

ECE 431, Introduction to Feedback Control Systems

Fall 2023

Instructor:

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Office Hours:

- > For simple questions, please email me. My email client fetches new emails automatically every minute and notifies me in real-time. I usually reply quite timely.
- > If you'd like to meet in person, please email me in advance to setup a time.
- > I'm usually available for quick discussions right before and after each lecture in the classroom.

Course description: An introduction to feedback control of dynamic systems, with a focus on the theories of Classical Control. Transfer functions are studied as a fundamental tool for modeling, with graphic tools such as Nyquist/Bode plots and root locus as stability and performance analysis tools. The theories are related to important applications such as the embedded real-time control of servo systems.

Prerequisite: ECE 333 (or ECE 232) and MATH 337

Reference Books: (no need to buy – will be explained in the first lecture)

- > Control Systems Engineering, Norman Nise, 6th edition
- > Modern Control Engineering, Katsuhiko Ogata, 5th edition

Software: MATLAB, <http://ist.njit.edu/software/download.php>

Lecture Mode: face-to-face

Homework:

Please submit to “Assignments” on Canvas. Either typed documents or scanned / photographed versions are fine. If you choose to scan or take photos, please make sure that the writings can be seen clearly and the file size is not over large (preferably under 5M).

Exams:

Midterm + Final, both in-person.

Tentative Grading Weights (subject to adjustment):

Homework - 28%

Midterm - 36%

Final Exam - 36%

Tentative Schedule:

Week	Date	Contents
1	Sep 6	(Sep 4 is Labor day) Introduction to dynamic systems, controls, and feedback
2	Sep 11, 13	Modeling with physics and differential equations Linear and non-linear systems
3	Sep 18, 20	Integral transformations and Laplace transforms
4	Sep 25, 27	Transfer functions and frequency responses
5	Oct 2, 4	Frequency responses Time response of basic systems
6	Oct 9, 11	Block diagrams Correlation between time domain and s-domain
7	Oct 16, 18	Graphic tools – Bode plots
8	Oct 23, 25	Graphic tools – Nyquist plots
9	Oct 30, Nov 1	Stability
10	Nov 6, 8	Design of control laws PID control
11	Nov 13, 15	Graphic tools – Root locus
12	Nov 20	Midterm exam (no lecture on Nov 22, Friday classes meet)
13	Nov 27, 29	Performance analysis and compensation
14	Dec 4, 6	Performance analysis and compensation
15	Dec 11, 13	State space methods Review
16	To be determined	Final exam

University Statement on 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 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