NIRMA UNIVERSITY
Institute of Technology
B.Tech. in Electrical Engineering
Semester – IV

L	T	P	C
3	1	0	4

Course Code	**2EE403**
Course Title	**Fundamentals of Power System**

Course Learning Outcomes (CLO):

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

1. understand the conventional and renewable energy sources of power generation, with associated issues and challenges
2. apply the basic concepts of designing the transmission and distribution system
3. know the technical specifications to be met by the utility and the consumer to ensure secure and economic functioning of the grid

Syllabus: **Teaching Hours: 45**

Unit-1: Prime Movers **06**

Properties of steam, high pressure steam boilers, classification and operation of steam turbines and hydraulic turbines

Unit-2: Generating Stations and basics of Power Generation **06**

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, gas turbine power plant, combined cycle power plants, load curves

Unit-3: Renewable Energy Resources **06**

Distributed and bulk power generation through renewable energy, Solar and wind electrical power systems, issues and concerns of large percentage of renewable penetration in grid and possible solutions

Unit-4: Electrical and Mechanical Design of Overhead Transmission Line **08**

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

Unit-5: Performance of Transmission Lines **08**

Classification and performance of short lines, medium and long transmission lines, generalized constants, Ferranti effect, power circle diagram

Unit-6: Distribution System **08**

Sub-stations types and equipment, layouts and bus-bar configuration, supply system, various configurations of distribution system, earthing, underground cables

Unit-7: Electricity Regulations **03**

Scenario of Indian power sector, introduction to Electricity Act 2003 and Indian Electricity Grid Code (IEGC), Energy Conservation Act, tariff, power factor improvement

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: **Tutorial Hours: 15**
Tutorial work will be based on above syllabus with minimum 08 tutorials to be incorporated.

Suggested Readings:

1. D.P. Kothari and I. J. Nagrath, Modern Power System analysis, McGraw Hill.
2. A. Chakrabarti, M. L. Soni, U.S. Bhatnagar and P.V. Gupta, Power System Engineering, Dhanpat Rai Publishers.
3. S. Sivanagaraju and S. Satyanarayana, Electric Power Transmission and Distribution, Pearson Education.
4. P. K. Nag, Power Plant Engineering, McGraw Hill Education (India) Private Limited.
5. D. P. Kothari, K. C. Singal and Rakesh Ranjan, Renewable Energy Sources and Emerging Technologies, PHI Learning Private Limited.
6. J. B. Gupta, A Course in Electrical Power, Dhanpat Rai Publishers.
7. H. Cotton, Transmission & Distribution, CBS Publishers.
8. Indian Electricity Grid Code, Ministry of Power, Government of India.
9. The Electricity Act, 2003, Central Electricity Regulatory Commission.
10. The Energy Conservation Act, 2001, Ministry of Power, Government of India.

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

w.e.f. academic year 2019-20 and onwards