ECE 431, Introduction to Feedback Control Systems
Fall 2024

Instructor:
Cong Wang
Office: 313 ECEC
Phone Number: (973)596-5744
E-mail: wangcong@njit.edu

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 - 32%
Midterm - 32%
Final Exam - 36%

Tentative Schedule:

Week	Date	Contents
1	Sep 4	(Sep 1 is Labor day) Introduction to dynamic systems, controls, and feedback
2	Sep 9, 11	Modeling with physics and differential equations Linear and non-linear systems
3	Sep 16, 18	Integral transformations and Laplace transforms
4	Sep 23, 25	Transfer functions and their frequency responses
5	Sep 30, Oct 2	Frequency responses Time response of basic systems
6	Oct 7, 9	Correlation between time domain and frequency domain
7	Oct 14, 16	Block diagrams Graphic tools – Nyquist plots
8	Oct 21, 23	Graphic tools – Bode plots
9	Oct 28, 30	Stability
10	Nov 4, 6	Stability
11	Nov 11, 13	Midterm exam Design of control laws
12	Nov 18, 20	PID control Performance analysis and compensation for PID control
13	Nov 25	Performance analysis and compensation for PID control (no lecture on Nov 27, Friday classes meet)
14	Dec 2, 4	Performance analysis and compensation for PID control Root locus
15	Dec 9, 11	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