



## ELE 412/612 – Modern Control Systems

### Spring 2022

- **Lectures:** MonWed 2:15pm–3:35pm, 221D Shaffer Art Bldg
- **Instructor:** Makan Fardad  
Office: 3-189 SciTech  
Email: [makan@syr.edu](mailto:makan@syr.edu)  
Office hours: MonWed 10:00am–11:00am
- **URL:** [http://ecs.syr.edu/faculty/fardad/index\\_ELE612.htm](http://ecs.syr.edu/faculty/fardad/index_ELE612.htm)
- **Prerequisites:** ELE 312 or some exposure to control systems; basic knowledge of linear algebra or matrix analysis; basic knowledge of ordinary differential equations and the Laplace transform; familiarity with MATLAB; and most importantly, willingness to learn.
- **Course Topics:** Linear algebra review; state variables and state-space realizations; solving state-space equations; review of Laplace transform; time response and state transition matrix; controllability; observability; state feedback; state observers; separation of observation and feedback; model-based controllers; optimal regulators; introduction to optimal estimation and Kalman filtering.
- **Course Objectives:** The aim of this course is to learn how to analyze and design linear control systems using state-space methods, which can be thought of as a time-domain parallel to the frequency-domain methods taught in classical control systems courses.
- **Texts:**
  - Primary source: Instructor’s lecture notes.
  - Supplementary text 1: Mohammed Dahleh, Munther Dahleh, and George Verghese, *Lectures on Dynamic Systems and Control*.
  - Supplementary text 2: Thomas Kailath, *Linear Systems*. Prentice Hall.
  - Supplementary text 3: William L. Brogan, *Modern Control Theory*. Prentice Hall, 3rd Ed.
- **Lecture Notes:** Instructor’s lecture notes for the entire semester are available on the class website.
- **Grading Policy:** Your overall grade will be determined based on the following distribution.

Attendance:	Class attendance and participation in discussions	15%
Homework:	Assigned approximately every week; collected electronically	25%
Midterm:	Wednesday, Mar 23, 2:15pm–3:35pm	30%
Final:	Wednesday, May 04, 2:15pm–3:35pm; comprehensive	30%

Your overall grade for this course will *not* depend on how well other students have done. It is possible (in fact, much desired) for every student to get an A. Numerical scores, rounded to whole numbers, will be converted to letter grades as follows:

Overall score (%)	Letter grade
91-	A
86-90	A-
81-85	B+
76-80	B
71-75	B-
66-70	C+
61-65	C
56-60	C-
00-55	F

- Homework Collection:** Your homework should be *scanned and emailed to the instructor by noon* on the day that it is due. Please send your homework as *one pdf document* and include your last name, course number, and homework number in the name of the file in the format `LastName_Course#_Hw#.pdf`; for example `Fardad_ELE612_Hw1.pdf`. Homework solutions will be posted on the class website soon after the deadline and late homework will not be accepted. While discussions on homework problems are allowed, even encouraged, it is critical that assignments be completed individually and not as a team effort. *Homework copied from any source is considered plagiarism and will be reported to the Office of Academic Integrity.*
- Academic Integrity:** Syracuse University's Academic Integrity Policy reflects the high value that we, as a university community, place on honesty in academic work. The policy defines our expectations for academic honesty and holds students accountable for the integrity of all work they submit. Students should understand that it is their responsibility to learn about course-specific expectations, as well as about university-wide academic integrity expectations. The policy governs appropriate citation and use of sources, the integrity of work submitted in exams and assignments, and the veracity of signatures on attendance sheets and other verification of participation in class activities. The policy also prohibits students from submitting the same work in more than one class without receiving written authorization in advance from both instructors. Under the policy, students found in violation are subject to grade sanctions determined by the course instructor and non-grade sanctions determined by the School or College where the course is offered as described in the Violation and Sanction Classification Rubric. Syracuse University students are required to read an online summary of the University's academic integrity expectations and provide an electronic signature agreeing to abide by them twice a year during pre-term check-in on MySlice. The Violation and Sanction Classification Rubric establishes recommended guidelines for the determination of grade penalties by faculty and instructors, while also giving them discretion to select the grade penalty they believe most suitable, including course failure, regardless of violation level. Any established violation in this course may result in course failure regardless of violation level.

All academic integrity expectations that apply to in-person quizzes and exams also apply to online quizzes and exams. In this course, all work submitted for quizzes and exams must be yours alone. Discussing quiz or exam questions with anyone during the quiz or exam period violates academic integrity expectations for this course. Using websites that charge fees or require uploading of course material (e.g. Chegg, Course Hero) to obtain exam solutions or assignments completed by others and present the work as your own violates academic integrity expectations in this course.

- Diversity, Inclusion, and Disability-Related Accommodations:** Syracuse University values diversity and inclusion; we are committed to a climate of mutual respect and full participation. There may be aspects of the instruction or design of this course that result in barriers to your inclusion and full participation in this course. I invite any student to contact me to discuss strategies and/or accommodations

(academic adjustments) that may be essential to your success and to collaborate with the Center for Disability Resources (CDR) in this process. If you would like to discuss disability-accommodations or register with CDR, please visit Center for Disability Resources <https://disabilityresources.syr.edu/>. Please call (315) 443-4498 or email [disabilityresources@syr.edu](mailto:disabilityresources@syr.edu) for more detailed information. The CDR is responsible for coordinating disability-related academic accommodations and will work with the student to develop an access plan. Since academic accommodations may require early planning and generally are not provided retroactively, please contact CDR as soon as possible to begin this process.

- **Religious Observances Policy:** SU religious observances policy recognizes the diversity of faiths represented among the campus community and protects the rights of students, faculty, and staff to observe religious holidays according to their tradition. Under the policy, students are provided an opportunity to make up any examination, study, or work requirements that may be missed due to are religious observance provided they notify their instructors before the end of the second week of classes. For fall and spring semesters, an online notification process is available through MySlice/StudentServices/Enrollment/MyReligiousObservances/AddaNotification from the first day of class until the end of the second week of class. For more information on SU's religious observance policy, see [http://supolicies.syr.edu/emp\\_ben/religious\\_observance.htm](http://supolicies.syr.edu/emp_ben/religious_observance.htm).