

# 16EE204 POWER GENERATION SYSTEMS



Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSB	CS	SA	S	BS
45	15	-	15	40	1	8	5	5

## Course Description and Objectives:

This course provides an overview of various conventional power generating stations consisting of hydro, thermal, gas, nuclear and non-conventional (solar and wind) power plants. It also deals with various types of electric substations, their layouts and overview of tariff methods. The objective of course is to enable the students to understand the various methods of electric power generation and economical aspects involved in it.

## Course Outcomes:

The student will be able to:

- identify different components and their functioning in hydro, thermal, nuclear and gas power plants.
- identify various components of solar and wind energy conversion systems.
- understand the economic aspects in formulating specific tariff.
- classify substations and specify the role of various equipments in it.

## SKILLS:

- ✓ *Understand layout and functioning of conventional power generating plants.*
- ✓ *Understand layout and functioning of solar and wind power plants.*
- ✓ *Analyze the different tariff schemes.*
- ✓ *Analyze the performance indices of a power generating plants.*
- ✓ *Sketch the layout of substations with specifications of various equipments.*

**UNIT - 1****L-10, T-3****STEAM AND NUCLEAR POWER GENERATION PLANTS:**

**Thermal power station:** Advantages and disadvantages, Schematic arrangement, Selection of site, Major and auxiliary power plant equipment, Environmental aspects for selecting the site and locations of thermal power stations.

**Nuclear power station:** Advantages and disadvantages, Schematic arrangement, Selection of site, Radioactivity, Nuclear fuels, Types of reactors - Pressurized water reactors, Boiling water reactors, Gas-cooled reactors; Hazards, Radioactive waste disposal, Environmental aspects for selecting the sites and locations of nuclear power stations.

**UNIT - 2****L-10, T-3****HYDRO, GAS TURBINE AND COMBINED CYCLE PLANTS:**

**Hydro power station:** Advantages and disadvantages, Schematic arrangement, Choice of site, Constituents of hydro power plant, Hydrographs – Flow duration curve, Mass curve; Pumped Storage plant, Environmental aspects for selecting the sites and locations of hydro power stations.

**Gas turbine power plants:** Advantages and disadvantages, Schematic arrangement, Equipment and performance.

**Combined cycle power plants:** Need for Combined cycle power plants, Advantages and disadvantages, Schematic arrangement, types, Integrated gasification combined cycle (IGCC), cogeneration plant, Equipment and performance.

**UNIT - 3****L-8, T-3****SOLAR AND WIND POWER GENERATION PLANTS:**

Need for Renewable energy, Sources and their features.

**Solar Power Plant:** Importance, Working principle and types, Site selection, Plant layout, Components, Merits and demerits.

**Wind Power Plant:** Importance, Working principle and types, Site selection, Plant layout, Components, Merits and demerits.

**UNIT - 4****L-8, T-3****SUBSTATIONS**

Indoor and Outdoor substations, Substation layout, Bus bar arrangements in the Sub-Stations -Single bus bar, Sectionalized single bus bar, Main and transfer bus bar system with relevant diagrams.

**UNIT - 5****L-9, T-3****ECONOMIC ASPECTS OF POWER GENERATION**

**Economics of Power Generation:** Load curve, Load duration and integrated load duration curves, Load, Demand, Diversity, Capacity, Utilization and Plant use factors, Numerical Problems.

**Tariff Methods:** Costs of generation - Fixed, Semi-fixed and Running Costs; Desirable characteristics of Tariff methods, Tariff methods - Flat rate, Block rate, Two part, Three part, and power factor tariff methods, Numerical problems.

**TEXT BOOKS:**

1. M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakraborti, "A Text Book on Power System Engineering", 1<sup>st</sup> edition, Dhanpat Rai & Co. Pvt. Ltd., 2007.
2. V.K Mehta and Rohit Mehta, "Principles of Power Systems", 1<sup>st</sup> edition, S.Chand & Company Ltd., New Delhi, 2009.

**REFERENCE BOOKS:**

1. G.D.Rai, "Non Conventional Energy Sources", 4<sup>th</sup> edition, Khanna Publishers, New Delhi, 2000.
2. C.L.Wadhwa, "Electrical Power Systems", 4<sup>th</sup> edition, New age International (P) Limited, 2008.
3. S.N.Singh, "Electrical Power Generation", 2<sup>nd</sup> edition, Transmission and Distribution PHI, 2010.
4. S.P.Sukhatme, J.K.Nayak, "Solar Energy", 1<sup>st</sup> edition, Tata Mc-Graw Hill Pvt. Ltd., New Delhi, 2010
5. Godfrey Boyle, "Renewable Energy, Power for a Sustainable Future", 1<sup>st</sup> edition, Oxford University Press, U.K., 2012.

**ACTIVITIES:**

- *Design a prototype of hydro electric power station with turbine.*
- *Design a working model of solar power plant.*
- *Design a prototype of wind energy conversion system.*
- *Study of power consumption trend in VFSTR University.*
- *Study of power tariff scheme in VFSTR University.*