

Cleveland State University
Department of Electrical and Computer Engineering
Spring 2003

EEC 473/571 Power Systems

Catalog Description: **EEC 473/571 Power Systems.** (4-0-4).

Prerequisite: EEC 361 & EEC 474. Power system components modeling: transformers, generators, and transmission lines. Power flow, power systems faults.

Textbook: Glover & Sarma, *Power System Analyses and Design with personal computer applications.*

Reference: Bergen, Power System Analyses, Prentice Hall.

Coordinator: Dr. A. V. Stankovic, Assistant Professor.

Course Objectives:

- To develop the ability to model the elements of a power system including transformers, rotating machines and transmission lines using per unit system and sequence impedance networks derived from the use of symmetrical components.
- To develop the ability to analyze the power flow in the power system.
- To develop ability to use matrix methods for solving network problems.

Expected Outcomes:

Upon completion of this course students should be able to:

1. Model the elements of a power system.
2. Analyze the power flow in a power system.
3. Use the matrix methods for solving power system problems.

Fulfills the Following Electrical Program Objectives and Outcomes:

Objectives:

- 1) practice electrical engineering in power systems.
- 2) define and diagnose problems, and provide and implement electrical engineering solutions in industry, business, and government.
- 3) develop their knowledge beyond the undergraduate level and to keep current with advancements in electrical engineering.

Outcomes:

- (a) an ability to apply knowledge of mathematics, science, and engineering to general electrical engineering and, in particular, to power systems.
- (b) an ability to design a system, component, or process to meet desired needs.
- (c) an ability to identify, formulate, and solve electrical engineering problems.
- (d) a recognition of the need for, and an ability to engage in life-long learning.
- (e) an ability to use the techniques, skills, and modern engineering tools necessary for electrical engineering practice.

Prerequisite by Topics:

1. Three-phase circuits.
2. Electromagnetic field theory.
3. Matrix methods.

Contribution of Course to Meeting the Professional Component:

Math & Basic Science: 1 credits; Engineering Topics: 3 credits; General Education: 0 credits

Week	Topics:	Reading
1 (Jan 13-17)	An Overview. Instantaneous power. Real and Reactive Power. Complex Power.	I. 2.1-2.4
2 (Jan 20-24)	Martin Luther King Holiday-January 20th Network equations, Balanced Three-Phase Circuits.	2.5-2.7
3 (Jan 27-31)	Symmetrical Components	8.1-8.4
4 (Feb.3-7)	Power Transformers. The Ideal Transformer. Practical transformers. The Per-unit System.	3.1-3.3
5 (Feb 10-14)	Three-Phase Transformers. Connections and Phase Shifts. Three-Winding Transformers.	3.4-3.7
6 (Feb 17-21)	President's Day Holiday-Feb 17th Review and Discussion.	
7 (Feb 24-28)	Midterm Exam Discussion.	
8 (Mar 3-7)	Transmission Line Parameters	4.1- 4.11
9 (Mar 10-14)	Spring Recess	

Week	Topics:	Reading
10 (Mar 17-21)	Transmission Lines. Steady State Operation.	5.1-5.3
11 (Mar 24-28)	Lossless Lines. Steady-State Stability Limit.	5.4-5.7
12 (Mar 31-Apr 4)	Power Flows. Iterative Solutions to Non-Linear Algebraic Equations	6.1-6.3
13 (Apr 7-11)	The Power-Flow Problem.	6.4-6.6
14 (Apr 14-18)	Easy Power- Software	
15 (Dec 2-6)	Field Trips- CSU substation. Review and Homework Discussions.	

Projects:

Term project, approved by instructor. Student submits a written report on the project.

Grading Midterm - 40%
Final – 45%
Project – 15%

Homework Has to be turned in on time.

Exam Format Open Book

Computer Usage: EasyPower
Software: MATLAB

Prepared by: Dr. A. V. Stankovic Date: 01 02 2003

There will be no make up quizzes, mid-term and final exams unless a student turns in a written excuse from a physician or an employer.