2/4 B.Tech FIRST SEMESTER

EE3T3 ELECTRICAL POWER GENERATION Credits: 4

Lecture: 4 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period /week **Semester end examination: 70 marks**

Objective:
Electrical Power plays significant role in day to day life of entire mankind. This course covers the generation of power along with the economic aspects and classification of substations.

Learning outcomes :

1. Upon completing the course students are able to understand how the electrical power will be generated from different sources.
2. Students will know the economical aspects of power generation .
3. Students will understand different methods of tariffs
4. Students will able to gain knowledge on different types of substations and their equipments.

UNIT-1 Hydroelectric power stations:

Introduction – List of sources available for generating electrical power (conventional and non-conventional energy sources). General layout of Hydro electric plant - selection of site - classification - mini hydro power plants - runoff river plants with pondage and without pondage - storage reservoir plants - and pumped storage plants- - spillways - penstocks - surge tank - Tail race. Hydrology - Catchment area - Mass curve - storage - discharge - station capacity - estimation of power developed from a given catchment area; heads and efficiencies - Numerical Problems. Merits and demerits.

UNIT-2 Thermal Power Stations:

General layout of Modern thermal plant - selection of site, coal handling equipment, preparation of coal, pulverization of coal, ash handling systems,dust collection systems, ESP system – draught system, natural and artificial. Brief description of: Economizers, Boilers, Super heaters, Turbines, Condensers, Chimney and Cooling towers. Numerical Problems- Comparision of thermal and hydel power plants.

UNIT- 3 Nuclear Power Stations:

Nuclear Power Stations: Nuclear Fission and Fusion - Chain reaction - Nuclear fuels - Fissile and fertile materials. Principle of operation of Nuclear reactor - Reactor Components: Moderators, Control rods, Reflectors and Coolants - Radiation hazards: Shielding and Safety precautions - Types of Nuclear reactors and brief description of PWR, BWR, CAND, Liquid Metal cooled nuclear reactors and FBR.

UNIT-4 Diesel and Gas stations:

Diesel electric power plants: Introduction – field of use – diesel engine working principle – essential components of diesel power plant – plant layout – advantages and disadvantages of diesel power plant.
Gas turbine stations: Classification - open and closed cycle plants – plant layout – components of gas turbine power plant – advantages of gas turbine power plant over diesel and thermal power plant - combined cycle Gas power plants – Merits and demerits.

UNIT-5 Economic Aspects of Power Generation:

Load curve, load duration and integrated load duration curves- load, demand, diversity, capacity, utilization and plant use factors. Generation cost and its classification – fixed, semi fixed and running charges – effect of load factor and diversity factor on cost of energy generated-Numerical Problems.

Unit-6 Tariff Methods:

Base load and peak load stations, requirement of peak load stations, load sharing between base load and peak load stations - Aims and objectives of tariff – Factors affecting tariff, types of tariffs – block and stepped tariff – Two part tariff and three part tariff – Frequency dependent tariff, unscheduled interchange based tariff, Numerical problems.

Unit-7 Air insulated Substations:

Classification of substations: Indoor & Outdoor substations: Substations layout 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, main and transfer bus bar system with relevant diagrams.

Unit-8 Gas insulated substations (GIS)

Advantages of Gas insulated substations, different types of gas insulated substations, single line diagram of gas insulated substations, bus bar, construction aspects of GIS, Installation and maintenance of GIS, Comparison of Air insulated substations and Gas insulated substations.

TEXT BOOKS

1. A course in Electrical Power systems by J.B. Gupta, Kataria Publications
2. 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., 1999.
3. Principles of Power Systems by V.K Mehta and Rohit Mehta S.CHAND& COMPANY LTD., New Delhi 2004.

REFERENCE BOOKS

1. Electrical Power Systems by C.L.Wadhawa New Age International (P) Limited, Publishers2002.
2. Elements of Power Station design and practice by M.V. Deshpande, Wheeler Publishing