Hellen and John C. Hartmann Department of Electrical and Computer Engineering

New Jersey Institute of Technology

ECE 449 - Power Systems Laboratory: **2 credit hours, 3 contact hours**

Instructor's or course coordinator's name: Walid Hubbi

Text book, title, author and year: Manual of experiments distributed to students in a flexible manner to correlate with the theoretical course.
Specific course information: Laboratory work in the design and synthesis of power systems, closely coordinated with the power systems elective course.
Prerequisites: ECE 494. Corequisite: ECE 442.
Elective course, required by students taking the power track.

Course Learning Outcomes:
Students will be able to

a. Measure and calculate complex power, real and reactive power, lagging and leading power factor, apparent power (volt amps); verify that the measurements are consistent with the theory.
b. Observe on the scope the phase sequence of a three-phase supply and use experiments to verify the observed sequence.
c. Understand the various three phase transformer connections and measure the various voltages.
d. Understand how electric energy is generated.
e. Experience how to control voltage, frequency, and power of an AC generator.
f. Experience how to operate generators and connect them to the grid.
g. Use modern power systems software.

ABET Criterion 3 Student Learning Outcomes

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics (CLO a-g);
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives (CLO a-g)
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions (CLO a-g).

Brief list of topics to be covered

Week 1:	Introduction
Week 2:	Measurements and Accuracy
Week 3:	Phase sequence measurements
Week 4:	Power Factor Correction
Week 5:	Multi-phase power generation
Week 6:	The V-curves of a Synchronous Machine

Week 7: Synchronizing an alternator and connecting it to the power system
Week 8: Real and Reactive Power Control of an Alternator
Week 9 & 10: Writing Matlab subroutines to solve the load-flow problem. Verify results with PowerWorld.
Week 11: Study the effect of load on voltage angles and voltage profile in the 14-bus system
Week 12& 13: Three-phase transformer connections.
Week 14: Line Parameters using PSCAD

Instructor: Dr. Walid Hubbi **email: hubbi@njit.edu**
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The grade of an individual student may be lower than for the rest of the team based on poor attendance or participation in the laboratory. The instructor may modify the above as he or she sees fit.

NJIT Honor Code will be upheld, and any violations will be brought to the immediate attention of the Dean of Students.