Course code.	Course Name	L-T-P - Credits	Year of Introduction
EE431	Power Systems Lab	0-0-3-1	2016

Prerequisite : EE306 Power System Analysis

Course Objectives

- Impart practical knowledge about various power system equipment
- Get a knowledge about the operation of power systems and the philosophy behind the relay settings, fault calculations etc.
- Simulate the power system operations which will be helpful in the design of power systems

List of Exercises/Experiments: (At least 12 experiments out of 18 experiments listed are mandatory**)**

1. **Visit a local Substation.**
   Aim: To see firsthand apparatus that will be studied in this course and learn about their role in operation and protection of power systems.
2. **Introduction to PSCAD/MATLAB/MIPOWER**
   Aim: 1). Learn the usage of PSCAD/MATLAB/MIPOWER in modeling of ac circuits and plotting of results.
   2). Understanding reactive power and power factor in single-phase and three-phase circuits.
3. **Transmission Line and Modeling.**
   Aim: Obtaining the parameters of a 345 kV transmission line and modeling it in PSCAD/MATLAB/MIPOWER
4. **Power Flow**
   Aim: To carry out power flow calculations.
5. **Transformers in Power Flow.**
   Aim: To look at the influence of including a tap-changer and a phase-shifter on power flow and bus voltages.
6. **Including an HVDC Transmission Line for Power Flow.**
   Aim: 1). To include an HVDC transmission line and see its effect on power transfer on other transmission line.
   2). To understand the operating principle of 12-pulse thyristor converters used in HVDC transmission systems.
7. **Power Quality.**
   Aim: To obtain the current harmonics drawn by power electronics interface.
8. **Synchronous Generators.**
   Aim: To obtain the effect of sudden short-circuit on a synchronous generator output.
9. **Voltage Regulation.**
   Aim: 1). To study the effect of real and reactive powers on bus voltages.
   2). Understanding the operation of a Thyristor Controlled Reactor (TCR).
10. **Transient Stability.**
    Aim: To simulate transient stability in a 3-bus example power system.

10. **A. Making a Power System Reliable.**
    Aim: 1). To understand the planning/design process that goes into making a power system reliable.

11. AGC and Economic Dispatch.

Aim: Study the dynamic interaction between two control areas using *Simulink* modeling and economic dispatch.

12. Short Circuit Faults and Overloading of Transmission Lines.

Aim: To study the effect of short-circuit faults and overloading of transmission lines.

12.A. Fault Analysis with Relay Settings.

Aim : To study a power system with faults and determine relay settings based on calculated fault currents

13. Switching Over-Voltages and Modeling of Surge Arresters.

Aim. : To study over-voltages resulting from switching of transmission lines and limiting them by sing ZnO arresters

14. Power Factor improvement:

Aim : To calculate rating of capacitors for power factor correction for a load and verifying it experimentally.

15. Solar Power Calculations :

Aim : To calculate the rating of solar panel required for a given area on rooftop or for a given load

16. Demonstration of Ferranti Effect on a transmission line

17. Methods of Insulation Testing

18. Modern Energy Meter calibration schemes

Expected outcome.

- Students will be able to design, setup and analyse various power systems and its simulations.

Text Book:

Ned Mohan, First Course in Power Systems , Wiley.