

COURSE INFORMATION SHEET

Department : Electrical and Electronics Engineering	DEGREE: B.TECH
COURSE: Power Systems – I	Year-2 SEMESTER: 2 CREDITS: 4

SYLLABUS:

UNIT	DETAILS
I	<p>Thermal Power Stations: Line diagram of Thermal Power Station (TPS) showing path of coal, steam, water, air ash and flue gasses. Brief description of TPS components: Economizers, Boilers, Super heaters, Turbines, Condensers, Chimney and Cooling Towers.</p> <p>Nuclear Power Stations: Nuclear Power Stations: Nuclear Fission and Chain reaction – Nuclear fuels. – 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 and FBR.</p> <p>Gas Power Stations: Principle of Operation and Components (Block Diagram Approach Only).</p>
II	<p>Hydroelectric Power Stations: Elements of hydro electric power station-types-concept of pumped storage plants-storage requirements, mass curve (explanation only) estimation of Power developed from a given catchment area; heads and efficiencies.</p> <p>Hydraulic Turbines: Classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies , hydraulic Design - draft tube- theory- functions and efficiency.</p>
III	<p>D.C. Distribution Systems: Classification of Distribution Systems.- Comparison of DC vs. AC and Under-Ground vs. Over- Head Distribution Systems.- Requirements and Design features of Distribution Systems.-Voltage Drop Calculations (Numerical Problems) in D.C Distributors for the following cases: Radial D.C Distributor fed one end and at the both the ends (equal/unequal Voltages) and Ring Main Distributor.</p> <p>A.C. Distribution Systems: Voltage Drop Calculations (Numerical Problems) in A.C. Distributors for the following cases: Power Factors referred to receiving end voltage and with respect to respective load voltages.</p>
IV	<p>Substations: Classification of substations</p> <p>Air insulated substations - Indoor & Outdoor substations: Substations layout showing the Location of all the substation equipment.</p> <p>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.</p> <p>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.</p>
V	<p>Economic Aspects of Power Generation: Load curve, load duration and integrated load duration curves-load, demand, diversity, capacity, utilization and plant use factors-Numerical Problems.</p> <p>Tariff Methods: Costs of Generation and their division into Fixed, Semi-fixed and Running Costs. Desirable Characteristics of a Tariff Method.-Tariff Methods: Flat Rate, Block-Rate, two-part, three –part, and power factor tariff methods and Numerical Problems</p>

POWER SYSTEMS – I (A40214)

UNIT- I

Thermal Power Stations: Line diagram of Thermal Power Station (TPS) showing paths of coal, steam, water, air, ash and flue gasses. - Brief description of TPS components: Economizers, Boilers, Super heaters, Turbines, Condensers, Chimney and cooling towers

Gas and Nuclear Power Stations: Nuclear Power Stations: Nuclear Fission and Chain reaction. - Nuclear fuels. - 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 and FBR.

Gas Power Stations: Principle of Operation and Components (Block Diagram Approach Only)

UNIT - II

Hydroelectric Power Stations: Elements of hydro electric power station-types-concept of pumped storage plants-storage requirements, mass curve (explanation only) estimation of power developed from a given catchment area; heads and efficiencies.

Hydraulic Turbines: Classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies , hydraulic design - draft tube-theory- functions and efficiency.

UNIT - III

D.C. Distribution Systems: Classification of Distribution Systems.- Comparison of DC vs. AC and Under-Ground vs. Over- Head Distribution Systems.- Requirements and Design features of Distribution Systems.-Voltage Drop Calculations (Numerical Problems) in D.C Distributors for the following cases: Radial D.C Distributor fed one end and at the both the ends (equal/unequal Voltages) and Ring Main Distributor.

A.C. Distribution Systems: Voltage Drop Calculations (Numerical Problems) in A.C. Distributors for the following cases: Power Factors referred to receiving end voltage and with respect to respective load voltages.

UNIT-IV

Substations: Classification of substations

Air insulated 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.

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.

UNIT-V

Economic Aspects 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 and their division into Fixed, Semi-fixed and Running Costs. Desirable Characteristics of a Tariff Method.-Tariff Methods: Flat Rate, Block-Rate, two-part, three – part, and power factor tariff methods and Numerical Problems

TEXT BOOKS:

1. “C. L. Wadhawa”, “Generation and utilization of Electrical Energy”, New ageInternational (P) Limited, Publishers 1997.
2. “C. L. Wadhawa”, “Electrical Power Systems”, New age International (P) Limited, Publishers 1997.
3. “M. L. Soni, P. V. Gupta, U. S. Bhatnagar and A. Chakraborti”, “A Text Book on Power System Engineering”, Dhanpat Rai and Co. Pvt. Ltd, 1999.

