Department of Electrical and Computer Engineering

1. Course number and name
   ECE 449 - Power Systems Laboratory

2. Credits and contact hours
   2 credit hours, 3 contact hours

3. Instructor's or course coordinator's name
   Walid Hubbi

4. Text book, title, author and year
   Manual of experiments distributed to students in a flexible manner to correlate
   with the theoretical course.

5. Specific course information
   a. (Catalog Description): Laboratory work in the design and synthesis of
      power systems, closely coordinated with the power systems elective
   b. Prerequisites: ECE 494. Corequisite: ECE 442.
   c. indicate whether a required, elective, or selected elective
      Elective course, required by students taking the power track.

6. Specific goals for the course, criterion 3 outcomes addressed are in parentheses:
   a. To be able to measure and calculate: complex power, real and reactive power;
      lagging and leading power factor, apparent power (volt amps) and verify that the
      measurements are predictable from the theory (a, b, c, d, e, g).
   b. To observe on the scope the phase sequence of a three-phase supply and use
      experiments to verify the observed sequence (a, b, d, g)
   c. To understand the various three phase transformer connections and measure the
      various voltages (b, d, g).
   d. To have hands-on experience on how electric energy is generated (b, d, e, g).
   e. To have hands-on experience on the control of voltage, frequency, and power
      of an AC generator (b, d, e, g).
   f. To have hands-on experience on paralleling of generators and connecting
      a generator to the grid (b, d, e, g).
   g. To have hands-on experience on the use and design of power systems
      software (a, d, e, g, k).

7. 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

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Office Hours: Mondays, Tuesdays, and Wednesday: 1:00 to 2:00 PM