

## EE 488 – Power Systems Analysis I

**Designation:** EE elective course for electrical engineering majors.

**University Bulletin Description:** EE 488: (3) Fundamentals, power transformers, transmission lines, power flow, fault calculations, power system controls.

Prerequisite: EE 387.

### Prerequisites by Topics:

1. Understanding and the ability to use complex variables and linear algebra in the modeling and analysis of linear circuits.
2. Understanding and ability to perform calculations involving complex power.
3. Understanding and the ability to model electrical machinery.

### Textbook/Required Materials:

*Power System Analysis and Design*, 4<sup>th</sup> ed., Glover, Sarma, and Overbye, Thompson, 2008

### Learning Outcomes:

This course provides an introduction to the modeling and analysis of power systems. Through lecture and out-of-class assignments, students are provided learning experiences that enable them to:

1. Analyze three-phase networks under balanced and un-balanced conditions.
2. Model 3-phase transformers.
3. Model transmission lines.
4. Understand computer-aided network analysis.
5. Understand power flow analysis.
6. Understand fault analysis.
7. Become proficient with programming algorithms for network analysis in MATLAB.

### Topics:

1. Overview of power systems
2. Poly-phase network analysis including symmetrical component analysis
3. Transformer modeling
4. Transmission line modeling
5. Computer-aided network analysis including graphs and solution of linear systems
6. Power flow analysis
7. Fault analysis including symmetrical and unsymmetrical faults

**Class/laboratory schedule:** Three 50-minute lectures per week.

### Computer usage:

1. MATLAB to automate evaluation of transmission line models.
2. MATLAB to produce PQ and PV characteristics for transmission lines.
3. MATLAB to implement Gauss-Seidel and Newton-Raphson power flow programs.

### Contribution to Meeting the Requirements of Criterion 5. Curriculum:

This course contributes to both the engineering topics and design components.

Topics pertaining to economic and regulatory considerations in the operation of power systems are addressed through lecture and out-of-class assignments.

### Relationship to Program Outcomes:

- O.1.1. Graduates will possess mathematics skills necessary for electrical engineering.
- O.1.3. Graduates will have attained computer proficiency.

- O.2.1. Graduates will understand how to analyze and design simple electrical/electronic circuits.
- O.3.1. Graduates will have in-depth technical knowledge in one or more areas of specialization.
- O.3.2. Graduates will have practical understanding of the major electrical engineering concepts and demonstrate application of their theoretical knowledge of the concepts.
- O.4.1. Graduates will interact with industry both within and outside of a classroom setting.
- O.5.1. Graduates will have good teamwork skills.
- O.5.2. Graduates will possess good oral and written communication skills.
- O.6. Graduates will appreciate their role as engineers in society.

**Prepared by:** Jeffrey S. Mayer

**Date:** April 10, 2008