Course Syllabus

Course No. & Title: EEL 5250/4250 – Power System Analysis

Term and Meeting Information: Fall 2017**, WM** 12:30am-1:45am, EDU 411

Instructor Info: Prof. Lingling Fan

TA: TBD

Office Hours: MW 1:45am-3:15pm or by appointment

Canvas Information: We use canvas to disseminate class information frequently. Please link Canvas notification with your emails. Notices on exams, homework assignments and classes will be posted on Canvas. Class notes as well as homework solutions will also be posted on Canvas. So please check Canvas frequently.

Catalog Description: This course will introduce analysis and operation of power systems. The topics covered in this course include per unit systems, circuit and fault analysis, load flow analysis and advanced topics such as voltage stability, economic dispatch, and state estimation. Specifically, vector/matrix handling skills will be trained so students can carry out circuit analysis for power grid. Further, computing techniques on solving nonlinear algebraic equations and optimization problems will be integrated into this course. The course will lay a solid foundation for students with power grid analysis knowledge and skills and help their future career in power utilities industry. Students will be trained to use programming/computing tools such as MATLAB to conduct large-grid computing and analysis.

Course Prerequisite: circuits, energy conversion (or similar type course or with permission of instructor).

Text: A. Bergan and V. Vittal, *Power Systems Analysis*, Prentice Hall; 2nd edition (August 16, 1999)

Test and Grading Information: Attendance and quizzes @10%, two tests each @ 30%, homework @ 30%. All exams, reports and HWs count equally for 100 points each. A=100-90, B=89-80, and so forth.

Homework: Homework should be turned in before the class of the due date. Homework should be neatly prepared and stapled. *Late, unstapled* homework will not be graded. If you do not turn in homework for two and more times, your grade will be down by one letter.

Course Topics

1. Circuit analysis basics:
    a. Phasors for ac signals (what if there are harmonics?)
    b. KCL, KVL, Ybus matrix and Z matrix
    c. Power computation: Instantaneous power, active power and reactive power in single phase ac systems and three-phase ac systems
2. Per unit systems
    a. How to get rid of transformers so that a power grid looks like a circuit with voltage sources and passive components such as R, L, C
3. Power system protection and fault analysis
    a. Z matrix-based three-phase fault analysis
    b. Other fault analysis based on symmetric components
4. Transmission line modeling and steady-state operation – the basic power and voltage phasor relationship.
5. Load flow anlaysis
    a. Problem formulation
    b. Nonlinear algebraic equations solving techniques (Gaussian, Newton-Raphson)
    c. Scope of the methods or when the NR method does not work well
6. Advanced topics (optional)
    a. Voltage stability or Maximum loading
    b. Economic Dispatch
    c. State Estimation & Maximum Likelihood Estimation

Tutorials:

1. MATLAB Programming using vectors and matrices; How to make plots
2. MATLAB Programming on iteration loops and load flow computing

Emergency Preparedness for Academic Continuity: In the event of an emergency, it may be necessary for USF to suspend normal operations. During this time, USF may opt to continue delivery of instruction through methods that include but are not limited to: Blackboard, Elluminate, Skype, and email messaging and/or an alternate schedule. It's the responsibility of the student to monitor Blackboard site for each class for course specific communication, and the main USF, College, and department websites, emails, and MoBull messages for important general information.

Students with Disabilities: Students in need of academic accommodations for a disability may consult with the office of Students with Disabilities Services to arrange appropriate accommodations. Students are required to give reasonable notice prior to requesting an accommodation."

Additional Course Features: The fundamentals of large scale power systems analysis is stressed, so that the student can then be prepared to further investigate a topic and share the results of their investigations with the rest of the class. The intent is to begin to train the student in becoming an independent researcher and/or productive member of an industrial or academic team. The course is taught by an interactive discourse between the instructor and student, and students with students.

Academic Integrity
The faculty of the Electrical Engineering Department is committed to maintaining a learning environment which promotes academic integrity and the professional obligations recognized in the IEEE Code of Ethics (http://ee.eng.usf.edu/about/codeOfEthics.htm). Accordingly, the department adheres to a common Academic Integrity Policy in all of its courses. This policy is to be applied uniformly in a fair and unbiased manner.

University rules regarding academic integrity will be strictly enforced. It is not acceptable to copy, plagiarize or otherwise make use of the work of others in completing homework, project, laboratory report, exam or other course assignments. Likewise, it is not acceptable to knowingly facilitate the copying or plagiarizing of one's own work by others in completing homework, project, laboratory report, exam or other course assignments. It is only acceptable to give or receive assistance from others when expressly permitted by the instructor. Unless specified otherwise, as in the case of all take-home exams, scholarly exchange regarding out-of-class assignments is encouraged. A more complete explanation of behaviors that violate academic integrity is provided at: http://www.ugs.usf.edu/catalogs/1112/pdf/AcademicIntegrityOfStudents.pdf.

The minimum penalty for violation of the academic integrity policy stated in the preceding paragraph is the greater of an automatic zero on the assignment or a letter grade reduction in the overall course grade. Student(s) found in violation of the policy on an exam will receive a minimum penalty of an F in the course. All instances of policy violations will be recorded in a letter from the instructor that is kept in the student files held by the department; a copy of the letter will be forwarded to the appropriate (undergraduate or graduate) Dean's office. A second violation of the policy, irrespective of whether it was related to an exam or any other course assignment, will result in a course grade of "FF" and expulsion from the Electrical Engineering Department.

At the instructor's discretion the penalties associated with the EE Department's Academic Integrity Policy may be stricter, in which case further explanation is provided in the following.
Modifications to the Uniform Academic Policy: <none>