EE 5379 — TOPICS IN POWER SYSTEM ENGINEERING: POWER SYSTEM RELIABILITY, PLANNING AND OPERATIONS IN COMPETITIVE ELECTRICITY MARKETS

Spring 2015

Instructor(s): Dr. Robert Spangler

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Faculty Profile:

Office Hours: MW 1:30 — 2:30 PM or by Appointment

Section Information: EE 5379 Section 001-LEC (29891)

Time and Place of Class Meetings: MW 4:00 to 5:20 PM — Life Science Bldg. Rm 424

Description of Course Content:

This course covers the application of fundamental planning and operating functions in the traditional vertically integrated utility and competitive electricity markets. The course focus will include the impacts of competitive economics on the traditional power system reliability and security requirements. Various competitive market structures including energy only market structures and energy with capacity market structures are covered. Course topics will include, for example, the effects of limited duration scarcity events and the achievement of generation planning reserve margins. As the class discussions develop, the topical content of the course may be adjusted as needed. Each topic will be approached from the viewpoints of Government Regulatory and Quasi-Regulatory Authorities, the Market Operators and the Market Participants and will consider their economic and operational motivations, which in the whole must satisfy power system reliability, security and planning requirements. (3 Lecture Hours • 0 Lab Hours)

Prerequisite: EE5308, Consent of the Instructor

Required Textbook:

"Electric Power System Planning — Issues, Algorithms and Solutions," Authors: Hossein Serfi, Mohammad Sepasian, Publisher: Springer-Verlag 2011, ISBN 978-3-642-17988-4 (E-book e-ISBN 978-3-642-17989-1).

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Course Schedule:

Please note that as the instructor for this course, I reserve the right to adjust the following schedule in any way that serves the educational needs of the students enrolled in this course — Dr. Robert Spangler.

Week	Date	Material Covered —Exam Dates
1	1/22	The following topics will be covered in weeks 1 through 7:
2	1/26	
	1/28	Review Course Syllabus and Other Administrative Matters
3	2/2	Organization Structure of Power Systems; Review of IP, DP and Mixed Integer
	2/4	Optimization Methods; Review of Engineering Economics Topics. Text References:
4	2/9	Electric Power System Planning, Chapters 1, 2 and 3.
	2/11	
5	2/16	Load and Economic Forecasting Topics including Weather Effects; Passive & Active
	2/18	Demand Response; Scarcity and Shortage Conditions & Emergency Curtailments Text
6	2/23	References: Electric Power System Planning, Chapter 4
	2/25	
7	3/2	Single Bus Generation Expansion Planning Text References: Electric Power System Planning, Chapter 5 Multi-Bus Generation Expansion Planning
	3/4	Examination 1
8	3/9	No Class — Spring Break
	3/11	
9	3/16	The following topics will be covered in weeks 8 through 16:
	3/18	
10	3/23	Continue Multi-Bus Generation Expansion Planning
	3/25	Text References: Electric Power System Planning, Chapter 6
11	3/30	
	4/01	Distribution Substation Planning
12	4/06	Text References: Electric Power System Planning, Chapter 7
	4/08	
13	4/13	Network Expansion Planning — A Basic Approach
	4/15	Text References: Electric Power System Planning, Chapter 8
14	4/20	
	4/22	Network Expansion Planning, an Advanced Approach; Reactive Power Planning Text
15	4/27	References: Electric Power System Planning, Chapters 9 and 10
	4/29	
16	5/04	Power System Planning in the Presence of Uncertainties
	5/06	Planning Reserve Margins in Energy Only and Energy/Capacity Markets Text References: Electric Power System Planning, Chapters 11, 12 and 13
17	5/13	Examination 2: 2:00 — 4:30 PM

Assignments, Exams, and Grading Policy:

Examinations:
Two examinations for a total weight of 60% of final class grade (30% weighting each).

Examination **1** will be given at midterm with a maximum point award toward the final grade of 30 points.

Examination 2 will be given at the assigned Final Examination Period with a maximum point award toward the final grade of 30 points.

Homework and Team Assignments totaling 40% of final class grade (30% and 10% weighting, respectively).

- Homework Assignments count as 30% of the final grade:

  Homework problem sets must be turned in at the beginning of class on the day an assignment is due and will count as 90% of the Homework and Team Assignments weighting with a maximum point award toward the final grade of 27 points.
  Homework will be considered one class period late for failure to hand in on time. Twenty-five percent (25%) will be deducted for each class period late (Note: score reduces to zero if late four class periods).

  The submission of Reading Memos (described in the Section "Expectations for Out-of-Class Study) count as Homework Assignments and will count as 10% of the Homework Assignment weighting with a maximum point award toward the final grade of 3 points.

