INTER AMERICAN UNIVERSITY OF PUERTO RICO
BAYAMON CAMPUS
SCHOOL OF ENGINEERING
ELECTRICAL ENGINEERING DEPARTMENT

ELEN 4352 – Power Systems Analysis II
Technical Elective

Catalog Description: Study of network calculations and power flow analysis. Includes study of faults, network sequences and stability in power systems. Analysis of the economic operation of a power system, the matrices of admittance and impedance and the use of computer programs for analysis of load flow and protection against failure of power systems.

Pre-requisite(s): ELEN 4351 – Power Systems Analysis I

Textbook: Glover, J. Duncan and Sarma, Malukutla S., *Power System Analysis and Design,* 3rd Ed., Brooks/Cole, 2002.

References: Bergen, Arthur R. and Vittal, Vijay, *Power System Analysis,* 2nd Ed., Prentice Hall, 2001.
Saadat, *Power System Analysis*, 2nd Ed., McGraw-Hill, 2002.
Wood, Allen J. and Wollenberg, Bruce F., *Power Generation, Operation, and Control,* 2nd Ed., John Wiley & Sons, 1996.
Grainger, John J and Stevenson Jr., William D., *Power System Analysis,* McGraw-Hill, 1994.
Electronic references of Power Systems, from
http://www.engnetbase.com/

Course Objectives

Upon successful completion of the course, the student will be able to:

1. Demonstrate an understanding of the process of power flow solution.
2. Determine and analyze the admittance and impedance matrix of a power system.
3. Determine the positive, negative and zero sequence network of a power system.
4. Demonstrate an understanding of the fault current calculation methodology.
5. Perform an engineering analysis of a power system to recommend basic modifications to improve the power transference and voltage regulation.
6. Demonstrate a basic understanding of the breaker selection process.
7. Demonstrate a basic understanding of the economic dispatch solution process.
8. Use specialized computer software to resolve the power flow problem and calculate the fault currents of a power system.

Topics Covered

Lecture Topic*	Hours
1. Introduction	1
2. Network Calculations (the admittance and the impedance model)	8
3. Power Flow Analysis (solution methods)	9
4. Power flow studies in system design and operation	6
5. Fault calculations and Analysis	6
6. The selection of circuit breakers	3
7. Economic Dispatch	6
8. Exams	6

Laboratory Topic*	Hours
1. Introduction to power system simulation software	3
2. Transformers in parallel	3
3. Three-phase transformers voltage and current relationship	3
4. Phase sequence	3
5. The transmission line	3

6. Alternator Synchronization 3
7. Alternator Power 3
8. Symmetrical and unsymmetrical fault analysis 3
9. Transformer-symmetrical and unsymmetrical fault analysis 3
10. Power Factor Correction 3
11. Power system project 15

*Schedule is subject to change

Class/Lab Schedule: Four credit hours. Forty-five hour lecture and forty-five hour laboratory per term.

Evaluation Strategies

1. Exams (60%): Two partial exams and a final exam will be scheduled early in the semester. You are expected to take the exams at the times and dates specified. All calculations must be done clearly, stating units and showing a coherent procedure to arrive to the results.
2. Laboratory (20%): Laboratory reports must be submitted by each group, one week after the experiment is done. The report must be written in a professional format.
3. Project (15%): A team project is required at the end of the course. Partial and final written reports will be submitted. A presentation is required at the end of the semester.
4. Homeworks and Quizzes (5%): Homeworks are due at the first meeting class of the next week after submission. Solution to the quizzes and homeworks will be available to provide immediate feedback.

Grading Policy

Grades are reported according to the following standard grading system:
A (90-100), B (80-89), C (70-79), D (60-69), F (0-59)

Contribution of Course to Meeting Professional Component

Three credit hours of engineering science and three credit hours of engineering design.

Relationship of Course to Program Educational Objectives**

1	2	3	4
√	√		√

Relationship of Course to Program Outcomes**

a	b	c	d	e	f	g	h	i	j	k
√	√	√	√	√		√				√

**The numbers and letters correspond to the Program Educational Objectives and Program Outcomes of electrical engineering, respectively. The program objectives and outcomes can be found in the ECE department website at http://bc.inter.edu/ingeelectrica.

Prepared by: Prof. Luis R. Francis Date:3/23/07