



**EEL 4298: Power System Economics**  
*Department of Electrical and Computer Engineering*  
*College of Engineering and Computer Science*  
3 Credit Hours

**Course Syllabus**

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Instructor:	Qun Zhou Sun	Term:	Fall 2025
Office:	HEC 358	Class Days:	F
Office Hours:	M 10:30am -1:30pm	Class Time:	9:00am - 11:50am
Phone:	407-823-3284	Class Location:	CB2 O206
Email:	qzsun@ucf.edu	Course Modality:	F2F

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GTA(s):	Ibrahim Abbas	Email:	<a href="mailto:muhammadibrahim.abbas@ucf.edu">muhammadibrahim.abbas@ucf.edu</a>
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**Course Description**

Electric power systems are undergoing major changes worldwide. The restructuring process unbundles the traditional power sector into generation, transmission and demand. Operating and planning power systems under the restructuring poses challenges and needs knowledge of power economics and market. This course introduces concepts and techniques that are used in power system economics analysis and market operations.

**Course format**

The course is interactive, and students will be asked to work out problems in class.

**Required Texts**

D. S. Kirschen and G. Strbac, Fundamentals of Power System Economics, John Wiley & Sons, April 2004.

**Supplemental Texts and Helpful Resources**

J. Lin and H. M. Fernando, Electricity Markets: Theories and Applications, John Wiley & Sons, 2017.

**Software**

Python Programming Language  
Pyomo for Optimization

**Student Learning Outcomes****Course Objectives**

The course is designed for students to achieve the following:

- 1) Characterize existing electric industry structure and market systems.
- 2) Solve optimization especially linear programming problems.
- 3) Understand electricity market operations.
- 4) Determine electricity and transmission prices and understand risk-hedging products.

**Course Expectations**

Students are expected to grasp basic concepts of power system economics and markets, understand the decision-making process in daily operations, and learn to program in python and Pyomo for solving optimization problems.

**Enrollment Requirements**

Pre-requisite: EEL 3004

**Course Activities**

- 1) Introduction and background
  - a. Power industry restructuring process from vertically integrated utilities to the market structure with competition.
  - b. Models of competition: monopoly, purchasing agency, wholesale competition, retail competition.
- 2) Basic concepts from economics
  - a. demand and inverse demand functions, elasticity of demand, opportunity cost, supply and inverse supply functions, elasticity of supply, revenue and cost functions.
  - b. Market equilibriums and pareto efficiency.
  - c. Spot market, forward market/contract, futures market/contract, options.
  - d. Risk management, market efficiency.
  - e. Markets with imperfect competition: Cournot model and Bertrand model.
- 3) Markets for electric energy
  - a. Bilateral trading and electricity pools.

- b. Electricity spot market operations.
  - c. The settlement process.
- 4) Transmission networks
  - a. Physical and financial transmission rights
  - b. Transmission congestion management
  - c. Security constrained economic dispatch
  - d. Pricing electricity: Location marginal prices for energy, congestion and losses.
  - e. AC and DC power flow.
- 5) Power market participants
  - a. Utility maximization and cost minimization.
  - b. Economic dispatch and scheduling: generation no-load cost, startup cost, dynamic constraints.
  - c. Linear programming and mixed-integer programming.

*If time permits,*

- 6) System security and ancillary services
  - a. System balancing need
  - b. Ancillary services

## **Assessment and Grading Procedures**

### ***Assignment***

- Assignments include weekly homework and one course project.
- Assignments are submitted online through webcourse.
- For textbook homework, please submit the derivation procedure. If python coding is required, please also submit the code.
- For the course project, submit project report, presentation slides, and python code.

### ***Midterm Exam and Final Exam***

- Both midterm and final exams will be closed-book and closed-notes.
- Tentative midterm exam is in the week of 10/10/2025 in class, please prepare ahead of time. Also note that this date may be subject to change depending on class progress.
- Final exam is cumulative, covering the entire semester with emphasis on the second half.
- Final exam will be in the Final Examination Period. The date is 11/21/2025. Time is 9:00am-11:00am in class.