REFERENCE BOOKS:

1. “M.V. Deshpande”, “Elements of Power Station design and practice” , WheelerPublishing, 3rd Edition 1999.
2. “S. N. Singh”, “Electrical Power Generation, Transmission and Distribution”, PHI,2003.
3. “V.K Mehta and Rohit Mehta”, “Principles of Power Systems”, S. Chand& CompanyLtd, New Delhi, 2004.

Subject	POWER SYSTEMS-I (EE402ES)			
Faculty	M.BHASKER			
II Year B.Tech. II Sem.				
S. No	Name of the Topic	No. of Classes required	Cumulative number of periods	Teaching AID
UNIT – I				
1	One Line Diagram and Operation of a Thermal Power Station	01	1	Chalk & Talk
2	Merits, Demerits, Site allocation of a TPS Coal Handling System	01	2	Chalk & Talk
3	Ash Handling & Dust Collecting Systems	01	3	Chalk & Talk
4	Fuel Burning System	01	4	Chalk & Talk
5	Super heaters, Economizer & Air Pre heaters	01	5	Chalk & Talk
6	Draft Systems & Cooling Towers	01	6	Chalk & Talk
7	Feed Water Treatment Systems, Boiler & Steam Turbines	02	8	Chalk & Talk
8	(Types of Chimneys)	01	9	Chalk & Talk
9	Nuclear Physics : Atomic Structure, Radioactive Phenomenon	01	10	Chalk & Talk
10	Radiations, Half life time, Mass Defect	01	11	Chalk & Talk
11	Nuclear Fission & Nuclear Fusion	01	12	Chalk & Talk
12	Nuclear power plant Lay Out & Nuclear Reactors	01	13	Chalk & Talk
13	Pressure Water Reactor (PWR) & Boiler Water Reactor (BWR)	01	14	Chalk & Talk
14	Fast Breeder Reactor (FBR)	01	15	Chalk & Talk
15	Nuclear Fuel, Coolants, Moderators, Control Rods , Nuclear Hazards	01	16	Chalk & Talk
16	Gas Turbine Power Plant	01	17	Chalk & Talk
17	(Generation of power using Non renewable Sources)	02	19	Chalk & Talk Chalk & Talk
18	Descriptive test 1	02	21	TEST
UNIT – II				
19	Elements of hydro electric power station	01	22	Chalk & Talk
20	Types-concept of pumped storage plants	01	23	Chalk & Talk
21	storage requirements	01	24	Chalk & Talk

22	mass curve (explanation only) estimation of power developed from a given catchment area	01	25	Chalk & Talk
23	heads and efficiencies	02	27	Chalk & Talk
24	Classification of turbines impulse and reaction turbines	01	28	Chalk & Talk
		01	29	Chalk & Talk
25	Pelton wheel, Francis turbine			
26	Kaplan turbine-working proportions	01	30	Chalk & Talk
27	work done, efficiencies	01	31	Chalk & Talk
28	Hydraulic design - draft tube- theory- functions and efficiency.	01	32	Chalk & Talk
UNIT –III				
29	DC and AC Distribution System	01	33	Chalk & Talk
30	Overhead and Underground System	01	34	Chalk & Talk
31	Feeders, Distributors and Service mains	01	35	Chalk & Talk
32	DC Distribution System	01	36	Chalk & Talk
33	Types of Distributors and DC Distribution Calculation	02	38	Chalk & Talk
34	(Ac distribution) Classification of distribution systems	01	39	Chalk & Talk
35	Types of AC Power Systems	01	40	Chalk & Talk
36	AC Distribution System	01	41	Chalk & Talk
37	Primary Distribution	01	42	Chalk & Talk
38	AC Distribution Calculation	01	43	Chalk & Talk
39	AC Distribution With Connected Load : Power Factor Referred to Receiving End Voltage	01	44	Chalk & Talk
40	AC Distribution With Connected Load : Power Factor Referred to Respective Load Voltages	01	45	TEST
UNIT-IV				
41	Introduction to Substations: Classification of Substations	02	47	Chalk & Talk
42	Air Insulated Substation	02	49	Chalk & Talk
43	Components of Substations	01	50	Chalk & Talk
44	Bus bar Arrangements: Single Bus bar and sectionalized bus bar	01	51	Chalk & Talk
45	Gas Insulated Substation (GIS)	03	54	Chalk & Talk
UNIT-V				
46	Economics of Power Generation	02	56	Chalk & Talk
47	Load Curves & Load Duration Curve	02	58	Chalk & Talk
48	Important Terms & Factors	02	60	Chalk & Talk

49	Load Curve & Selection of Generating Units	01	61	Chalk & Talk
50	Introduction to Economics of Power Generation	01	62	Chalk & Talk
51	Division of Cost of Generation	01	63	Chalk & Talk
52	Methods for Determining Depreciation	02	65	Chalk & Talk
53	Tariff : Objectives & Desirable Characteristics	02	67	Chalk & Talk
54	Tariff Methods	02	69	Chalk & Talk