

## EEL 4216 Electric Power Systems

**Credits:** 3 credits

**Text book, title, author, and year:** Instructor's notes, posted on Blackboard

**Reference materials:** Power System Analysis and Design (Fifth Edition) by Glover, Sarma, Overbye , 2012 Cengage Learning ISBN-13: 978-1-111-42577- 7

### **Specific course information:**

**Catalog description:** Fundamentals of electromechanical devices; energy conversion, transformers and rotary machines. The operation and analysis of power systems is presented. Topics include energy supply and demand, structure of power systems, power system components, voltage and frequency control and load flows.

**Prerequisites:** EEL 3111 Circuits 1

### **Specific goals for the course:**

By the end of the course students will be able to: (i) To understand present and future trends in electric power systems and perform computer-based calculations. (ii) Understand elementary aspects of balanced three-phase circuits. (iii) To understand symmetrical components in order to lay a foundation and provide a framework for more advanced topics covering both equipment models as well as power-system analysis and design methods. (iv) Solve circuits with single-phase or three-phase transformers as well as autotransformers. (v) Analyze the performance of single-phase and balanced three-phase transmission lines under normal steady-state operating conditions using a two-port network and ABCD parameters. (vi) Develop an understanding of the principles of the synchronous machine. (vii) Use Gauss-Seidel and Newton-Raphson solution methods to solve the power-flow problem. (viii) Analyze a power system when a fault (symmetrical or unsymmetrical) occurs, including usage of a special personal computer program to compute short-circuit currents in power systems.

### **Brief list of topics to be covered:**

- Review of Network basics and polyphase circuits
- Introduction to existing power grid generation, transmission, distribution, interconnection and protection
- Combustion/steam generation technology – coal, oil, natural gas, nuclear
- History and future of present generation fuels
- Environmental impact of present generation (solar power, wind turbines)
- Transmission Lines
- Transformers (single phase, three phase, autotransformer)
- Machines
- Symmetrical Components
- Power Flow
- Symmetrical Fault
- Unsymmetrical Fault