

NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	B. Tech. in Electrical Engineering
Semester:	V
Course Code:	3EE206DC24
Course Title:	Power System Design
Course Type:	Core Course-II under Minor (Disciplinary)
Year of Introduction:	2024-25

L	T	Practical component				C
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Course Learning Outcomes (CLOs):

At the end of the course, the student will be able to –

1. outline general power plant design aspects (BL2)
2. apply the design practices associated with transmission lines (BL3)
3. infer the fundamentals of substation design (BL4)
4. appraise the concepts involved in distribution system design (BL5)

Contents:

Teaching Hours: 45

Unit I Power Plant Design 08

Design philosophy, economic consideration, environmental consideration, water supply, fuel supply, soil investigation, site development, safety considerations, generator types and selection, excitation, switchyards, transformer, grounding, battery, emergency AC systems, motor sizing for auxiliaries, intra-plant communication, control and instrumentation, heating, ventilation and air conditioning systems for operation areas and service areas, thermal insulation, fire protection

Unit II Transmission Line Design 14

Role of EHV AC transmission, selection of voltages, choice of conductors, conductor spacing, insulators, mechanical design, corona, effect of electrostatic field and magnetic field, lightning protection, overvoltages due to switching operations, EHV cable transmission, HVDC transmission system, design considerations in UHV transmission line

Unit III Substation Design 15

Protective relays, discrimination by time, current and time–current, earth fault and instantaneous protection schemes, fuses, substation grounding, need for grounding, various methods of neutral grounding, equipment grounding permissible Body current limits, tolerable voltages, step and touch potentials, substation ground grid design criteria, selection of electrodes and conductors for grounding system, design of gantry and earth wire, lightning stroke protection, lightning parameters, fire protection objectives and philosophies, fire Hazards, typical fire protection measures, design of gas insulated substation

Distribution system structures, feeder configuration, transformer connection and sizing, feeder loading, selection of voltage and current, protection equipment rating, layout design, underground cable design, network reconfiguration and sectionalizing switch design

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Tutorial Work:

This shall consist of at least 06 tutorials based on the above Contents.

Suggested Readings:

1. J. D. McDonald (Ed)., Electric Power Substations Engineering, CRC Press.
2. P. K. Nag, Power Plant Engineering, McGraw-Hill.
3. M. V. Deshpande, Electrical Power System Design, Tata McGraw-Hill.
4. Turan Gonen, Electric Power Distribution System Engineering, CRC Press.
5. Abdelhay A. Sallam, Om P. Malik, Electric Distribution Systems, Wiley-IEEE Press
6. R. D. Begamudre, High Voltage Engineering Problems and Solution, New Age International Publishers.
7. R. D. Begamudre, Extra High Voltage AC Transmission Engineering, New Age International Publishers.
8. R. S. Dahiya, Substation Engineering, Design, Concepts and Computer Applications.

L = Lecture, T = Tutorial, P = Practical, C = Credit

w.e.f. academic year 2024 – 25 and onwards