EE478 Control Systems

School of Engineering and Science

Spring 2025

Instructor: Yi Guo
Canvas Course Address: https://sit.instructure.com/courses/77296
Course Schedule: Friday 2:00pm-4:50pm
Contact Info: yguo1@stevens.edu (201) 216 5658
Office Hours: Wednesday 3:00pm-4:00pm, Friday 1:00pm-2:00pm
Office Location: Burchard 202
Prerequisite: EE348

COURSE DESCRIPTION

Introduction to the theory and design of linear feedback and control systems in both digital and analog form, review of z-transform and Laplace transforms, time domain performance error of feedback systems, PID controller, frequency domain stability, including Nyquist stability in both analog and digital form, frequency domain performance criteria and design, such as via the gain and phase plots, state variable analysis of linear dynamical systems, elementary concepts of controllability, observability and stability via state space methods, and pole placement and elements of state variable design for single-input single-output systems.

STUDENT LEARNING OUTCOMES

After successful completion of this course,

- Student will be able to find the transfer function from a differential equation;
- Student will be able to reduce a block diagram of multiple subsystems to a single block representing the transfer function from input to output;
- Student will be able to make and interpret a basic Routh table to determine the stability of a system;
- Student will be able to design the gain of a closed-loop system to meet a steady-state error specification.

Lecture Time and Location

Lecture: Friday 2:00pm-4:50pm
Location: Burchard 104

TENTATIVE COURSE SCHEDULE

Week	Date	Topic
1	24-Jan	Introduction to control, review of Laplace transform
2	31-Jan	Transfer function modeling, block diagram, state space representation
3	7-Feb	Feedback, Mason's rule, closed-loop, poles and zeros
4	14-Feb	Stability, Routh's stability criterion
5	21-Feb	Transient behavior and steady-state error
6	28-Feb	Root locus
7	7-Mar	Review for midterm exam
8	14-Mar	**Midterm Exam**
9	21-Mar	Spring Recess. No Class.
10	28-Mar	Root locus design
11	4-Apr	PID control
12	11-Apr	Lead/lag compensator
13	18-Apr	Good Friday. No Class.
14	25-Apr	Frequency response techniques, Bode plot
15	2-May	Nyquist diagram and Nyquist criterion
16	7-May	(Last day of class. Friday class schedule.) Review for final exam

COURSE MATERIALS

Textbook: Norman S. Nise, *Control Systems Engineering*, Eighth Edition. Wiley, 2019.

Reference book: Gene F. Franklin, David Powell, Abbas F. Emami-Naeini, *Feedback Control of Dynamic Systems*, Eighth Edition. Pearson, 2021.

COURSE REQUIREMENTS

Attendance: Attendance of lectures is mandatory. Attendance verification is reported to university during the semester following university policy.

Homework: Homework will be assigned regularly in class, and the due time will be announced in class. Late submission will not be accepted. Possible revision of grades may be discussed immediately following the announcement of grades (no later than one week from it).

Quizzes: In-class pop-up quizzes will be offered a few times throughout the semester. They are designed to help inform the instructor whether students understand course content. There will be no make-up quizzes unless documented sickness or emergency is provided by the student.

Midterm Exam: The midterm exam will be held in class as scheduled in Section "Tentative Course Schedule".

Final Exam: The final exam will be held according to Stevens final exam schedule.

Exam policies: It is the student's responsibility to keep track of exam dates. There will be no make-up exams unless documented sickness or emergency is provided by the student. Possible revision of grades may be discussed immediately following the return of the test papers, and no late than a week from the announcement of grades. Any act of academic dishonesty will result in a failing grade.

TECHNOLOGY REQUIREMENTS

Baseline technical skills necessary for online courses

- Basic computer and web-browsing skills
- Navigating Canvas

Technology skills necessary for this specific course

- Live web conferencing using Zoom for Online Lectures and Virtual Office Hours, if needed

Required Equipment

- Computer: PC with Linux, or PC with Windows 7+, or Mac (OS X) with high-speed internet connection

Required Software

- Matlab

GRADING PROCEDURES

Grades will be based on:

Homework 15%
In-class Quizzes: 15%
Midterm Exam 30%
Final Exam (comprehensive) 40%

Late Policy

Late assignment will not be accepted.

Academic Integrity

Undergraduate Honor System

Enrollment into the undergraduate class of Stevens Institute of Technology signifies a student's commitment to the Honor System. Accordingly, the provisions of the Stevens Honor System apply to all undergraduate students in coursework and Honor Board proceedings. It is the responsibility of each student to become acquainted with and to uphold the ideals set forth in the Honor System Constitution. More information about the Honor System including the constitution, bylaws, investigative procedures, and the penalty matrix can be found online at http://web.stevens.edu/honor/

The following pledge shall be written in full and signed by every student on all submitted work (including, but not limited to, homework, projects, lab reports, code, quizzes and exams) that is assigned by the course instructor. No work shall be graded unless the pledge is written in full and signed.

