4EE57: POWER SYSTEM PRACTICE AND DESIGN

CREDITS - 4 (LTP: 3, 0, 1)

Course Objective:
To understand the electrical as well as mechanical design of overhead transmission line and design of distribution system.

Teaching and Assessment Scheme:

Teaching Scheme (Hours per Week)			Credits	Assessment Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	CE	ESE	CE	150
3	0	2	4	60	40	20	30	

Details of Assessment Instruments under CE Practical Component:

Term work [20]	Allied Evaluation [10]
Report/Presentations/Assignment/Journal	Performance/Quiz/ Questions & Answers/ Discussion

Course Contents:

Unit No.	Topics	Teaching Hours
1	**Elements of Power Station Practice:** Flow diagram; main components of a thermal power plant – boiler plant, turbines, control room, electrostatic precipitators, coal and ash handling plants, circulating water system; combined cycle power plants – flow diagram.; hydro-electric power plants – classification, arrangement and layout, types of water turbines, discharge and specific speed, discussion on Central Electricity Regulatory Commission(CERC), Central Bureau Of Irrigation And Power(CBIP)	10
2	**Electrical Packages of a Power Plant:** Generator, exciter, bus-duct, generator transformer, auxiliary transformers and motors, batteries, instrumentation and control equipment, neutral grounding equipment, 6.6 kV and 415 V switchgear, switchyard equipment's	08
3	**Design of EHV Transmission Line:** Requirements and specifications, selection of voltage, choice of conductors, spacing of conductors, corona, radio and television interference, insulation coordination, insulators, surge impedance loading, main considerations of mechanical design, sag-tension relation, stringing of transmission lines, transmission towers.	07

Unit No.	Topics	Teaching Hours
4	**Design of Distribution Systems:** AC 3-phase 4-wire distribution, types of primary distribution systems, types of secondary distribution systems, voltage drop in ac distributors, kelvin's law, limitations of kelvin's law, general design considerations, load estimation, design of primary distribution, sub-stations, secondary distribution design, economical design of distributors, design of secondary network, lamp flicker.	06
5	**Substation Design:** Classification, terms and definitions, stresses on substation equipment, clearances, maintenance zones, designing a sub-station layout; design of 66/11 kV distribution substation; selection and specification of main equipment's.	08
6	**SF6 Gas Insulated Sub-stations (GIS):** Introduction, applications of GIS, range of ratings, demerits of GIS, configuration of GIS, circuit arrangement and single-line diagram of GIS, design aspects, earthing switches in GIS.	06
	Total	**45**

List of References:

1. M. V. Deshpande , "Electrical Power System Design" , McGraw-Hill Education - Europe, 1985.
2. B. R. Gupta, "Power System Analysis and Design", Sixth Edition, S. Chand & Sons, 2011
3. P. M. Reynolds (Editor), "Modern Power Station Practice – volumes A to D", Third Edition, Elsevier, 1990
4. S. Rao, "Electrical Substation Engineering & Practice: EHVAC, HVDC & SF6 - GIS ", Khanna Publishers, 2003.

Web resources:

1. Website of Central Board of Irrigation and Power(CBIP) available at http://www.cbip.org/

Course Outcomes (COs):

After learning this course the students will be able to:

1. Understand steam cycle and water cycle with electrical key-line diagram.
2. Estimate the electrical design of overhead transmission lines.
3. Estimate the mechanical design of overhead transmission lines.
4. Choose the proper size of the cables at distribution system.
5. Identify different switchgears in substation.

List of Experiments:

Sr. No.	Suggested List of Experiments
1	Electrical design of transmission line.

2	Mechanical design of transmission line.
3	Power circle diagram of transmission line.
4	Transmission tower design.
5	Electrical design of 220 kV / 400 kV substation.
6	Electrical of design and survey of rural feeder.