

## EE 553 Power System Economics - Spring 2017

### Learning Outcomes

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

- Define and discuss the major problems in power system economics
- Formulate these problems as optimization problems
- Solve simple power system optimization problems by hand
- Use optimization packages to solve more complex problems
- 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
- Calculate locational marginal prices in a small system
- Discuss the role of ancillary services
- Discuss the factors that affect investments in generation and transmission

**Time:** Tu 6:00 pm-8:50 pm

**Instructor:** Baosen Zhang  
**Office:** EEB M310  
**Phone:** (206) 616-3818  
**Email:** zhangbao@uw.edu  
**Office hours:** Monday 5pm-6pm, skype id: baosen.zhang

**Teaching Assistant:** Yishen Wang, EEB 215  
**Email:** ywang11@uw.edu  
**Office hours:** Monday 6pm-7pm, Friday 5pm-6pm

**Final Exam** 5/30, in class

**Grading**

Homework:	40%
Attendance:	10%
Final Examination:	50%

**Website** <http://zhangbaosen.github.io/teaching/EE553> (main)  
<https://canvas.uw.edu/courses/1138428> (grading)

All group communications will take place through the website or by email. Use the course website:

- To check for announcements
- To get copies of the lecture slides and other material
- To get the homework and project assignments
- To submit your coursework
- To get your grades
- To ask or answer questions on the discussion board

## Textbooks

Required: Kirschen & Strbac, *Fundamentals of Power System Economics*, Wiley 2004

Supplemental Wood & Wollenberg, *Power System Generation, Operation & Control*, 3rd Ed.  
References: Wiley, 2014. Accessible online through the UW library.  
Varian, *Intermediate Microeconomics – A Modern Approach*, W.W. Norton  
(various editions)

Students may want to consult an introductory text on optimization among the many that are available in the library

Class notes: Will be posted on the EE 553 web page

## Tentative timetable of topics

Week	Topic	Reference
1	Introduction to power system economics Introduction to economic dispatch and optimization	Notes, K&S Ch. 1 W&W Ch. 2, 3
2	Optimization techniques Application to economic dispatch	Notes
3	Unit Commitment	Notes W&W Ch. 5
4	Introduction to mixed integer programming Optimal power flow	Notes
5	Optimal power flow Basic concepts from economics	Notes K&S Ch. 2, Varian
6	Markets for electrical energy Participating in electricity markets	K&S Ch. 3, 4
7	System security and ancillary services	K&S Ch. 5
8	Transmission networks and electricity markets	K&S Ch. 6
9	Investing in generation and transmission	K&S Ch. 7, 8
10	Current Research in Power System Economics	Notes, papers

K&S: Kirschen & Strbac *Fundamentals of Power System Economics*

W&W: Wood & Wollenberg, *Power System Generation, Operation & Control*, 2nd Ed.

Varian: Varian, *Intermediate Microeconomics – A Modern Approach*

## Homework

Written homework will be assigned weekly. It will typically be due one week after it is assigned. It will typically consist of several problems or essay questions, often with multiple parts.

Homework will be assigned and submitted through the course web site. Late homework will **not** be accepted without pre-approval. Homework will be graded and returned as soon as possible.

### **Disabled Students**

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.