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

L	T	P	C
3	0	2	4

Course Code	**2EE502**
Course Title	**Electrical Power System Analysis**

Course Outcomes (COs):

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

1. Solve power system problems using per unit system
2. formulate the network matrices and determine the load flow solution
3. analyze the symmetrical and unsymmetrical faults
4. discuss the power system stability and analyze its effect on power system performance

Syllabus **Teaching Hours: 45**

Unit - 1: Introduction and Per Unit Representation of Power System **03**

Need for power system planning and operational studies, overview of different power system studies, importance of per unit system, impedance and reactance diagram.

Unit - 2: Load Flow Analysis **13**

Primitive network, construction of Y-Bus matrix, classification of Buses, load flow problem and its solution techniques, concept of static and dynamic load flow, static load flow equations, Gauss-Seidel method, Newton-Raphson method, Decoupled method, Fast Decoupled method, DC load flow method and recent trends in load flow studies.

Unit - 3: Short Circuit Analysis **11**

Construction of Z-Bus matrix, assumptions in fault analysis, fault analysis using Thevenin's theorem, symmetrical fault calculation, sequence components, sequence networks of power system, unsymmetrical fault calculation, analysis of open conductor faults, Bus impedance matrix method for analysis of unsymmetrical shunt faults.

Unit - 4: Stability Analysis **15**

Importance of stability analysis, classification of power system stability, power angle characteristics, stability limits, dynamics of synchronous machines, swing equation, synchronizing coefficient, equal area criterion and its applications, numerical solution of swing equation, Multi-machine stability, factors affecting steady state and transient stability, concept of RE integration and system stability, grid codes and its importance, concept of LVRT and synthetic inertia

Unit - 5: Load Forecasting **03**

Need of load forecasting, Key factors, types of load forecasting, forecasting process, forecasting challenges, practical case study from POSOCO, WRLDC, own institute.

Self-Study:

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

Laboratory Work:
This shall consist of at least 10 experiments / simulations based on the above syllabus.

Suggested Readings:

1. John Grainger and W. D. Stevenson, Power System Analysis, McGraw Hill
2. G.W.Stagg and A.H.El-Abiad, Computer Methods in Power System Analysis, McGraw Hill
3. D.P. Kothari and I. J. Nagrath, Modern Power System analysis, McGraw Hill
4. A. Chakrabarti, M. L.Soni, U.S. Bhatnagar & P.V. Gupta, Power System Engineering, Dhanpat Rai Publishers
5. J. Duncan Glover, Mulukutla S. Sarma, Power System Analysis and Design, Cengage Learning.
6. B. R. Gupta, Power System Analysis and Design, S. Chand Publishers
7. M. A. Pai, Computer Techniques in Power System Analysis, McGraw Hill
8. C. L. Wadhwa, Electrical Power Systems, New Age International Publishers
9. Arthr R Bergen, Vijay Vittal, Power System Analysis, Pearson Education
10. S. S. Vadhera, Power System Analysis and Stability, Khanna Publishers
11. Power system grid code of India and other leading nations

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

w.e.f. academic year 2020-21 and onwards