

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME55d – POWER PLANT OPERATION AND CONTROL

(Open Elective-I)

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Course Objectives: The objectives of the course are to make the students learn about

- Familiarize with various methods of power generation.
- Outline the working components of power plants.
- Expose the students measuring of various controllable and uncontrollable factors in power plants.
- Explain the concepts of boiler and turbine control.

UNIT I : OVERVIEW OF POWER GENERATION

12 Hours

Survey of methods of power generation: Hydro, thermal, nuclear, solar and wind power - Importance of instrumentation in power generation - Thermal power plant - Building blocks - Combined cycle systems - Combined heat and power system - sub critical and supercritical boilers.

Learning Outcomes:

At the end of this unit, the student will be able to

- List the various types of power plants. L1
- Illustrate the importance of instrumentation in power generation. L4
- Compare subcritical and supercritical boilers. L2

UNIT II: MEASUREMENTS IN POWER PLANTS

10 Hours

Measurement of feed water flow, air flow, steam flow and coal flow – Drum level measurement – Steam pressure and temperature measurement – Turbine speed and vibration measurement – Flue gas analyzer – Fuel composition analyzer

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe turbine speed and vibration measurements. L2
- Determine the steam flow and coal flow in power plants. L3
- Appraise the importance of flue gas and fuel composition analyzer in power plants. L5
- Illustrate the various controllable and uncontrollable factors that can be measure in power plants. L2

UNIT III : BOILER CONTROL – I

8 Hours

Combustion of fuel and excess air – Firing rate demand – Steam temperature control – Control of deaerator– Drum level control – Single, two and three element control – Furnace draft control – implosion – flue gas dew point control – Trimming of combustion air – Soot blowing.

Learning Outcomes:

At the end of this unit, the student will be able to

- List the various boiler control methods. L1
- Describe the steam temperature control and drum level control. L2
- Demonstrate furnace draft control and drum level control. L2

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UNIT IV : BOILER CONTROL – II**8 hours**

Burners for liquid and solid fuels – Burner management – Furnace safety interlocks – Coal pulverizer control – Combustion control for liquid and solid fuel fired boilers – air/fuel ratio control – fluidized bed boiler – Cyclone furnace.

Learning Outcomes:

At the end of this unit, the student will be able to

- Identify the burners for liquid and solid fuels. L3
- Describe the working principle of coal pulverizer control. L2
- Explain combustion control for liquid and solid fuel fired boiler. L2

UNIT V : CONTROL OF TURBINE**8 Hours**

Types of steam turbines – impulse and reaction turbines – compounding – Turbine governing system – Speed and Load control – Transient speed rise – Free governor mode operation – Automatic Load Frequency Control – Turbine oil system – Oil pressure drop relay – Oil cooling system – Turbine run up system.

Learning Outcomes:

At the end of this unit, the student will be able to

- List the various types of steam turbines. L1
- Compare impulse and reaction turbines. L2
- Describe turbine governing system for speed and load control. L2
- Explain about oil cooling system in turbine. L2

Text Books:

1. Sam Dukelow, Control of Boilers, Instrument Society of America, 1991.
2. Everett Woodruff, Herbert Lammers, Thomas Lammers, Steam Plant Operation, 9th Edition McGraw Hill, 2012.
3. Rajput R.K. A Text book of Power plant Engineering. 5th Edition, Lakshmi Publications, 2013.

Reference Books:

1. Liptak B.G., Instrumentation in Process Industries, Chilton Book Company, 2005.
2. Jain R.K., Mechanical and Industrial Measurements, Khanna Publishers, New Delhi, 1999.
3. P.K.Nag, Powerplant Engineering, Tata McGraw-Hill Education, 3rd edition, 2007.
4. Tamilmani, Power plant instrumentation, Sams Publishers, 2011.
5. Krishnaswamy.K and Ponnibala.M., Power Plant Instrumentation, PHI Learning Pvt.Ltd., New Delhi, 2011.

Course Outcomes:

At the end of this Course the student will be able to

- Outline sources of energy for various power plants. L2
- Explain boiler and turbine control. L2
- Describe working components of a steam power plant. L2
- Illustrate the working mechanism of Diesel and Gas turbine power plants. L2
- Summarize types of measuring parameters for controlling the power plant. L2
- Demonstrate the working principle of nuclear power plants. L4