II B.Tech – II Semester
(20EE4007) POWER SYSTEMS – I

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

Pre-Requisites: Electrical Circuit Analysis

Course Objectives

- To study the principle of operation of different components of a thermal power nuclear power stations.
- To study the concepts of DC/AC distribution systems and voltage drop calculations
- To study the constructional and operation of different components of an Air and Gas Insulated substations
- To study different types of load curves and tariffs applicable to consumers
- To study the basic principles of heating, welding and illumination

UNIT-I: Thermal and Nuclear Power Stations

Thermal Power Station: Selection of site, general layout of a thermal power plant, Brief description of components, steam Turbines: Impulse and reaction turbines, Condensers, feed water circuit, Cooling towers and Chimney.

Nuclear Power Stations: Nuclear Power Stations: Nuclear Fission and Chain reaction. Nuclear fuels.- Principle of operation, -Reactor Components: Moderators, Control rods, Reflectors and Coolants.- Types of Nuclear reactors and brief description.

UNIT-II: 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-III: Substations

Air Insulated Substations - Indoor & Outdoor substations, Substations layouts of 33/11 kVshowing the location of all the substation equipment. Bus bar arrangements in the Sub-Stations. Single bus bar, Double bus bar with one and two circuit breakers, with relevant diagrams.

Gas Insulated Substations (GIS) – Advantages of Gas insulated substations, different typesof gas insulated substations, single line diagram of gas insulated substations, Comparison of Air insulated substationsand Gas insulated substations.

UNIT-IV: 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.

UNIT-V: Utilisation of Electrical Energy

Illumination: Introduction, terms used in illumination–Laws of illumination–Polar curves–Integratingsphere–Lumens, Lux meter–Discharge lamps.

Various Illumination Methods: Comparison between tungsten filament lamps and fluorescent tubes–Basic principles of light control– Types and design of lighting and flood lighting– LED lighting, principle ofoperation, street lighting and domestic lighting – Conservation of energy.

Electric Heating& Welding: Advantages and methods of electric heating–Resistance heating induction heating anddielectric heating – Arc furnaces – Direct and indirect arc furnacesElectric welding–Resistance and arc welding–Electric welding equipment–Comparisonbetween AC and DC Welding

Course Outcomes:

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

S.No	Course Outcome	BTL
1.	The students will be able to illustrate the economic aspects and choice of power stations	L3
2.	The students will be able to analyse DC/AC distribution systems and evaluate voltage drop calculations	L4
3.	Summarize the operation of Air and Gas Insulated substations	L2
4.	The students will be able to analyse the economic aspects and various tariff methods in the power systems	L4
5.	The students will be able to understand the concepts of illumination, heating and welding	L2

Correlation of COs with POs& PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3										3	2
CO2	3	2		2									3	2
CO3	3	3			2	2							3	2
CO4	2	2	1	1									2	1
CO5	3	2	2		2								3	2

Text Books:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagarand A. Chakrabarti, DhanpatRai& Co. Pvt. Ltd.
2. Generation, Distribution and Utilization of Electric Energy by C.L.Wadhawa New Age International (P) Limited, Publishers.
3. Utilization of Electric Energy – by E. Open shaw Taylor, Orient Longman.

Reference Books:

1. Elements of Electrical Power Station Design by – M V Deshpande, PHI, New Delhi
2. A course in Power systems by J B Gupta – S. K. KATARIA & SONS
3. Utilization of Electrical Power including Electric drives and Electric traction – by N.V.Suryanarayana, New Age International (P) Limited, Publishers, 1996
4. Art & Science of Utilization of electrical Energy – by Partab, DhanpatRai& Sons