the pH meter and fuel analyzer.
AEE516.09	Illustrate the pollution monitoring instruments.
AEE516.10	Discuss the combustion control.
AEE516.11	Summarize the various methods available for steam temperature control.
AEE516.12	Evaluate the effect of distributed control and interlocks in boiler.
AEE516.13	Analyze the steam pressure control and lubricant oil, temperature control.
AEE516.14	Explore the methods of turbine control.
AEE516.15	Explore the different methods of cooling systems.
AEE516.16	Apply the concepts of non-renewable and renewable generation, measurements and control in power plants to solve real world applications.
AEE516.17	Explore the knowledge and skills of employability to succeed in national and international level competitive examinations.

TUTORIAL QUESTION BANK

UNIT - I				
OVERVIEW OF POWER GENERATION				
PART – A (SHORT ANSWER QUESTIONS)				
S No.	QUESTIONS	Blooms Taxonomy Level	Course Outcomes	Course Learning Outcomes (CLOs)
1	State the law of conservation of energy	Remember	CO 1	AEE516.01
2	State non-renewable sources of power generation.	Remember	CO 1	AEE516.01
3	State renewable sources of power generation.	Remember	CO 1	AEE516.01
4	List the products of incomplete combustion.	Remember	CO 1	AEE516.01
5	Name the reactor which is the most suitable reactor for India.	Remember	CO 1	AEE516.01
6	Give the efficiency of thermal power plants.	Understand	CO 1	AEE516.01
7	Mention the different cycles used in thermal power plants.	Understand	CO 1	AEE516.01
8	State the purpose of economizer.	Understand	CO 1	AEE516.01
9	Give the importance of draught in power plants.	Understand	CO 1	AEE516.01
10	What is the purpose of boiler in thermal power plants?	Understand	CO 1	AEE516.01
11	Explain the function of turbine in power.	Understand	CO 1	AEE516.01
12	Mention the types of boilers in power plants.	Understand	CO 1	AEE516.01
13	List the different circuits used in thermal power plants.	Understand	CO 1	AEE516.01
14	Define critical pressure ration of a convergent nozzle.	Remember	CO 1	AEE516.01
15	State the different types of turbines.	Remember	CO 1	AEE516.01
16	Explain the purpose of cooling towers in power plants.	Understand	CO 1	AEE516.01
17	What is meant by piping and instrumentation diagram.	Understand	CO 1	AEE516.01
18	Define cogeneration.	Remember	CO 1	AEE516.01
19	What are the two major advantages of thermal powerplant?	Understand	CO 1	AEE516.01
20	State any two major advantages of hydel power plant.	Understand	CO 1	AEE516.01
21	State any two application of the diesel power plant.	Understand	CO 1	AEE516.01
22	Write principle of Solar cell	Understand	CO 1	AEE516.01
23	Write importance of instrumentation in power plant	Understand	CO 1	AEE516.02
24	Define cogeneration	Remember	CO 1	AEE516.03
PART – B (LONG ANSWER QUESTIONS)				
1	Explain the block diagram and working of thermal power plant.	Understand	CO 1	AEE516.01
2	Explain the block diagram and working of hydel power plant.	Understand	CO 1	AEE516.01
3	Explain the block diagram and working of nuclear power plant.	Understand	CO 1	AEE516.01
4	Explain the block diagram and working of solar power plant.	Understand	CO 1	AEE516.01
5	Explain the working of wind power plant.	Understand	CO 1	AEE516.01
6	Write notes on importance of instrumentation in power generation.	Understand	CO 1	AEE516.02
7	Compare thermal power plant with nuclear power plant.	Understand	CO 1	AEE516.01
8	Compare hydel power plant with thermal power plant.	Understand	CO 1	AEE516.01
9	What are the factors to be considered while selecting the power plant?	Understand	CO 1	AEE516.01

