EE 7400: Power Systems
Operation and Planning

Lecture 1
Amin Kargarian
Contact Information

- Instructor: Amin Kargarian
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- Phone: (225) 578-3091
Introduce Yourself

- Name
- Department
- Program
- Why are you interested in this course?
Today’s Lecture

• Course overview
  – Lecture content
  – Exams
  – Grading
  – Important dates
  – Rules and policies
  – Other required information
Course Overview

• Lecture:
  Monday & Wednesday, 3:30pm–4:50am, Tureaud Hall 100

• Lecture material:
  – Slides, textbooks, and papers
  – Lectures will be based on notes and handouts provided by the instructor. Therefore, attendance at lectures and your attention is very important.
Where the Course Notes Come From

• Textbook and reference texts

• Notes provided by
  – Prof. G. T. Heydt, Arizona State University
  – Dr. G. Hug, Carnegie Mellon University & ETH Zurich
  – Dr. Y. Fu, Mississippi State University
  – Prof. B. Wollenberg, University of Minnesota
  – Prof. R. Baldick, University of Texas at Austin
  – Dr. M. Rais-Rohani, Mississippi State University

• Journal/conference papers which will be determined by the instructor
Lecture Content

Overall subject: advanced topics in power systems operation, planning, security, economics and electricity markets, and optimization

- Overview of power systems operation, planning, security, and economics
- Basics of optimization
- Short-term system operation
  - Economic dispatch
  - Power flow and optimal power flow
    - DC OPF
    - AC OPF
  - Unit commitment
  - Security-constrained unit commitment
  - Ancillary services
    - Reactive power procurement and voltage security
    - Multiobjective optimization and Pareto optimality
Lecture Content
Prerequisites

- AC and DC circuits analysis
  - phasors, impedance, three phase circuits, active and reactive power, and power factor
- Complex numbers and their manipulation
- Basic algebraic manipulation
- Basic concepts of optimization
- The per unit system
- Basic terminology of power engineering including units, energy vs. power, components, and a concept of the magnitudes involved in power systems
Course Calendar

• Starting date: August 22, 2016
• Ending date: December 02, 2016

• Midterm exam: take-home
  Friday, October 14, 2016

• Final exam: take-home
# Estimated Course Calendar

<table>
<thead>
<tr>
<th>Session</th>
<th>Topic</th>
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<tr>
<td>1 weeks</td>
<td>Overview of power systems operation, planning, security, and economics</td>
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<tr>
<td>2 weeks</td>
<td>Basics of optimization</td>
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</tbody>
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## Tests and Grading Criteria

### Homework (25%)

### Classroom Attendance (5%)
- Proportional to attendance, e.g., if someone attends 30 sessions out of a total of 36 sessions, his/her attendance grade is $\frac{30}{36} \times 5 = 4.17$

### Midterm Exam (20%)

### Final Exam (20%)

### Project Assignment (30%):

a) Computational project: select a topic related to the course subject and code it in Matlab, GAMS, YALMIP, or any related software (the instructor’s confirmation is needed before selecting a topic and software)
- Grading will be based on generality of the code, accuracy and creditability of the solution, quality and readability of the documentation and the prepared report

b) Research project: select a topic related to the course subject, find an innovative method/algorithm to solve the problem (it can end up with a publication)
- Grading will be based on the level of innovation, creditability of the algorithm, accuracy of the solution, quality of the documentation and the prepared report (or publication)

- Team work: different students might be involved in a project, and in this case, the role each student needs to be clearly determined
Tests and Grading Criteria

- $97 \leq p \leq 100$ grade A+
- $93 \leq p < 97$ grade A
- $90 \leq p < 93$ grade A-
- $87 \leq p < 90$ grade B+
- $83 \leq p < 87$ grade B
- $80 \leq p < 83$ grade B-
- $77 \leq p < 80$ grade C+
- $73 \leq p < 77$ grade C
- $70 \leq p < 73$ grade C-
- $67 \leq p < 70$ grade D+
- $63 \leq p < 67$ grade D
- $60 \leq p < 63$ grade D-
- $p < 60$ grade F

- Grades may be affected by curving at the instructor's discretion.
Course Objectives and Outcomes

• The course will provide students with a fundamental knowledge on the power systems operation, economic, security, and planning. Concepts, models, and solution methodologies for short-term operation and long-term planning of power systems will be studied. Application of optimization techniques for management and design of power generation and transmission systems will be presented.

• Upon completion of this course, students should
  – Know basic concepts of power systems operation, economics, security, and planning
  – Be able to model and formulate some of the most important power systems operation and planning problems, e.g., OPF and SCUC
  – Know several methodologies to solve some of the most important energy management functions, e.g., OPF, SCUC, TEP
  – Apply several linear, non-linear, and mixed integer optimization techniques to solve power systems operation and planning problems
Deadlines

• Each assignment/project milestone has a clear deadline. However,
  – each student gets two jokers which can be used to extend a deadline by two days
  – if at the end of the semester a student still has one of the jokers, he/she gets 2 additional percent per joker for the grade of the final exam
  – once the jokers are gone, if assignments are turned in late, 50% will be deducted from the assignment grade
  – assignments handed later than one week of the deadline are graded with 0 points
  – if there is a special situation which makes it difficult for you to hand in your work on time even with jokers, please come and talk to me
How to turn in homework

• In class on due date
• As an email attachment to Kargarian@lsu.edu (put EE7400 in subject line)
• By sliding under the door of my office (ERAD 333)
Policies

• **Plagiarism:** Students are responsible for completing and submitting their own course work and preparing their own modules. All work submitted in the course modules must be the student’s own work unless outside work is appropriate to the assignment; all outside material must be properly acknowledged. It is also unacceptable to copy directly from your textbook or to use published answer keys or the teacher's edition of a textbook.

• **Collaboration:** Unauthorized collaboration constitutes plagiarism. Collaborative efforts that extend beyond the limits approved by the instructor are violations of the academic integrity policy. Students who study together are expected to prepare and write their own individual work for submission and grading.