



Control System Theory and Applications

MECG 630 - Spring 2022

3 Credits

Instructor Info —



Masoud Masoumi



Office Hrs: Tue & Fri 1-2pm



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Course Info —



Fridays



3:30-6:20pm



Classroom: LEO 242

Overview

System model formulation; transfer functions and block diagrams; linear control and feedback systems; root-locus method will be covered along with control hardware and schematic diagrams. Case studies and applications to various engineering systems will be used to introduce students to the principles of control system design.

Learning Objectives

- Modeling of linear systems using Laplace transform
- Investigating linear systems for stability using different methods
- Investigating system accuracy by analyzing steady state error
- Improving the system response by introducing PID controllers
- Tuning PID controllers
- Investigating frequency response using Bode and Nyquist Diagrams

Material

Required Text

Control Systems Engineering by Norman S. Nise, 7th Edition, Wiley (2014)

Recommended Text

Modern Control Systems by Richard C. Dorf and Robert H. Bishop, 13th Edition, Pearson (2016)

Other

Any handouts, required journal articles and additional book chapters will be provided.

Grading Scheme

25%	Exam I	A	Grade $\geq 93\%$
		A ⁻	$90\% \leq \text{Grade} < 93\%$
		B ⁺	$87\% \leq \text{Grade} < 90\%$
25%	Exam II	B	$83\% \leq \text{Grade} < 87\%$
		B ⁻	$80\% \leq \text{Grade} < 83\%$
		C ⁺	$77\% \leq \text{Grade} < 80\%$
30%	Final Exam	C	$73\% \leq \text{Grade} < 77\%$
		C ⁻	$70\% \leq \text{Grade} < 73\%$
		D ⁺	$65\% \leq \text{Grade} < 70\%$
20%	Project	D	$60\% \leq \text{Grade} < 65\%$
		F	Grade $< 60\%$

Class Policy & Attendance

Due to the nature of the materials covered in this course, regular attendance is highly recommended. Students are required to fulfill all course requirements as detailed in the course syllabi for their registered courses. Implicit in these requirements is completion of all course assignments and attendance in all classes. Also, if I believe that a student's failure to attend class is substantially affecting his/her course grade, I am obligated to report the situation to the dean of the school in which the student is matriculated. The dean will address the situation with the student. In case you miss a class, it is your responsibility to keep up with the class work and be informed of all announcements in class such as homework assignments, quizzes, etc. Cell phones and all other forms of electronic communication devices, if carried into the classroom, must be turned off. The use of computers and other electronic devices during class is restricted to classroom activities and course applications.

FAQs

? What if my schedule does not allow me to attend office hours?

! You are more than welcome to make an appointment whenever you have a question or concern by contacting me via email.

? What is the topic for the projects?

! The details for the project and the deadlines will be announced during the semester. As a general guideline, you will have to model a system, study its behavior, and design a controller for it. You will need to use MATLAB in the process

? Is there any online resource that you suggest for this course?

! There are many references and materials available for the topics covered in this course. However, a recommended resource is this YouTube channel, explaining most of the concepts we cover in this course: <https://www.youtube.com/user/ControlLectures/playlists>.

Academic Integrity

The college Community Standards & Student Code of Conduct is central to the ideals of this course. Students are expected to be independently familiar with the code and to recognize that their work in the course is to be their own original work that truthfully represents the time and effort applied. Violations of the Academic Policies of the Community Standards & Student Code of Conduct are most serious and will be handled in a manner that fully represents the extent of the Code and that befits the seriousness of its violation. See the code here <https://inside.manhattan.edu/student-life/dean-of-students/code-conduct.php#academicintegrity> for more information.

Diversity and Inclusivity

I consider this classroom to be a place where you will be treated with respect, and I welcome individuals of all ages, backgrounds, beliefs, ethnicities, gender identities, national origins, religious affiliations, sexual orientations, ability, and other visible and non-visible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class.

Accommodations for Students with Special Needs

If you are a student with learning needs that require special accommodation, contact the Accommodation Administrator in Specialized Resource Center (SRC) located in Thomas Hall, Room 3.15 as soon as possible to make an appointment to discuss your special needs. Once your Academic Adjustment/ Auxiliary Form is approved, please meet with me during my office hours and bring the form. You can find more information about SRC and the procedure on their website <https://inside.manhattan.edu/academic-resources/specialized-resource-center/index.php>.

Class Schedule

The course will tentatively follow this schedule :

Week	Topic	Textbook Chapter	Date
Week 1	Introduction	1	Jan 21 st
Week 2	System Modeling	2.1-2.8	Jan 28 th
Week 3	System Modeling	2.1-2.8	Feb 4 th
Week 4	System Response	4.1-4.6	Feb 11 th
Week 5	Multiple Subsystems Reduction	5.1-5.3	Feb 18 th
	Stability	6.1-6.4	
Week 6	Exam I		Feb 25 th
Week 7	Steady-State Error	7.1-7.6	Mar 4 th
Week 8	Root Locus Techniques	8.1-8.10	Mar 11 th
	Spring Break - No Class		Mar 18 th
Week 9	Root Locus Techniques	8.1-8.10	Mar 25 th
	Design via Root Locus	9.1-9.5	
Week 10	Design via Root Locus	9.1-9.5	Apr 1 st
Week 11	Exam II		Apr 8 th
Week 12	Easter Holiday - No Class		Apr 15 th
Week 13	Frequency Response Techniques	10.1-10.12	Apr 22 nd
Week 14	Frequency Response Techniques	10.1-10.12	Apr 29 th
Week 15	Design via Frequency Response	11.1-11.5	May 6 th
Week 16	Final Exam		