10	What is co-generation? Explain in detail.	Understand	CO 1	AEE516.03
UNIT – II				
MEASUREMENTS IN POWER PLANTS				
PART – A (SHORT ANSWER QUESTIONS)				
1	Define the terms ‘accuracy’ and ‘precision’.	Remember	CO 2	AEE516.04
2	Define error.	Remember	CO 2	AEE516.04
3	What is meant by calibration?	Remember	CO 2	AEE516.04
4	Define damping torque.	Remember	CO 2	AEE516.04
5	Explain deflecting torque.	Understand	CO 2	AEE516.04
6	List the measurements carried out in power plants	Understand	CO 2	AEE516.04
7	Give the importance of measurement in power plants.	Understand	CO 2	AEE516.04
8	Name the instruments used to measure pressure.	Understand	CO 2	AEE516.05
9	What is the purpose of flow meters in power plants?	Understand	CO 2	AEE516.05
10	Define power. List out the instruments used to measure power.	Remember	CO 2	AEE516.04
11	Explain the importance of frequency in power systems.	Understand	CO 2	AEE516.04
12	Define power factor.	Remember	CO 2	AEE516.04
13	Mention some devices which are used to improve power factor.	Understand	CO 2	AEE516.04
14	State the operating principle of Bicolor level gauges used for drum level measurement.	Understand	CO 2	AEE516.05
15	How to measure speed of a turbine?	Understand	CO 2	AEE516.05
16	Name the sensors used in measuring vibration	Understand	CO 2	AEE516.05
17	List out the methods to measure smoke and radiation.	Understand	CO 2	AEE516.06
PART – B (LONG ANSWER QUESTIONS)				
1	Write briefly about a) Voltage measurement b) Current measurement	Understand	CO 2	AEE516.04
2	Write briefly about a) power measurement b) pressure measurement	Understand	CO 2	AEE516.05
3	Write short notes on a) Drum level measurement b) Pressure and temperature compensation techniques	Understand	CO 2	AEE516.05
4	Explain in detail the function of smoke density measurement and dust monitor	Understand	CO 2	AEE516.06
5	Describe about flow measurements involved in power plants.	Understand	CO 2	AEE516.05
6	Describe temperature measurements in power plants in detail	Understand	CO 2	AEE516.05
7	Describe air flow control system.	Understand	CO 2	AEE516.05
8	Explain in detail about Steam temperature Measurement.	Understand	CO 2	AEE516.05
9	Write notes on a) power factor measurement b) frequency measurement	Understand	CO 2	AEE516.04
10	Explain about various types of radiation detectors.	Understand	CO 2	AEE516.06
UNIT – III				
ANALYSERS IN POWER PLANTS				
PART – A (SHORT ANSWER QUESTIONS)				
1	What is fuel analyzer?	Remember	CO 3	AEE516.06
2	What is flue gas analyzer?	Remember	CO 3	AEE516.06
3	What are the constituents of flue gas?	Understand	CO 3	AEE516.06
4	What are the different methods to measure pH?	Understand	CO 3	AEE516.07
5	What are the different types of gas analyzers?	Understand	CO 3	AEE516.07

6	Why do we need to analyze oxygen content in flue gas?	Understand	CO 3	AEE516.07
7	What do you mean by deaerated water.	Remember	CO 3	AEE516.07
8	Name any two instruments to find CO in flue gas.	Understand	CO 3	AEE516.07
9	What are the different types of chromatography?	Understand	CO 3	AEE516.07
10	State the importance of pollution monitoring instruments.	Understand	CO 3	AEE516.08
11	What is the indication of incomplete combustion in boiler?	Understand	CO 3	AEE516.09
12	Explain the term alkaline	Understand	CO 3	AEE516.08
13	Explain the term acidic	Understand	CO 3	AEE516.08
14	Discuss the method of desulphurization	Understand	CO 3	AEE516.09
PART – B (LONG ANSWER QUESTIONS)				
1	Explain the necessity of flue gas analyzer in power plants.	Understand	CO 3	AEE516.06
2	Brief about analysis of impurities in feed water and steam.	Understand	CO 3	AEE516.07
3	Explain about (a) Dissolved oxygen analyzer (b) Flue gas Oxygen analyzer	Understand	CO 3	AEE516.07
4	Explain the methods of chromatography used in power plants.	Understand	CO 3	AEE516.08
5	Explain about (a) liquid chromatography (b) gas chromatography	Understand	CO 3	AEE516.08
6	Explain about different types of detectors in chromatography	Understand	CO 3	AEE516.08
7	Describe in detail about flue gas analysis.	Understand	CO 3	AEE516.08
8	Explain about steam purity measurement and basic steaming process.	Understand	CO 3	AEE516.08
9	Brief about different methods of pH measurements.	Understand	CO 3	AEE516.08
10	Explain the various methods about measurement of Oxidants (Ozone)	Understand	CO 3	AEE516.09
11	Brief about carbon dioxide recorders and flame condition.	Understand	CO 3	AEE516.09
12	Explain the various methods about measurement of nitrogen oxide.	Understand	CO 3	AEE516.09
13	Explain the different methods to improve the efficiency of boiler with respect to fuel desulphurization.	Understand	CO 3	AEE516.09
14	What are the different pollutants available in flue gases? Explain the methods to remove these pollutants in power plants.	Understand	CO 3	AEE516.09
UNIT – IV				
CONTROL LOOPS IN BOILER				
PART – A (SHORT ANSWER QUESTIONS)				
1	Where is the steam pressure measured?	Understand	CO 4	AEE516.11
2	What is the effect of high electrical conductivity in boiler water?	Understand	CO 4	AEE516.10
3	What is the difference between forced draft and induced draft fans?	Understand	CO 4	AEE516.11
4	What is reheat control?	Remember	CO 4	AEE516.10
5	What are the types of feed water control	Understand	CO 4	AEE516.11
6	What are the types of super heater?	Understand	CO 4	AEE516.11
7	What are the methods used for steam temperature control?	Understand	CO 4	AEE516.11
8	What are the methods used for drum level measurement?	Understand	CO 4	AEE516.11
9	Explain boiler interlocks.	Understand	CO 4	AEE516.12
10	What is meant by distributed control?	Remember	CO 4	AEE516.12

