Georgia Institute of Technology
George W.Woodruff School of Mechanical Engineering
ME6401 Linear Control Systems
Fall 2026

Professor:	**Dr. Nader Sadegh** Office: MARC 475, Tel: 404-894-8172 Office Hours: TBD Email: sadegh@ gatech.edu	
GTA	**TBD**	
Prerequisite:	ME4452 (Control of Dynamics Systems) or equivalent; Some Knowledge of Linear Algebra	
Scope:	Theory and applications of linear systems, state space representation (controllability, observability, realization), stability, feedback control, observers, optimal control and estimation, linear quadratic Guassian (LQG) control. Mechatronics and aerospace examples.	
Textbooks:	Required: *Linear Systems Theory* by João P. Hespanha, 2ed, Priceton University Press, 2019. Recommended: 1. Linear State-Space Control Systems by Robert L. Williams II (Author), Douglas A. Lawrence, Wiley 2007 (available online). 2. Control Systems: https://en.wikibooks.org/wiki/Control_Systems/Print_version 3. *Feedback Systems* by Karl J. Astrom and Richard M. Murray, Priceton University Press, 2010. Online: http://www.cds.caltech.edu/~murray/books/AM05/pdf/am08-complete_22Feb09.pdf.	
Additional References:	1. Chen, C-T., Linear System Theory and Design, Oxford University Press, 2012. 2. L. Brogan, *Modern Control Theory* by, Prentice Hall, 3/ed, 1991. 3. Szidarovszky, F. and Bahill, A.T. , *Linear Systems Theory*, 2/ed, CRC Press, 1998 4. Bay, J.S., *Fundamentals of Linear State Space Systems*, McGraw-Hill, 1999. 5. Kailath, T, *Linear Systems*, Prentice Hall, 1980. 6. Lewis, F. and V.L. Syrmos, *Optimal Control*, Wiley Inter-science, 2/ed, 1995.	
Homework	The homework problems will be assigned weekly and the solutions to *some* of the problems will be placed on Canvas.	
Computer Usage:	Matlab will be used as a supplementary software program for this course. A large number of homework problems assigned throughout the semester may require computer aided design and simulation provided by Matlab.	
Grading Policy:	Homework …… 3 Midterm Tests ……..…..…… Final Exam .....……	12% 53% 35%

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Letter Grades:	The following grades are guaranteed:	90.0% + A 80.0% + B 70.0% + C 65.0% + D < 65% F
Class Attendance:	In-Person class attendance for on-campus students is highly encouraged but absences for valid personal and professional reasons are understood. All the lectures are recorded and posted on Canvas for asynchronous viewing by both on-campus and DL students.	
Tests	All 3 midterms and final exam will be open-book and open-notes. They will be available on Canvas during the class time for the on-campus students (A-section) and from 8:00am-midnight for the DL students (Q-section) on the scheduled dates. Unless specified otherwise, the test and homework due dates are the same for both A and Q sections. All the exams are digitally proctored by Honorlock.	
Homework	The homework problems will be assigned weekly and the solutions to *some* of the problems will be placed on Canvas.	
Computer Usage:	Matlab will be used as a supplementary software program for this course. A large number of homework problems assigned throughout the semester may require computer aided design and simulation provided by Matlab.	
Class Attendance:	In-Person class attendance for on-campus students is highly encouraged but absences for valid personal and professional reasons are understood. All the lectures are recorded and posted on Canvas for asynchronous viewing by both on-campus and DL students.	

Academic Honesty
The Student Conduct Code is described in the current Georgia Tech General Catalog. All items in the Honor Code under the topic of Academic Misconduct apply to this class. In particular, the following items are considered to be cheating:

- Submission of a computer program that is copied from another student.
- Communicating with classmates or others during the online quizzes and exams.
- Copying from another student's paper during an exam.
- Alteration of graded tests submitted for regarding.

Academic misconduct will be reported to the Vice President for Student Affairs as described in the General Catalog.

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Course Homeworks/Assignments/Papers

All course assignments will be submitted electronically via Canvas under the Assignment menu.

Exam Proctoring

This course will use digital proctoring for exams (indicate all or some of the exams). The following are required of students:

- Include important HonorlockLinks to an external site. technical requirements.
- Students must have a broadband internet connection.
- Students must have a webcam and microphone.
- Students must have a secure private location to take an exam.
- Students will be asked to provide a picture ID and take a picture of themselves via a webcam as part of the exam process.
- Honorlock is not compatible with Linux OS, Virtual Machines, tablets, or smartphones
- Honorlock requires the installation of Google Chrome and the Honorlock Chrome extension.

Tentative Course Outline:

	Topics	Text sections	Lectures
1.	Introduction to Dynamic Systems and control	Class Notes	1
2.	State-Space Linear Systems	1.1-1.2	1
3.	Linearization	2.1-2.3	2
4.	Basic Linear System Concepts & Laplace Transform;	3.1-3.5	2
5.	Time Response Analysis of Linear Systems; **Test #1 (9/20)**	Ch. 5-6	4
6.	Modal Decomposition; Jordan Normal Forms	Ch. 7	3
7.	Stability	8.1-8.3;9.1-9.4	3
8	Controllability and Reachability	Ch. 11-14	4
8.	Stabilizability and State Feedback Control; **Test #2 (10/25)**	Ch. 14	3
9.	Observability and Constructability	Ch. 15	3
8.	Observer Design and Output Feedback Control	Ch. 16	3
9.	Minimal Realizations	Ch. 17,19	2
10.	Linear Quadratic (LQR) Optimal Control	Ch. 10,20-22	3
11.	Optimal Estimation and LQG Regulator **Test #3 (11/25)**	Ch. 23	2
12	Review		3