

Nirma University

Institute:	Institute of Technology
Name of Programme:	B.Tech. in Electrical Engineering
Semester:	IV
Course Code:	2EE201CC26
Course Title:	Fundamentals of Power System
Course Type:	Core
Year of Introduction:	2023 – 2024

L	T	Practical component				C
		LPW	PW	W	S	
2	0	2	-	-	-	3

Course Learning Outcomes (CLOs):

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

1. comprehend the conventional sources of power generation with associated issues and challenges **(BL3)**
2. appraise the need of renewable energy based generation and its impact on grid **(BL4)**
3. evaluate the electrical and mechanical parameters of overhead transmission line **(BL4)**
4. analyse the performance parameters of transmission and distribution system **(BL3)**

Content:

Total Teaching hours: 30

Unit-I	Conventional Power Generating Stations	05
	Scenario of Indian power sector, single line diagram of power system, structures of power system: bulk power grids and micro-grids, schematic diagram, choice of site, equipment and efficiency for thermal power plant, hydro power plant, nuclear power plant, load curves, tariff – residential, commercial etc.	
Unit-II	Renewable Power Generating Stations	06
	Distributed and bulk power generation through renewable energy, Solar, wind, geothermal, biomass, and ocean thermal energy in electrical power systems, issues and concerns of large percentage of renewable penetration in grid and possible solutions	
Unit-III	Electrical and Mechanical Design of Overhead Transmission Line	07
	Transmission line parameters, calculation of inductance and capacitance, transmission tower and its components, sag – tension calculations, string efficiency and its improvement, most economical diameter of conductor, concepts of corona, Sub-stations types and equipment	
Unit-IV	Performance of Transmission Lines	06
	Classification and performance of short lines, medium and long transmission lines, generalized constants, Ferranti effect	
Unit-V	Distribution Systems	06
	Supply system, various configurations of AC and DC distribution systems, underground cables: construction and classification, grading methods, calculation of insulation resistance and capacitance	

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.

Suggested Reading:

1. William D Stevenson, John J. Grainger, Power System Analysis, McGraw Hill Education India.
2. D.P. Kothari and I. J. Nagrath, Modern Power System analysis, McGraw Hill.
3. A. Chakrabarti, M. L.Soni, U.S. Bhatnagar and P.V. Gupta, Power System Engineering, Dhanpat Rai Publishers.
4. S. Sivanagaraju and S. Satyanarayana, Electric Power Transmission and Distribution, Pearson Education.
5. B H Khan, Non-Conventional Energy Resources, McGraw Hill.
6. D. P. Kothari, K. C. Singal and Rakesh Ranjan, Renewable Energy Sources and Emerging Technologies, PHI Learning Private Limited.
7. J. B. Gupta, A Course in Electrical Power, Dhanpat Rai Publishers.
8. H. Cotton, Transmission & Distribution, CBS Publishers.
9. Indian Electricity Grid Code, Ministry of Power, Government of India.
10. The Electricity Act, 2003, Central Electricity Regulatory Commission.

Suggested List of Experiments :

Title of Experiment	Hrs.
1. Determination of the generalized constants A, B, C, D of a long transmission line.	2
2. To Study the Ferranti Effect of a transmission line (Virtual lab platform).	2
3. Study of various types of power distribution cables.	2
4. Radial and Ring mains distribution systems.	2
5. Demonstration of wind power generation.	2
6. Demonstration of solar power generation.	2
7. Study of series and shunt compensation	2
8. To determine the efficiency and regulation of a medium transmission line.	2
9. To determine the line parameters L and C per phase per kilometre of a three-phase single and double-circuit transmission line for different conductor arrangements.	2
10. Simulation of DC and AC distribution by network analysis.	2
11. To study different types of insulator.	2
12. Different parameter calculation by power circle diagram.	2
13. To design different types of distribution systems and to measure voltages and currents at different feeder point in PSCAD.	2
14. Study of thermal and hydro-electric power plants.	2

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

w.e.f. academic year 2023 - 24 and onwards