"I pledge my honor that I have abided by the Stevens Honor System."

Reporting Honor System Violations

Students who believe a violation of the Honor System has been committed should report it within ten business days of the suspected violation. Students have the option to remain anonymous and can report violations online at www.stevens.edu/honor.

EXAM CONDITIONS

The following procedures apply to quizzes and the exams for this course.

1. Students may use the following materials during quizzes and exams. Any materials that are not mentioned in the list below are not permitted.

Material	Permitted?	
	Yes	No
Handwritten Notes		X
Typed Notes		X
Textbooks		X
Readings		X
Nonprogrammable Calculator	X	

2. Students are not allowed to work with or talk to other students during quizzes and exams.

LEARNING ACCOMODATIONS

Stevens Institute of Technology is dedicated to providing appropriate accommodations to students with documented disabilities. The Office of Disability Services (ODS) works with undergraduate and graduate students with learning disabilities, attention deficit-hyperactivity disorders, physical disabilities, sensory impairments, psychiatric disorders, and other such

disabilities in order to help students achieve their academic and personal potential. They facilitate equal access to the educational programs and opportunities offered at Stevens and coordinate reasonable accommodations for eligible students. These services are designed to encourage independence and self-advocacy with support from the ODS staff. The ODS staff will facilitate the provision of accommodations on a case-by-case basis.

For more information about Disability Services and the process to receive accommodations, visit https://www.stevens.edu/student-diversity-and-inclusion/disability-services. If you have any questions please contact: Phillip Gehman, the Director of Disability Services Coordinator at Stevens Institute of Technology at pgehman@stevens.edu or by phone: 201.216.3748.

Disability Services Confidentiality Policy

Student Disability Files are kept separate from academic files and are stored in a secure location within the Office of Disability Services. The Family Educational Rights Privacy Act (FERPA, 20 U.S.C. 1232g; 34CFR, Part 99) regulates disclosure of disability documentation and records maintained by Stevens Disability Services. According to this act, prior written consent by the student is required before our Disability Services office may release disability documentation or records to anyone. An exception is made in unusual circumstances, such as the case of health and safety emergencies.

INCLUSIVITY

Name and Pronoun Usage

As this course includes group work and class discussion, it is vitally important for us to create an educational environment of inclusion and mutual respect. This includes the ability for all students to have their chosen gender pronoun(s) and chosen name affirmed. If the class roster does not align with your name and/or pronouns, please inform the instructor of the necessary changes.

Inclusion Statement

Stevens Institute of Technology believes that diversity and inclusiveness are essential to excellence in academic discourse and innovation. In this class, the perspective of people of all races, ethnicities, gender expressions and gender identities, religions, sexual orientations, disabilities, socioeconomic backgrounds, and nationalities will be respected and viewed as a resource and benefit throughout the semester. Suggestions to further diversify class materials and assignments are encouraged. If any course meetings conflict with your religious events, please do not hesitate to reach out to your instructor to make alternative arrangements.

You are expected to treat your instructor and all other participants in the course with courtesy and respect. Disrespectful conduct and harassing statements will not be tolerated and may result in disciplinary actions.

MENTAL HEALTH RESOURCES

Part of being successful in the classroom involves a focus on your whole self, including your mental health. While you are at Stevens, there are many resources to promote and support mental health. The Office of Counseling and Psychological Services (CAPS) offers free and confidential services to all enrolled students who are struggling to cope with personal issues (e.g., difficulty adjusting to college or trouble managing stress) or psychological difficulties (e.g., anxiety and depression). Appointments are can be made by phone (201-216-5177).

EMERGENCY INFORMATION

In the event of an urgent or emergent concern about the safety of yourself or someone else in the Stevens community, please immediately call the Stevens Campus Police at 201-216-5105 or on their emergency line at 201-216-3911. These phone lines are staffed 24/7, year round. For students who do not reside near the campus and require emergency support, please contact your local emergency response providers at 911 or via your local police precinct. Other 24/7 national resources for students dealing with mental health crises include the National Suicide Prevention Lifeline (1-800-273-8255) and the Crisis Text Line (text "Home" to 741-741). If you are concerned about the wellbeing of another Stevens student, and the matter is *not* urgent or time sensitive, please email the CARE Team at care@stevens.edu. A member of the CARE Team will respond to your concern as soon as possible.