PART – B (LONG ANSWER QUESTIONS)				
1	Describe in detail about interlocks in boiler.	Understand	CO 4	AEE516.12
2	Discuss various combustion control systems used in power plants.	Understand	CO 4	AEE516.10
3	Describe three element feed water control system in boiler.	Understand	CO 4	AEE516.11
4	Explain single element and two element drum level control.	Understand	CO 4	AEE516.11
5	Write about control loop interactions.	Understand	CO 4	AEE516.12
6	Describe distributed control systems in power plants.	Understand	CO 4	AEE516.12
7	Describe single element and two element feed water control system in boiler.	Understand	CO 4	AEE516.11
8	Describe various methods of controlling reheated steam temperature.	Understand	CO 4	AEE516.10
9	Explain the instrumentation diagram using feedback controller for boilers.	Understand	CO 4	AEE516.12
10	Describe fire side control mechanism of steam temperature control in detail.	Understand	CO 4	AEE516.12
UNIT – V				
TURBINE MONITORING AND CONTROL				
PART – A (SHORT ANSWER QUESTIONS)				
1	How to control the shell temperature?	Understand	CO 5	AEE516.14
2	How to control the speed of turbine?	Understand	CO 5	AEE516.14
3	How sulphuroxides enter into the atmosphere?	Understand	CO 5	AEE516.14
4	How nitrogenoxides enter into the atmosphere	Understand	CO 5	AEE516.14
5	What are the advantages and disadvantages of wet cooling?	Understand	CO 5	AEE516.15
6	What are the different methods of dry cooling?	Understand	CO 5	AEE516.15
7	How to control the vibration of turbine blades?	Understand	CO 5	AEE516.14
8	Why do we need to control lubricant oil?	Understand	CO 5	AEE516.13
9	Define turbine efficiency.	Remember	CO 5	AEE516.14
10	What are the types of gas turbine?	Understand	CO 5	AEE516.14
11	Name the sensors used in measuring vibration.	Understand	CO 5	AEE516.14
PART – B (LONG ANSWER QUESTIONS)				
1	Describe in detail steam pressure control	Understand	CO 5	AEE516.13
2	Write short notes on speed and vibration monitoring and control	Understand	CO 5	AEE516.14
3	Explain in detail shell temperature monitoring and control	Understand	CO 5	AEE516.14
4	Describe in detail about cooling system used in thermal power plant	Understand	CO 5	AEE516.15
5	Explain any two control methods used in monitoring turbine.	Understand	CO 5	AEE516.13
6	Detail the methods of lubricant oil control and temperature control	Understand	CO 5	AEE516.13
7	Explain the need of monitoring and control of turbine in power plants	Understand	CO 5	AEE516.14
8	Write briefly on speed and vibration monitoring and shell temperature monitoring	Understand	CO 5	AEE516.14
9	Discuss the different cooling systems used in power plants	Understand	CO 5	AEE516.15
10	Explain the need of various turbine control methods in power plants	Understand	CO 5	AEE516.14