



II Year-II Semester		L	T	P	C
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<b>POWER SYSTEMS-I (R1622025)</b>					

**Preamble:** Electrical Power plays significant role in day to day life of entire mankind. The aim of this course is to allow the students to understand the concepts of the generation and distribution of power along with economic aspects.

**Course Outcomes:**

Upon completion of the course, the student will be able to achieve the following outcomes.

Cos	Course Outcomes	POs
1	Students are able to identify the different components of thermal power plants.	4
2	Students are able to identify the different components of nuclear Power plants.	4
3	Students are able to distinguish between AC & DC distribution systems and also estimate voltage drops in both types of distribution systems.	2
4	Students are able to identify the different components of an air and gas insulated substations.	2
5	Students are able to identify single core and multi core cables with different insulating materials.	2
6	Students are able to analyse the different economic factors of power generation and tariffs.	2

**Syllabus:**

**UNIT I:**

**Objective:** To study the principle of operation of different components of a thermal power station.

**Thermal Power Stations:**

Selection of site, general layout of a thermal power plant showing paths of coal, steam, water, air, ash and flue gasses, ash handling system, Brief description of components: Boilers, Super heaters, Economizers, electrostatic precipitators steam Turbines: Impulse and reaction turbines, Condensers, feed water circuit, Cooling towers and Chimney.

**UNIT II:**

**Objective:** To study the principle of operation and of different components of a Nuclear power station.

**Nuclear Power Stations:**

Location of nuclear power plant, Working principle, Nuclear fission, Nuclear fuels, Nuclear chain reaction, nuclear reactor Components: Moderators, Control rods, Reflectors and Coolants. Types of Nuclear reactors and brief description of PWR, BWR and FBR. Radiation: Radiation hazards and Shielding, nuclear waste disposal.

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**UNIT III:**

**Objective: To study the concepts of DC / AC distribution systems along with voltage drop calculations.**

**Distribution Systems:**

Classification of distribution systems, design features of distribution systems, radial distribution, ring main distribution, voltage drop calculations: DC distributors for following cases - radial DC distributor fed at one end and at both ends (equal / unequal voltages), ring main distributor, stepped distributor and AC distribution, comparison of DC and AC distribution.

**UNIT IV:**

**Objective: To study the constructional and operation of different components of an Air and Gas Insulated substations.**

Classification of substations:

**Air Insulated Substations** - Indoor & Outdoor substations, Substations layouts of 33/11 kV showing the location of all the substation equipment.

Bus bar arrangements in the Sub-Stations: Simple arrangements like single bus bar, sectionalized single bus bar, double bus bar with one and two circuit breakers, main and transfer bus bar system with relevant diagrams.

**Gas Insulated Substations (GIS)** – Advantages of Gas insulated substations, different types of gas insulated substations, single line diagram of gas insulated substations, constructional aspects of GIS, Installation and maintenance of GIS, Comparison of Air insulated substations and Gas insulated substations.

**UNIT V:**

**Objective: To study the constructional details of different types of cables.**

**Underground Cables:** Types of Cables, Construction, Types of insulating materials, Calculation of insulation resistance, stress in insulation and power factor of cable.

Capacitance of single and 3-Core belted Cables: Grading of Cables-Capacitance grading and Intersheath grading.

**UNIT VI:**

**Objective: To study different types of load curves and tariffs applicable to consumers.**

**Economic Aspects of Power Generation & Tariff:**

**Economic Aspects** - Load curve, load duration and integrated load duration curves, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, power capacity factor and plant use factor, Base and peak load plants.

**Tariff Methods-** Costs of Generation and their division into Fixed, Semi-fixed and Running Costs, Desirable Characteristics of a Tariff Method, Tariff Methods: Simple rate, Flat Rate, Block-Rate, two-part, three-part, and power factor tariff methods.

**TEXT BOOKS:**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA**

**KAKINADA-533003, Andhra Pradesh, India**

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1. A Text Book on Power System Engineering by M.L. Soni, P.V. Gupta, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co. Pvt. Ltd.
2. Generation, Distribution and Utilization of Electric Energy by C.L. Wadhawa New age International (P) Limited, Publishers.

**REFERENCE BOOKS:**

1. Electrical Power Distribution Systems by - V. Kamaraju, Tata Mc Graw Hill, New Delhi.
2. Elements of Electrical Power Station Design by – M V Deshpande, PHI, New Delhi.