# POWER PLANT CONTROL AND INSTRUMENTATION

**Group - IV**

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | CIA | SEE | Total |
| AEE516 | Elective | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

## I. COURSE OVERVIEW:

The course focuses on electric power generation concepts. In addition to the power generation technologies adopted to generate electric power, power plant instrumentation is also included. The variouscontrol techniques adopted in power plants are discussed. The course would provide an insight to the students who want to pursue research in power plant engineering.

## II. OBJECTIVES:

**The course should enable the students to:**

I The operation of different types of power plants.

II The basic working principle of instruments for measurement of electrical and non-electrical quantities like Temperature Pressure flow level measurements.

III The instrumentation and protection systems applied in thermal power plant.

IV The control techniques employed for the operation of modern power generationplant

## III. COURSE OUTCOMES:

**After successful completion of the course, students should be able to:**

| | | |
|---|---|---|
| CO 1 | **Explain** the different methods of power generation. Along with Piping and Instrumentation diagram of boiler. | Understand |
| CO 2 | **Select** various measurements involved in power generation for measuring electrical and non-electrical parameters. | Understand |
| CO 3 | **Identify the** different types of analyzers used for scrutinizing boiler steam and water. | Understand |
| CO 4 | **Model** different types of controls and control loops in boilers. | Apply |
| CO 5 | **Illustrate** the methods of monitoring and control of differentparameters like speed, vibration of turbines. | Apply |

## IV. SYLLABUS:

| UNIT - I | OVERVIEW OF POWER GENERATION | Classes: 08 |
|---|---|---|

Brief survey of methods of power generation, hydro, thermal, nuclear, solar and wind power, importance of instrumentation in power generation, thermal power plants, block diagram, details of boiler processes, Piping and Instrumentation diagram of boiler, cogeneration.

| UNIT - II | MEASUREMENTS IN POWER PLANTS | Classes: 10 |
|---|---|---|

Electrical measurements, current, voltage, power, frequency, power factor etc, non electrical parameters, flow of feed water, fuel, air and steam with correction factor for temperature, steam pressure and steam temperature, drum level measurement, radiation detector, smoke density measurement, dust monitor.

| UNIT - III | ANALYSERS IN POWER PLANTS | Classes: 09 |
|---|---|---|

Flue gas oxygen analyzer: Analysis of impurities in feed water and steam, dissolved oxygen analyzer.

Chromatography, pH meter, fuel analyzer, pollution monitoring instruments.

| UNIT - IV | CONTROL LOOPS IN BOILER | Classes: 10 |
|---|---|---|
| Combustion control, air / fuel ratio control, furnace draft control, drum level control, main steam and reheat steam temperature control, super heater control, air temperature, distributed control system in power plants, interlocks in boiler operation. | | |
| **UNIT - V** | **TURBINE MONITORING AND CONTROL** | **Classes: 08** |
| Speed, vibration, shell temperature monitoring and control, steam pressure control, lubricant oil temperature control, cooling system. | | |

**Text Books:**

1. Sam G. Dukelow, The Control of Boilers, Instrument Society of America, 2nd Edition, 2010.
2. P.K. Nag, 'Power Plant Engineering', Tata McGraw-Hill, 1st Edition, 2001.

**Reference Books:**

1. S.M. Elonka and A.L. Kohal, "Standard Boiler Operations", Tata McGraw-Hill, 1st Edition, 1994.
2. R K Jain, "Mechanical and Industrial Measurements", Khanna Publishers, 1st Edition, 1995.
3. E Al Wakil, "Power Plant Engineering", Tata McGraw-Hill, 1st Edition, 1984.

**Web References:**

1. https://www.researchgate.net
2. https://www.aar.faculty.asu.edu/classes
3. https://www.facstaff.bucknell.edu/
4. https://www.electrical4u.com
5. https://www.iare.ac.in

**E-Text Books:**

1. https://www.jntubook.com/
2. https://www.freeengineeringbooks.com

**Course Home Page:**