### ***Percent of Final Grade***

- Attendance: 10%

- Homework: 25%
- Project: 15%
- Midterm Exam: 25%
- Final Exam: 25%

### ***Grading Scale***

*(Grades at the breakpoints will round up to the higher level, e.g., 90 will be granted A-)*

- A: 93-100
- A-: 90-93
- B+: 87-90
- B: 83-87
- B-: 80-83
- C+: 77-80
- C: 73-77
- C-: 70-73
- D+: 67-70
- D: 63-67
- D-: 60-63
- F: 0-60

### ***Make-up Exams and Assignments***

The Undergraduate Catalog states, "Reasons for acceptable absences may include illness, serious family emergencies, special curricular requirements (e.g., judging trips, field trips, professional conferences), military obligations, severe weather conditions, and religious holidays." Our course policy regarding the late work includes the following:

- Late work grade reduction policy: 1 day 10% reduction, 2-day 30% reduction, 3-day 50% reduction, 4-day 70% reduction, 5-day 100% reduction.
- Policy/process to request an exception to the late/make up work policy: students are required to provide written notices with reasons identified above.
- Policy to request an extension before the due date: students are required to provide written notices with reasons identified above.

### ***Extra Credit***

We may have extra credits for our class interactions such as whole-class games. This will be announced later in the semester.

## Policy Statements

### **Academic Integrity**

Students should familiarize themselves with UCF's Rules of Conduct at <https://scai.sdes.ucf.edu/student-rules-of-conduct/>. According to Section 1, "Academic Misconduct," students are prohibited from engaging in

1. Unauthorized assistance: Using or attempting to use unauthorized materials, information or study aids in any academic exercise unless specifically authorized by the instructor of record. The unauthorized possession of examination or course-related material also constitutes cheating.
2. Communication to another through written, visual, electronic, or oral means: The presentation of material which has not been studied or learned, but rather was obtained through someone else's efforts and used as part of an examination, course assignment, or project.
3. Commercial Use of Academic Material: Selling of course material to another person, student, and/or uploading course material to a third-party vendor without authorization or without the express written permission of the university and the instructor. Course materials include but are not limited to class notes, Instructor's PowerPoints, course syllabi, tests, quizzes, labs, instruction sheets, homework, study guides, handouts, etc.
4. Falsifying or misrepresenting the student's own academic work.
5. Plagiarism: Using or appropriating another's work without any indication of the source, thereby attempting to convey the impression that such work is the student's own.
6. Multiple Submissions: Submitting the same academic work for credit more than once without the express written permission of the instructor.
7. Helping another violate academic behavior standards.
8. Soliciting assistance with academic coursework and/or degree requirements.

### **Responses to Academic Dishonesty, Plagiarism, or Cheating**

Students should also familiarize themselves with the procedures for academic misconduct in UCF's student handbook, *The Golden Rule* <https://goldenrule.sdes.ucf.edu/>. UCF faculty members have a responsibility for students' education and the value of a UCF degree, and so seek to prevent unethical behavior and respond to academic misconduct when necessary. Penalties for violating rules, policies, and instructions within this course can range from a zero on the exercise to an "F" letter grade in the course. In addition, an Academic Misconduct report could be filed with the Office of Student Conduct, which could lead to disciplinary warning, disciplinary probation, or deferred suspension or separation from the University through suspension, dismissal, or expulsion with the addition of a "Z" designation on one's transcript.

Being found in violation of academic conduct standards could result in a student having to disclose such behavior on a graduate school application, being removed from a leadership position within a student organization, the recipient of scholarships, participation in University activities such as study abroad, internships, etc.

Let's avoid all of this by demonstrating values of honesty, trust, and integrity. No grade is worth compromising your integrity and moving your moral compass. Stay true to doing the right thing: take the zero, not a shortcut.

### **Unauthorized Use of Websites and Internet Resources**

There are many websites claiming to offer study aids to students, but in using such websites, students could find themselves in violation of academic conduct guidelines. These websites include (but are not limited to) Quizlet, Course Hero, Chegg Study, and Clutch Prep. UCF does not endorse the use of these products in an unethical manner, which could lead to a violation of our University's Rules of Conduct. They encourage students to upload course materials, such as test questions, individual assignments, and

examples of graded material. Such materials are the intellectual property of instructors, the university, or publishers and may not be distributed without prior authorization. Students who engage in such activity could be found in violation of academic conduct standards and could face course and/or University penalties. Please let me know if you are uncertain about the use of a website so I can determine its legitimacy.

