Course Description


Course Objectives

- Present computational methods for bulk power and distribution systems operation and control.
- Describe economic optimization algorithms used in electrical energy systems.
- Presents algorithms for system state estimation.
- Describe the architecture of energy management systems.
- Describe emerging trends on renewable energy integration, smart grids, and electricity markets.

Pre-requisites:

Graduate Standing

ECE4320 or similar undergraduate power system analysis course is highly desirable.

Time and Place:

Section A of this course is face to face on campus

- Course times are Monday and Wednesday, 0930-1045 am
- Classroom is Sustainable Education, Room 110.
- All course lectures will be recorded and will be available online.
- This course includes a set of hands-on workshops where we will use software to simulate power systems. Two or three workshops will take place in the assigned classroom using some of the assigned course times.

Instructor

Prof. Santiago Grijalva
e-mail: sgrijalva@ece.gatech.edu

Office Hours: Wednesdays 11-12 ET, Online: Team Meeting

**Grading Policy:**

Homework (20%)

2 Midterm Exams (15% each), 1 Final Exam (30%); Total 60%

Term Project, will be to write a paper (20%)

**Text:**

Instructor will provide full set of electronic notes. Lectures will be posted on Canvas under Files/Lecture PDFs

**Tentative Course Schedule:**

<table>
<thead>
<tr>
<th>Day</th>
<th>Date</th>
<th>Lectures</th>
<th>Homework/Project</th>
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<tbody>
<tr>
<td>M</td>
<td>Aug 21</td>
<td>L0. Pre-read: Review of Phasors</td>
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<tr>
<td>M</td>
<td>Aug 21</td>
<td>L1. Operation Paradigms</td>
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<tr>
<td>W</td>
<td>Aug 23</td>
<td>L2. Gauss Power Flow Computation</td>
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<tr>
<td>M</td>
<td>Sep 4</td>
<td>Labor Day: No Class</td>
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<tr>
<td>W</td>
<td>Sep 6</td>
<td>L5. Reactive Power Flow Limits</td>
<td>Hw01 due</td>
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<tr>
<td>M</td>
<td>Sep 11</td>
<td>L6. Sensitivity Analysis</td>
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<tr>
<td>W</td>
<td>Sep 13</td>
<td>L6. Sensitivity Analysis, Cont.</td>
<td>Project Deliverable 1 due</td>
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<tr>
<td>M</td>
<td>Sep 18</td>
<td>Workshop 1</td>
<td>HW02 due</td>
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<tr>
<td>W</td>
<td>Sep 20</td>
<td>L7. Contingency Analysis</td>
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<tr>
<td>M</td>
<td>Sep 25</td>
<td>L8. Available Transfer Capability</td>
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<tr>
<td>W</td>
<td>Sep 27</td>
<td>Exam 1</td>
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<td>M</td>
<td>Oct 2</td>
<td>L9. Economic Dispatch</td>
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<td>W</td>
<td>Oct 4</td>
<td>L10. Non-Linear Optimal Power Flow</td>
<td>Hw03 due</td>
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<td>M</td>
<td>Oct 9</td>
<td>Fall Break: No Class</td>
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<tr>
<td>W</td>
<td>Oct 11</td>
<td>L11. Linear Programming OPF</td>
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<td>M</td>
<td>Oct 16</td>
<td>L12. Marginal Pricing</td>
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<tr>
<td>M</td>
<td>Oct 23</td>
<td>L14. Unit Commitment</td>
<td>Hw04 due</td>
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<td>W</td>
<td>Oct 25</td>
<td>L15. Distributed Energy Resources</td>
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<tr>
<td>M</td>
<td>Oct 30</td>
<td>Workshop 2</td>
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<tr>
<td>W</td>
<td>Nov 1</td>
<td>L16. Review of Statistics (Background Material)</td>
<td>Hw05 due</td>
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L17. WLS State Estimation

M Nov 6 Exam 2

W Nov 8 L18. WLS State Estimation, Cont.

M Nov 13 L19. Enhanced Estimation
L20. Bad Data Detection

W Nov 15 L21. Automatic Generation Control

Module 4: EMS

M Nov 20 L22. Distribution Systems Hw06 due

W Nov 22 Student Recess: No Class, No Office Hours

M Nov 27 L23. Substation Automation/PMU

W Nov 29 L24. Central System
L25. Visualization

Saturday Dec 2 Project Final Deliverable Due

M Dec 4 L26. Future Grids and Course Wrap-Up Hw07 due

W Dec 13 Final Exam 8:00 am - 10:50 am

Supplemental References

Background Texts:

These are texts you may want to review if you feel you need to enhance your power systems background. These are the types of texts used in classes that are prerequisites to EC6320. If you are planning a career in power systems, I suggest you have copies of at least 1 and 2.


Power System Analysis, by John Grainger, Jr., William Stevenson, 1994. This is the book that I used when I originally took the undergraduate power system class. It is a little outdated, but great material.

Texts:

These are texts you can read to complement the material presented in ECE6320 lectures.


Computational Methods for Large Sparse Power Systems: An Object-Oriented Approach (With CD-ROM), by S.A. Soman, et al., 2001. This is good book if you are interested in coding applications or future research on computational power systems.
Course Expectations & Guidelines

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. For information on Georgia Tech's Academic Honor Code, please visit http://www.catalog.gatech.edu/policies/honor-code/ or http://www.catalog.gatech.edu/rules/18/ (Links to an external site.).

Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at (404)894-2563 or http://disabilityservices.gatech.edu/ (Links to an external site.), to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Extensions, Late Assignments, & Re-Scheduled/Missed Exams

Assignments are provided with significant notice. Unless you have an emergency, no late assignments or missed exams will be accepted.