- Team Assignments count as 10% of the final grade:

  Team Assignments are 15 to 20 minute in-class presentations by teams of class members (consisting of 3 to 4 students). Presentation subjects will be assigned by the instructor. A typical team assignment could be the detailed presentation of an example or derivation presented in an assigned reading for the class period or a separate topic relevant to the current study topic. Details regarding the grading rubric for Team Assignment presentations and team membership will be provided at the start of the course. The maximum point award for the Team Assignments toward the final grade is 10 points.

Final Grade Range:

Grade Point Range	Letter Grade
90 to 100	A
80 < 90	B
70 < 80	C
60 < 70	D
0 < 60	F

Outcomes:

1. Students will be able to describe the component processes utilized to develop intermediate and long-term Power System Plans.
2. Students will be able to compare and contrast the impacts on the Power System Intermediate and Long-term Plans between monopoly electricity and competitive electricity market structures.
3. Students will gain hands-on experience with the applications used in the intermediate and long-term Power System Planning process.

Attendance Policy:
Attendance at all sessions is expected as much of the knowledge derived from a study of assigned reading materials will arise not only from the materials themselves but also from discussions among the class participants and the instructor. If you are unable to attend a session, advise the instructor by Email {Insert "EE5309 Attendance" in the subject line). Student attendance history will not explicitly factor into the determination of the student's course grade; however, students are responsible for the information presented in class by the instructor and team assignment presenters (i.e. this information is included in the examination knowledge base).

Expectations for Out-of-Class Study:
Beyond the time required to attend each class meeting, students enrolled in this course should expect to spend an additional 9 hours per week of their own time in course-related activities, including reading required materials, completing assignments, preparing for exams, etc. Students will be responsible for submitting "Reading Memos" covering each assigned reading for an upcoming class period. A Reading Memo is a brief form that identifies specific elements in the assigned reading materials that the reader wants to further discuss or clarify. More details regarding the Reading Memos will be provided at the start of the course.

Grade Grievances: Any appeal of a grade in this course must follow the procedures and deadlines for grade-related grievances as published in the current graduate catalog available at http://catalog.uta.edu/academicregulations/gradesfflgraduatetext.

Drop Policy: Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. **Students will not be automatically dropped for non-attendance.** Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (http://wweb.uta.edu/aao/fao/).

Americans with Disabilities Act: The University of Texas at Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including the *Americans with Disabilities Act (ADA).* All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of that disability. Any student requiring an accommodation for this course must provide the instructor with official documentation in the form of a letter certified by the staff in the Office for Students with Disabilities, University Hall 102. Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability or by calling the Office for Students with Disabilities at (817) 272-3364.

Title IX: The University of Texas at Arlington is committed to upholding U.S. Federal Law "Title IX" such that no member of the UT Arlington community shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity. For more information, visit www.uta.edu/titleIX.

Academic Integrity: Students enrolled in this course are expected to adhere to the UT Arlington Honor Code:

> *I pledge, on my honor, to uphold UT Arlington's tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.*
> *I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.*

UT Arlington faculty members may employ the Honor Code as they see fit in their courses, including (but not limited to) having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System *Regents' Rule* 50101, §2.2, suspected violations of university's standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student's suspension or expulsion from the University.

Electronic Communication: UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at http://www.uta.edu/oit/cs/email/rnavmail.php.

Student Feedback Survey: At the end of each term, students enrolled in classes categorized as "lecture," "seminar," or "laboratory" shall be directed to complete an online Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student's feedback enters the SFS database anonymously and is aggregated with that of other students enrolled in the course. UT Arlington's effort to solicit, gather, tabulate, and publish student feedback is required by state law; students are strongly urged to participate. For more information, visit http://www.uta.edu/sfs.

Final Review Week: A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week *unless specified in the class syllabus.* During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

Emergency Exit Procedures: Should we experience an emergency event that requires us to vacate the building, students should exit the room and move toward the nearest exit stairway, which can be reached from either the right or left in the building hallway. Take the stairs down to the ground floor and exit the building. When exiting the building during an emergency, one should never take an elevator but should use the stairwells. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist handicapped individuals.

Student Support Services: UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to resources@uta.edu, or view

the information at www.uta.edu/resources.

Writing Center: The Writing Center, 411 Central Library, offers individual 40 minute sessions to review assignments, *Quick Hits* (5-10 minute quick answers to questions), and workshops on grammar and specific writing projects. Visit https://uta.mywconline.com/ to register and make appointments. For hours, information about the writing workshops we offer, scheduling a classroom visit, and descriptions of the services we offer undergraduates, graduate students, and faculty members, please visit our website at www.uta.edu/owl/.

Librarian Contacts:

Economics	Carol Byrne	817-272-7437	cbyrne@uta.edu
Engineering: Electrical Engineering	Sylvia George-Williams	817-272-7519	sylvia@uta.edu