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

ECE 442: Power Systems (3 credits, 3 contact hours, required course)

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

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

Textbook:

- "Power System Analysis and Design" by J. Duncan Glover, Mulukutla S. Sarma, Thomas Overbye, and Adam Birchfield. 7th Edition, Cengage, 2023, ISBN: 9780357676264.

Catalog Description:
Introduction to power plants and power networks. Topics include transmission line parameters, system modeling, economic operations of power systems, load flow studies, short circuit analysis, and power system stability.

Prerequisites: ECE 341 or ECE 342

Corequisites: None

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

1. understand the importance of power systems to modern society.
2. calculate real power, reactive power, and understand the phasor domain.
3. obtain a model of a power system and its components.
4. calculate system response to static boundary conditions—power flow.
5. schedule generation economically.
6. calculate the system response under faulty conditions.
7. understand aspects of power systems controls.

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 2–7)
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 1–7)

Computer assisted design and course specific software: PowerWorld and MATLAB. The textbook includes PowerWorld examples and problems. You can download a free, educational version of the PowerWorld software using the following link: https://www.powerworld.com/gloveroverbyesarma. We will also occasionally use MATLAB to solve problems.

Tentative Course Schedule:

Week	Topic	Text section	Homework / Test
1	Introduction, power system operational problems, review of circuit theory, phasors, complex power	Sec. 2.1–2.3	HW1: 2.6, 2.9, 2.12, 2.24
2–3	Balanced three-phase systems, transformers, per unit system	Sec. 2.5–2.7, Ch. 3	HW2: 2.50, 3.2, 3.4, 3.16 HW3: 3.22, 3.23, 3.25, 3.28
4	R and L and C parameters of transmission lines	Ch. 4	HW4: 4.1, 4.6, 4.8, 4.9, 4.10, 4.11, 4.16, 4.23, 4.25, 4.31, 4.32, 4.33, 4.39, 4.40, 4.43
5	Medium and short line representation, network equations	Ch. 5 and Sec. 2.4	HW5: 2.35, 2.37, 5.1, 5.2, 5.11
6	Test 1		
6–7	Power flow methods	Sec. 6.2, 6.4, 6.5	HW6: 6.6, 6.7, 6.9, 6.28, 6.30, 6.31 (use MATLAB)
8–9	Power flow methods	Sec. 6.3, 6.6–6.9	HW7: 6.25, 6.43, 6.55
10	Economic dispatch	Ch. 7	HW8: 7.1, 7.2, 7.3, 7.4
11	Test 2		
11–12	Symmetrical faults	Ch. 8	HW9: 8.3, 8.12, 8.14, 8.23
13–14	Power system controls and review	Ch. 13	HW10: 13.5, 13.6, 13.7, 13.14

Homework Policy:
Homework problems will be assigned regularly. Solutions will be posted online and discussed in class. The text contains numerous examples. Students are encouraged to study these examples and to work on additional problems for practice. Late homework will be penalized.

Grading Policy:

Class participation	10
Homework	30
Test 1	20
Test 2	20
Final Exam	20
Total	100

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

Prepared by: M. Netto

Academic integrity:

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 code of Academic Integrity policy that is found at: NJIT Academic Integrity Code.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Office of the Dean of Students. 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 Office of the Dean of Students at dos@njit.edu.

Generative AI:

This course expects students to work without artificial intelligence (AI) assistance in order to better develop their skills in this content area. As such, AI usage is not permitted throughout this course under any circumstance.

Student absences for religious observance:

NJIT is committed to supporting students observing religious holidays. Students must notify the instructor in writing of any conflicts between course requirements and religious observances, ideally by the end of the second week of classes and no later than two weeks before the anticipated absence.