#### ***Unauthorized Distribution of Class Notes***

Third parties may attempt to connect with you to sell your notes and other course information from this class. Distributing course materials to a third party without my authorization is a violation of our University's Rules of Conduct. Please be aware that such class materials that may have already been given to such third parties may contain errors, which could affect your performance or grade. Recommendations for success in this course include coming to class on a routine basis, visiting me during my office hours, connecting with the Teaching Assistant (TA), and making use of the Student Academic Resource Center (SARC), the University Writing Center (UWC), the Math Lab, etc. If a third party should contact you regarding such an offer, I would appreciate your bringing this to my attention. We all play a part in creating a course climate of integrity.

#### ***In-Class Recording***

Students may, without prior notice, record video or audio of a class lecture for a class in which the student is enrolled for their own personal educational use. A class lecture is defined as a formal or methodical oral presentation as part of a university course intended to present information or teach enrolled students about a particular subject. Recording class activities other than class lectures, including but not limited to lab sessions, student presentations (whether individually or part of a group), class discussion (except when incidental to and incorporated within a class lecture), clinical presentations such as patient history, academic exercises involving student participation, test or examination administrations, field trips, private conversations between students in the class or between a student and the faculty member, and invited guest speakers is prohibited. Recordings may not be used as a substitute for class participation and class attendance, and may not be published or shared without the written consent of the faculty member. Failure to adhere to these requirements may constitute a violation of the University's Student Code of Conduct as described in the Golden Rule.

#### ***Course Accessibility Statement***

The University of Central Florida is committed to providing access and inclusion for all persons with disabilities. Students with disabilities who need access to course content due to course design limitations should contact the professor as soon as possible. Students should also connect with Student Accessibility Services (SAS) <<http://sas.sdes.ucf.edu/>> (Ferrell Commons 185, [sas@ucf.edu](mailto:sas@ucf.edu), phone 407-823-2371). For students connected with SAS, a Course Accessibility Letter may be created and sent to professors, which informs faculty of potential course access and accommodations that might be necessary and reasonable. Determining reasonable access and accommodations requires consideration of the course design, course learning objectives and the individual academic and course barriers experienced by the student. Further conversation with SAS, faculty and the student may be warranted to ensure an accessible course experience.

#### ***Campus Safety Statement***

Emergencies on campus are rare, but if one should arise during class, everyone needs to work together. Students should be aware of their surroundings and familiar with some basic safety and security concepts.

- In case of an emergency, dial 911 for assistance.
- Every UCF classroom contains an emergency procedure guide posted on a wall near the door. Students should make a note of the guide's physical location and review the online version at <<https://centralflorida-prod.modolabs.net/student/safety/index>>.

- Students should know the evacuation routes from each of their classrooms and have a plan for finding safety in case of an emergency.
- If there is a medical emergency during class, students may need to access a first-aid kit or AED (Automated External Defibrillator). To learn where those are located, see <https://ehs.ucf.edu/automated-external-defibrillator-aed-locations>.
- To stay informed about emergency situations, students can sign up to receive UCF text alerts by going to <https://my.ucf.edu> and logging in. Click on “Student Self Service” located on the left side of the screen in the toolbar, scroll down to the blue “Personal Information” heading on the Student Center screen, click on “UCF Alert”, fill out the information, including e-mail address, cell phone number, and cell phone provider, click “Apply” to save the changes, and then click “OK.”
- Students with special needs related to emergency situations should speak with their instructors outside of class.
- To learn about how to manage an active-shooter situation on campus or elsewhere, consider viewing this video (<https://youtu.be/NIKYajEx4pk>).

### ***Deployed Active Duty Military Students***

If you are a deployed active duty military student and feel that you may need a special accommodation due to that unique status, please contact your instructor to discuss your circumstances.