Fall 2023

ECE 617 - ECON CONT INTERCONNCTD PW SYS

Marcos Netto

Helen and John C. Hartmann Department of Electrical and Computer Engineering
New Jersey Institute of Technology

ECE 617: Economic Control of Interconnected Power Systems (3 credits, 3 contact hours)

Instructor: Marcos Netto, email: marcos.netto@njit.edu, tel.: 973-596-3507

Office: ECE Building, Room 337. **Office hours:** By appointment

Textbook:

- Allen J. Wood, Bruce F. Wollenberg, Gerald B. Sheblé, "Power Generation, Operation, and Control," 3rd Edition, John Wiley & Sons, 2014.

Additional reference:

- Antonio Gomez-Exposito, Antonio J. Conejo, Claudio Canizares, "Electric Energy Systems: Analysis and Operation," 2nd Edition, CRC Press, 2018.

Catalog Description:
An advanced course on power system operation and control. Topics include economic dispatch, unit commitment, optimal power flow, state estimation, and automatic generation control.

Prerequisites: All graduate students in the power system area are encouraged to take this course.

Corequisites: None

Specific course learning outcomes (CLO): The student will be able to

1. understand fundamental concepts in power system generation, operation, and control.
2. formulate power system problems as optimization problems.
3. apply linear and nonlinear programming, dynamic programming, and convex optimization techniques to power system problems.
4. understand the problems of economic dispatch, unit commitment, and optimal power flow. Understand their implication on power system operation.
5. understand power system state estimation and its critical importance for the real-time operation tasks performed at control centers.
6. understand the automatic generation control scheme.
7. understand the problem of short-term load forecasting.

Relevant student outcomes (ABET criterion 3):

1. an ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science, and mathematics. (CLOs 1–3)
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. (CLOs 4–7)

Computer assisted design and course specific software: MATLAB and PSS/E.

Course Schedule:

Week	Topic	Text section
1	Introduction to power generation, operation, and control	Chapters 1-2
2	Optimization with constraints / Linear programming	Chapter 3
3	Dynamic programming / Economic dispatch of thermal units	Chapter 3
4	Unit commitment	Chapter 4
5	Generation with limited energy supply	Chapter 5
6	Transmission system effects	Chapter 6
7	**Midterm Test**	
8	Power system security	Chapter 7
9	Optimal power flow	Chapter 8
10	Power system state estimation	Chapter 9
11	Power System state estimation	Chapter 9
12	Control of generation	Chapter 10
13	Interchange, pooling, brokers, and auctions	Chapter 11
14	Short-term demand forecasting	Chapter 12
16	**Final Exam**	

Grading Policy:

Homework 30%
Midterm Test 35%
Final Exam 35%

Homework:

Homework problems will be assigned regularly. Late homework will be penalized.

Midterm Test:

The test will be in class, and open book/notes.

Final Exam:

The final exam will be of the take-home type. It consists of a project and a report.

Updates and assignments: distributed via email and posted on Canvas.

Prepared by: M. Netto

Honor Code:

"Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu."