

EE 553 Power System Economics – Winter 2024

Prerequisite: EE454 or consent of the instructor (enforced).

Learning Outcomes

Upon completing this course, the student should be able to:

- Define and discuss the major problems in power system economics
- Describe the various types of electricity markets and discuss their purpose
- Discuss what differentiates electricity markets from markets for other commodities
- Discuss bidding strategies in electricity markets with perfect and imperfect competition
- Explain how locational marginal prices are calculated and calculate such prices in a small system
- Discuss the need and the use of operational reliability resources
- Discuss issues related to investments in generation and transmission
- Formulate power system economics problems as optimization problems

Time: W – F 10:30 am - 12:20 pm in ECE 026

Instructor: Daniel S Kirschen
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Office Hours: By appointment (send me an email)

Method of Instruction

This course will **NOT** be taught as a traditional lecture course. Instead, you will be expected to take an active approach to learning.

What does this mean in practice?

- Each week, I will assign a section of the textbook as the topic for the following week.
- You will be expected to **study** (i.e. not just read) this section. If necessary, you should refer to other textbooks in order to understand the material presented in this section.
- You should therefore come to class prepared to present the assigned topics.
- During the class time, I will ask students, selected at random, to present or discuss different aspects of the assigned topics.
- You may be asked to present in consecutive sessions.
- You do not need to memorize the material. When presenting you can refer to notes that you have made while studying the material or to the textbook itself.

- While you read the assigned material, you are strongly encouraged to make notes
- When you reach the end of each subsection, ask yourself:
 - What did the authors try to explain in this subsection?
 - How does this relate to the overall goal of the chapter?
 - How does this relate to the previous subsections?
 - How would I explain this to my classmates?
- You do not need to prepare PowerPoint slides but you should be ready to illustrate your explanations using diagrams on the white board.
- I will provide slides with the important diagrams and equations that you can use in your explanations
- You are also expected to contribute to the discussion by asking questions. These questions can be for clarification (e.g. “I don’t quite understand how this works...” or “I am lost, can we go over this again?”) or for extension or context (e.g. How would you apply this technique or this model?)
- Participation in the class discussions counts for **50%** of your final grade. I will grade your participation in every session where you were asked to present something
- I will assess your participation using the following criteria:
 - Did your presentations show that you made a solid effort to understand the material?
 - Were you able to explain the material clearly and in a synthetic manner? (i.e. by highlighting the goal and principles of a mathematical derivation rather than the details)
 - Did your presentations help your classmates understand the material?
 - Did you ask questions for clarification or extension?
 - Did you bring to the discussion something that was not in the textbook?

Textbooks

Required:	Kirschen & Strbac, <i>Fundamentals of Power System Economics</i> , Second Edition Wiley 2018
Supplemental References:	<ul style="list-style-type: none"> • Wood & Wollenberg, <i>Power System Generation, Operation & Control</i>, 3rd Ed. Wiley, 2014. (Accessible online from the UW library). • Varian, <i>Intermediate Microeconomics – A Modern Approach</i>, W.W. Norton (various editions) • Students may want to consult an introductory text on optimization among the many that are available in the library

Grading

Presentations by students: 50%
 Participation in class discussions: 10%

Final project / paper: 40%

Tentative timetable of topics

Date	Topic
W 3/27	Introduction to power system economics
F 3/29	Basic concepts from economics
W 4/3	Basic concepts from economics
F 4/5	Markets for electrical energy
W 4/10	Markets for electrical energy
F 4/12	No class
W 4/17	Participating in electricity markets
F 4/19	Participating in electricity markets
W 4/24	Participating in electricity markets
F 4/26	Transmission networks and electricity markets
W 5/1	Transmission networks and electricity markets
F 5/3	Transmission networks and electricity markets
W 5/8	Power system operation
F 5/10	Power system operation
W 5/15	Power system operation
F 5/17	Investing in generation
W 5/22	Investing in transmission
F 5/24	Investing in transmission
W 5/29	Towards 100% renewables
F 5/31	Towards 100% renewables

Students with Disabilities

If you have a documented disability and wish to discuss academic accommodations, please contact me as soon as possible. I am happy to make every reasonable accommodation.

Academic Integrity

I expect every member of the class to conform to the highest standards of academic integrity. The following statements set forth these standards as I understand them to apply to the EE 553 class:

Because your homework has a bearing on your grade, it must be your own original work. You may compare homework answers and discuss problem solving methods with other students in the class, but the final result - the work you hand in - must consist of work that you, and you only, have performed. Copying homework done by someone else, or copying old homework or the answer key, copying the work of anyone else on examinations, the use of unauthorized notes or other unauthorized aids during examinations, and knowingly permitting your work to be copied for the purpose of cheating are all examples of cheating.

Examinations must be your individual original work. No discussion of any kind is allowed among students while taking an examination. During an examination, you may ask the instructor questions if you do not understand some aspect of a problem statement, or if you are unclear about what is required.

If you cheat, you cheat yourself of the opportunity to learn the material, and you cheat your classmates - all of your classmates - out of grades they have earned. If you let someone else copy your work, you are allowing them to devalue your grade and that of your fellow students. Cheating is a bad way to embark on a career in engineering. Cheaters make bad engineers, and I want you to be good ones. You can help by not tolerating cheating by your fellow students. I will monitor for cheating and will write up all suspected cases. About the worst thing I can imagine is writing up someone who is not actually cheating. Please help us avoid this by avoiding even the appearance of possible cheating. Cheating can result in failure of the course and/or eventual expulsion from the University.

Religious Accommodations

Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW's policy, including more information about how to request an accommodation, is available at Religious Accommodations Policy:

<https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/>

Accommodations must be requested within the first two weeks of this course using the Religious Accommodations Request form:

<https://registrar.washington.edu/students/religious-accommodations-request/>