EE 303 Power Systems

Credit **:** 3-1-0-4 **Approval**: Approved in 6th Senate

Prerequisites **:** EE 201 Electromechanics or Instructors consent

Students intended for **:** UG **Semester** **:** Even

Elective or Compulsory: Compulsory for EE, Elective for CSE/ME

Preamble:

The basic objective of this course is to proide a comprehensive introduction on Power Systems, incorporating issues on supply, generation, transmission, distribution, reliability and stability, economics, demand management and renewable energy in the grid & "Smart Grids".

Course Outline:

The objective of the course is to provide the first detailed treatment of fundamental understanding and operation of the power systems. Beginning with the basic terms, concepts and power system components representations, the course will present power generation technologies and power delivery systems. Students will be introduced about fault analysis, integrated economic operation of power systems with reliability and stability. Introduction to new developments in power system operation and control by restructuring of power systems and smart grid will be discussed.

Course Modules:

Basic Concept of Three-phase circuit and Three-Phase power , Introduction to power systems and its structure: Generation, transmission and distribution, substation arrangements. Energy resources and power generation: An overview of conventional and non-conventional energy sources. (5 lectures)

Representation of power system components: Generator, Transformers, Transmission lines, line parameters, transmission line design, corona, interference of power lines with communication circuits, line insulators, power cables, per unit system. (15 lectures)

Load Flow Analysis – Concepts of PV, PQ and Slack Bus - NR Method (5 Lectures)

Fault Analysis: Symmetrical components, symmetrical and unsymmetrical fault calculations. (8 lectures)

Integrated operation of power systems, economic operation (ELD), stability, swing equation, equal area criterion, reactive power control, HVDC transmission and FACTS devices, load management. (10 lectures)

Introduction to protection and switchgear (6 lectures).

Introduction to restructuring of power systems, power market fundamentals and price discovery, and "smart grid". (4 lectures)

Introduction to modelling and simulation to perform of power system studies/analysis through graphical user interface as well as programming based tools. Like, load flow studies, performance analysis of transmission lines, ELD, fault analysis, etc. (3 lectures)

Text Books:

1. J. J. Grainger and W. D. Stevenson, “Power System Analysis”, Tata McGraw Hill.
2. Hadi Saadat, “Power System Analysis”, Tata McGraw Hill.
3. D. P. Kothari and I. J. Nagrath, “Modern Power System Analysis”, Tata McGraw Hill.
4. Ravindranath B. and Chander M., “Power System Protection and Switchgear”, New Age International Private Limited.

Reference :

1. S. N. Singh, Electric Power System Generation, Transmission and Distribution, PHI.
2. NPTEL Courses
3. Paithankar Y. G. and Bhide S. R., “Fundamentals of Power System Protection”, Prentice Hall of India Private Limited.
4. O. L. Elgerd, “Electric Energy Systems Theory: An Introduction”, Tata McGraw Hill.