

COURSE TITLE	POWER SYSTEM PRACTICE AND DESIGN
COURSE CODE	01EE1608
COURSE CREDITS	3

Objective:

- 1 This course focus on basic concepts of generation, transmission and distribution planning and importance of mechanical and electrical design of power system components. The earthing of power systems and insulation co-ordination are also covered in this course.

Course Outcomes: After completion of this course, student will be able to:

- 1 Define the key terminology and explain the systematic steps involved in power system planning.
- 2 Illustrate the procedure for designing the power system parameters.
- 3 Solve power system design problems utilizing standard and specified parameters.
- 4 Differentiate mechanical and electrical design aspects for power system.
- 5 Determine the peak demand and total energy needs of the system by validating various forecasting techniques.

Pre-requisite of course:Electrical power generation and Electrical Power System– I

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	0	50	30	20	0	0

Contents : Unit	Topics	Contact Hours
1	Transmission lines design Requirements of transmission lines, selection of voltage for high-voltage transmission lines, choice of conductors, spacing of conductors, corona, insulators, specifications of transmission lines, surge-impedance loading of transmission lines, electrical design of transmission lines, main considerations in the mechanical design of transmission lines, sag-tension relation, stringing of transmission lines, Design of EHV transmission lines: transmission of electric power at extra-high voltage, design considerations of EHV lines, , selection and spacing of conductors, corona, radio and television interference, insulation co-ordination, towers	10

Contents : Unit	Topics	Contact Hours
2	Design of generation & distribution systems Introduction, selection of sizes and location of generating stations, selection and specifications of transmission lines, sizes and location of substations, Development of a distribution plan, transmission and distribution systems, , types of distribution systems arrangements, primary distribution design, secondary distribution design, distribution substations, calculation of distributor sizes: voltage drops, voltage regulation, Lamp flicker, sizes and location of substations	9
3	Power system earthing Objectives, definitions, tolerable limits of body currents, soil resistivity, earth resistance, tolerable step and, actual step and touch voltage, design of earthing grid, concrete encased electrodes, tower footing resistance, measurement of earth resistance R, measurement of soil resistivity, impulse behavior of earthing system	5
4	Insulation co-ordination Introduction, definitions, determination of line insulation, B.I.L and insulation levels of sub-station equipment, lightning arrester selection, power system over voltages, tentative selection of arrester voltage ratings, selection of arrester discharge currents, arrester discharge voltage, establishment of impulse voltage level of equipment, protective margin, establishment of separation limits, location of lightening arrester	7
5	Performance improvement of power system Introduction, methods of power system improvement, power system improvement scheme, determination of the voltage regulation and losses in a power system, shifting of distribution transformer center, , financial aspects of the power system improvement scheme	5
6	Power system planning and forecasting Introduction, methods of power system planning, Planning Principles, Planning Process, Project Planning, Power Development, Power Growth, National and Regional Planning, forecasting load and energy requirements, Load Requirement, Forecasting Techniques, Forecasting Modelling, , generation planning, transmission system planning, distribution system planning, Electricity consumption pattern, Peak demand and energy forecasting by trend and economic projection methods	6
Total Hours		42

Textbook :

- 1 Electrical Power System Design, B. R. Gupta, S Chand & Company, 2005
- 2 A Course in Electrical Power, Soni, Gupta and Bhatnagar, Dhanpat Rai Publications (P) Ltd, 1987
- 3 Substation Design and Equipment , Pratap Singh Satnam and P. V. Gupta, Dhanpat Rai Publications (P) Ltd, 2001
- 4 Electric Power Planning, A S Pabla, McGraw-Hill; Second edition, 2015

References:

- 1 Electrical Power System Design, Electrical Power System Design, M. V. Deshpande, McGraw Hill Higher Education, 1985
- 2 Electric Power System Planning, Electric Power System Planning, Dasari, S., IBT Publishers , 1999

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
10.00	25.00	30.00	20.00	10.00	5.00

Supplementary Resources:

- 1 <https://law.resource.org/pub/in/bis/>
- 2 <http://www.electrical-engineering-portal.com>
- 3 <https://nptel.ac.in/courses/108/105/108105104/>