EE 394J-10 Distributed Generation Technologies (Unique: 17180)

Meetings: Mondays and Wednesdays from 2:00 to 3:30 PM in ENS 145

Professor: Alexis Kwasinski (ENS528, akwasins@mail.utexas.edu, Ph: 232-3442)

Course Home Page: http://users.ece.utexas.edu/~kwasinski/EE394J10DGFa12.html

Office Hours: M and W 10-11 AM and M 3:30 – 4:30 PM.; or by appointment.

Prerequisites: Fundamentals of power electronics and power systems or consent from the instructor. Strong familiarity with at least one computer simulation software. Knowledge on how to browse through professional publications.

Reference Textbook(s): There is no required textbook. The reference textbook is:

G. Masters, *Renewable and Efficient Electric Power Systems*

In addition of the book, the course will use selected scientific and engineering papers, and articles from professional magazines as reference material.

Course Description and objectives: This is a graduate level course with two equally important main goals and all activities of this course are planned to support meeting these two main goals. The first goal is to discuss topics related with distributed generation technologies. The second goal is to prepare the students to conduct research or help them to improve their research skills. This latter goal implies that students are expected to have a proactive approach to their course work, which in some cases will require finding on their own proper ways to find unknown solutions to a given problem. Still the instructor will provide guidance on skill necessary to succeed in this course goal. Guidance topics include, but are not limited to, writing technical journal tips or presentation skills. **Technical topics included in this course are:** distributed generation and microgrids elements; microsources; energy storage; power electronics interfaces; dc and ac architectures; economics, operation, stabilization, and control; reliability aspects; grid interconnection, "smart" grids.

Schedule:

Wed., August 29	Introduction. Course description. The electric grid vs. microgrids: technical and historic perspective. The "Energy Internet."
Wed. September 5	Distributed Generation units. Microturbines, reciprocating engines, wind generators, photovoltaic generators, fuel cells, and other technologies.
Week 2 (begins September 10)	Distributed Generation units. Microturbines, reciprocating engines, wind generators, photovoltaic generators, fuel cells, and other technologies.
Week 3 (begins September 17)	Distributed Generation units. Microturbines, reciprocating engines, wind generators, photovoltaic generators, fuel cells, and other technologies.
Week 4 (begins September 24)	Energy Storage – batteries, fly-wheels, ultracapacitors, and other technologies. *Dr. K at NATO Energy Security Conference* (*W only*)
Week 5 (begins October 1)	Energy Storage – batteries, fly-wheels, ultracapacitors, and other technologies. *Dr. K at INTELEC*
Week 6 (begins October 8)	Power electronics interfaces: multiple and single input dc-dc converters.
Week 7 (begins October 15)	Power electronics interfaces: ac-dc and dc-ac.
Week 8 (begins October 22)	Power architectures: distributed and centralized. Dc and ac distribution systems. Stability and protections.
Week 9 (begins October 29)	Controls: distributed, autonomous, and centralized systems. Operation.
Week 10 (begins November 5)	Reliability and availability.
Week 11 (begins November 12)	Economics *Dr. K at ICRERA*

Week 12 (begins November 19) Grid interconnection. Issues, planning, advantages and disadvantages both for the grid and the microgrid. (Thanksgiving week)
Week 13 (begins November 26) Smart grids.
Week 14 (begins December 3) Presentations

Note about the schedule: Italics indicate weeks when the instructor will be attending conferences. However, some additional trips unknown at this time may come up during the course of the semester. For example, due to the particular nature of his research Dr. K may need to travel to disaster areas on short notice. Although Dr. K will communicate these trips in advance along with any potential changes that these trips may cause, it is not possible to know at this time when those trips may occur. Still, provisions will be taken so no lecture classes are missed.

Grading:
Homework: 25%
Project preliminary evaluation: 15%
Project report: 30%
Project presentation: 20%
Class participation: 10%

Letter grades assignment: 100% – 96% = "*A+*", 95% – 91% = A, 90% – 86% = A-, 85% – 81% = B+, and so on.

Homework:
Homework is designed to support both main course objectives. Hence, it may require some more time than conventional homework assignments that you are used to receive in other courses. Solving homework assignment problems will also require students to find solutions with minimal guidance from the instructor. The goal of this approach for homework assignment planning is for students to learn how to find paths for solutions to problems. Many times there could be many paths that will lead to solving a problem. For this reason, homework will be assigned approximately every 2 weeks. Making mistakes is part of the learning process. For this reason the lowest score for an assignment will not be considered to calculate the homework total score. However, all assignments need to be submitted in order to obtain a grade for the homework. Also, many homework problems may have each different paths to various solutions and all of them are valid. The focus when grading homework is, then, more on the process taken to address the problem and not so much on a numerical answer. Hence, it is very important that homework problem solutions explain clearly but concisely the path taken to find the solution to a given problem and that students include some brief discussion explaining their answer to each homework question.

Project:
The class includes a project that will require successful students to survey current literature and to analyze a problem. The project consists of carrying out a short research project throughout the course. The students need to identify some topic related with the application of distributed generation technologies. The project is divided in two phases:

1) Preliminary phase. Due date: Oct. 17. Submission of references, application description, and problem formulation (1 to 2 pages long).
2) Final phase. Due date: Nov. 28. Submission of a short paper (the report), at most 10 pages long, single column.

Participation:
Participation points are assigned at instructor's discretion based on the perceived attitude of individual students towards learning during the semester.

Final Presentation:
Every student is expected to do a presentation discussing his/her project to the rest of the class as if it were a conference presentation of a paper. The format of the presentations will be announced during the semester and its date will also be confirmed during the semester because these two variables depend on the number of students registered for the course..

Disclaimers:
Although unlikely, this syllabus and course topics may change according to my judgment as to what is best for the class. Any changes will be declared in class. For example, due to the particular nature of my research I may need to travel to disaster areas on short notice. Although I will communicate these trips in advance along with any potential changes that these trips may cause, it is not possible to know at this time when those trips may occur. General course schedule and administrative deadlines follow The UT Austin calendar, long session 2010-2011, which can be found at http://registrar.utexas.edu/calendars/10-11/.

Students with disabilities may request appropriate academic accommodations from the Division of Diversity and Community Engagement, Services for Students with Disabilities, 471-6259. The link to this office is: http://www.utexas.edu/diversity/ddce/ssd/. An official letter should be provided outlining authorized accommodations.

University of Texas Honor Code: "The core values of The University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the university is expected to uphold these values through integrity, honesty, trust, fairness, and respect toward peers and community." Each student in this course is expected to abide by this University of Texas Honor Code. Any work submitted by a student in this course for academic credit will be the student's own work. Link to University Honor Code: http://registrar.utexas.edu/catalogs/gi09-10/ch01/index.html. A good explanation of what constitutes plagiarism can be found in the following IEEE's web page: http://www.ieee.org/publications_standards/publications/rights/ID_Plagiarism.html. Notice that paraphrasing could be considered a case of plagiarism.

By UT Austin policy, you must notify me of your pending absence at least fourteen days prior to the date of observance of a religious holy day. If you must miss a class, an examination, a work assignment, or a project in order to observe a religious holy day, you will be given an opportunity to complete the missed work within a reasonable time after the absence.