University of Michigan
Department of Electrical Engineering & Computer Science
EECS 536: Power System Markets & Optimization
Winter 2026

Course Syllabus

The course covers the fundamentals of electric power system markets and the optimization methods required to solve planning and operational problems (economic dispatch, optimal power flow, and unit commitment). The course will highlight recent advances including convex relaxations of the optimal power flow problem, and formulations/solutions to stochastic dispatch problems. Problems will be placed in the context of actual electricity markets, and new issues, such as incorporation of renewable resources and demand response into markets, will be covered. All students will conduct an individual research project.

Prerequisites: EECS 463 (Power System Design & Operation, or equivalent) or Permission of Instructor; Proficiency with MATLAB/Python/Julia and basic linear algebra

Instructor: Prof. Vladimir Dvorkin, 4240 EECS Building. E-mail: dvorkin@umich.edu

Lectures

- Tuesdays and Thursdays 9-10:30am
- Lectures will be in-person in the classroom, EECS 1303
- Lectures will be recorded and posted on Canvas after class
- All lecture material (notes, handouts, etc.) will be posted after class
- In-person attendance is highly encouraged
- If in-person lecture isn't possible for any reason, the lecture will be held over Zoom

Office hours

- Wednesdays 4:30 to 5:30 PM in EECS 4240
- If you would like to attend office hours via Zoom, please let me know
- Office hours are not held on holidays or breaks
- Office hours are not recorded
- Normally during office hours all students will talk together with the instructor. If you require a 1-1 discussion, please let Prof. Dvorkin know. If it is possible to discuss 1-1 during that office hour, we will do that. If it is not possible, email me to find another time for a 1-1 discussion

Piazza: All technical questions/concerns should only be communicated over Piazza. Feel free to post questions on course material, homework, etc. You are encouraged to answer each other's questions. The instructor will up-vote answers and also respond to questions. Piazza is not monitored by the instructor over weekends, holidays, and university breaks. Otherwise, the instructor will generally check Piazza at least once per day.

Literature

- Kirschen, Strbac, *Fundamentals of Power System Economics*, 2nd Edition, Wiley, 2019.
- Wood, Wollenberg, Sheblé, *Power Generation, Operation, and Control*, 3rd Edition, Wiley, 2014.
- Taylor. *Convex Optimization of Power Systems*. Cambridge UniversityPress, 2015.

Course Topics:

- Basic principles of electricity markets, price elasticity, market power
- Types of markets: capacity, energy, ancillary services, financial transmission rights, bilateral trading
- Comparison of actual markets
- Economic dispatch, locational marginal prices, co-optimization of energy and ancillary services
- Optimal power flow, solution methods, convex relaxations
- Unit commitment, mixed integer programming
- Robust and stochastic optimal power flow/unit commitment
- Incorporating renewable resources and demand response into markets
- Optimal infrastructure planning

Grading: Homework (20%), Project 1 (10%), Project 2 (30%), Midterms (40%)

Homework: There will be approximately six homework assignments. In addition to completing quantitative problems, you will also be asked to read academic reports/papers and write analyses. You are encouraged to discuss problems, solution approaches, and readings with your peers. However, your submitted solutions, code, write-ups, etc. must be your own work.

Projects: There will be two projects. The first will be a group project. The second will be an individual research project on a topic related to the course of your own choosing. Deliverables include a project proposal, project presentation, and final project report.

Exams: There will be two midterm exams. Exams are to be done entirely individually. Exact dates/details will be announced later in the semester. There is no final exam.

Re-grades: If you believe there is an error in the grading of your assignment or exam you may re- submit it for a re-grade within one week of receiving your grade. You must provide a detailed written explanation of the issue. Your grade may increase or decrease.

Late work: In fairness to all students, late work is not accepted. If there is an extenuating circumstance, please contact Prof. Dvorkin *well* before the due date.