

University of California, Santa Cruz, Electrical and Computer Engineering
Department

ECE141: Feedback Control Systems

Summer 2024 classes: Mon/Wed 09:00am-12:30pm

Prof. Dejan Milutinović

Classroom: J Baskin Engr 372

Discussion section: Fri 10:00-11:00am

Office hours : Fri 11:00am-12:00pm

Section room: J Baskin Engr 165

Web page *: <https://sites.google.com/ucsc.edu/ece141summer24>

Control of continuous linear dynamic systems. Design of feedback controllers for disturbance rejection, stability, command-following error, and dynamic response specifications. Root locus and frequency response design techniques. Nyquist stability criterion. Design of dynamic compensators. Examples are drawn from electrical and mechanical applications. Computer-aided design with MATLAB, SIMULINK and a virtual environment robot simulation platform. Prerequisite(s): ECE 141 catalog ([link](#))

Computer requirements: To be able to follow all course activities, students are required to have a high-speed internet and a computer with the capability to communicate via zoom. To work on assignments, students will need a computer on which they can run Matlab and the virtual robot simulator V-REP*. Since the submission of assignments will be online, students need to be able to create pdf documents that will include their writing, figures and computer-typed text.

***Students are advised to regularly check the course webpage for updates.**

Tentative week-by-week course plan:

- Week 1 Introduction: Why Feedback Control? Homework 1 material and feedback control examples (suggested reading: Textbook, Ch1)
Dynamic models: Ordinary Differential Equation Models (ODEs); Laplace Transform (review)
- Week 2 System Modeling Diagrams and Time-Domain Specifications
Poles, Zeros and Stability
- Week 3 Analysis of Feedback Loops and PID control
Root Locus Method
- Week 4 Nyquist Stability Criterion
Gain and Phase Margins
- Week 5 State-Space Design
Selected topics/Review

Final exam: Wed, July 24, 9am-12pm

Textbook: Feedback Control of Dynamic Systems, by Franklin, Powell and Emami-Naeini (recommended)

Lecture notes: My lecture notes will be used as the basis for the course and the final exam. The notes will be posted on the course webpage under the link "Course Material"¹. Audio/video recording and taking photos of the class are not permitted.

Homework will be posted on the course webpage. Homework deadlines are firm; NO LATE homework will be accepted for any reason. Your weakest (one) homework score will be dropped. Also, if you do not have all of the homework done, turn in what you have managed to do by the deadline. The submission instructions will be provided as part of the assignments. All questions regarding the homework solutions should be addressed to Prof. Milutinović. Please bear in mind that your scores will be heavily based on the quality and completeness of problem solutions, and not only on their correctness. All submitted work should be done individually.

Final grade will be based on your homework 35%, final exam 55%, and 10% for the class attendance above 70%. If your score on the final exam is lower than 50, and your overall score in the class is higher than 77, then your grade will be C+ regardless of the overall score in the class. In all other cases, the ranges from the table on the class webpage apply. The exam work not submitted scores 0.

E-mail: It is essential that your e-mail message contains a proper salutation. In addressing me, both in person/via zoom and by e-mail, please use the appropriate title, which is "Professor". Always use your ucsc e-mail addresses in your correspondence with me.

For DRC students: UC Santa Cruz is committed to creating an academic environment that supports its diverse student body. If you are a student with a disability who requires accommodations to achieve equal access in this course, please submit your Accommodation Authorization Letter from the Disability Resource Center (DRC) to me, preferably in the first week of the summer session. At that time, we can discuss ways to ensure your full participation in the course. Contact DRC at 831-459-2089 (voice) or <http://drc.ucsc.edu> for more information on the requirements and/or process.

Note: For any questions, I am available during my lectures and office hours.

Cheating: Cheating in any form will not be tolerated. Cheating devalues everyone's grades:

¹Please note that students may be disciplined for selling, preparing, or distributing course lecture notes for any commercial purpose, whether or not the student himself or herself took the notes.

- you shouldn't tolerate it either
- students who help others cheat are also cheaters.
- students caught cheating will be dropped from the course and receive a failing grade.
- such students will also be reported to the department chair.

Academic integrity: By enrolling in the university, students are automatically agreeing to abide by policies, including those on academic misconduct. Academic integrity and scholarship are core values that should guide our conduct and decisions as members of the UCSC community. Plagiarism and cheating contradict these values, and so are very serious academic offenses. Penalties can include a failing grade in an assignment or in the course, or suspension or expulsion from the university. Students are expected to familiarize themselves with and follow citation practices and the university's Rules of Conduct regarding student conduct and discipline. (<https://deanofstudents.ucsc.edu/student-conduct/student-handbook/>)