ME 364L/384Q.4: Automatic Control System Design
Fall 2024, Unique No. 19050/19220
https://utexas.instructure.com/courses/1398443

Instructor:	Prof. Raul G. Longoria
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Lectures:	MW 12:30-2:00p, ETC 4.150
Office/hours:	TTH 1-2 pm and by appt (zoom)
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TA:	
Contact info:	

1. Course aims / objectives[1]: This course introduces modeling, analysis, and design of feedback controlled systems. The role of feedback and its use in applications is described, with emphasis on how feedback influences system response and stability. Linearization is reviewed to support transfer function and linear state space equation formulation. Routh, Nyquist, Bode, and root locus methods are introduced and applied, along with mathematical tools for time and frequency domain design and analysis. State-space control principles are also introduced, as they arise in many practical applications and in advanced control methods.

2. Prerequisites: ME 344 is a **required** prerequisite for undergraduates enrolled in this course. Graduate students are expected to have knowledge equivalent to that taught in ME 344. It is also expected that you are familiar with Matlab or Python for analysis and simulation.

3. Format and procedures: This course is delivered using lecture-based presentation. Exercises and case studies will be completed in the form of homework assignments. Class discussion, in-class examples, and short quizzes will be used to encourage engagement.

4. ME 364L vs 384Q: Graduate students should be registered for ME 384Q (especially students in the ME Integrated BS/MSE program). As required by the graduate school, there are explicit differences in assignments, quizzes, and expectations for students enrolled in the undergraduate (364L) section versus the graduate (384Q) section.

5. Course Schedule: This syllabus conveys current plans and objectives. Adjustments may be made based on how the class is progressing. *Always* refer to the *Home Page* on Canvas. A proposed schedule of topics is provided in Table 1 on the last page of this syllabus.

6. Course Readings/Materials: The course will primarily draw from: 1) Ogata, Modern Control Engineering, Prentice-Hall (3rd ed or later) and 2) Franklin, Powell, and Emami-Naeini, Feedback Control of Dynamic Systems, Pearson Publishing (6th ed). It is expected that you will **read** from the book, slides, and any assigned handouts or online sources.

7. Course Work:

(a) **Assignments and Submissions**: Homework will be assigned on Canvas with specified due dates and requirements. **A single pdf file must be uploaded to Canvas.**

(b) **Preparation and submission of assignments**: Submitted work will not be accepted unless it is neatly prepared and organized. **Handwriting must be legible and dark enough to appear on scanned documents.** Any submission that is not legible or reasonably organized will not be graded. Late penalties may apply.

[1]NOTE: This course substantially equivalent to comparable courses offered as ECE 362K and ASE 370C

(c) **Late policy**: Late submissions will be dealt with on a case-by-case basis, and penalties will be applied if late submissions become common.

(d) **Make-ups**: Make-ups on HW or Quizzes will be handled on a case-by-case basis, but *prior* notice must be given except in cases of emergency.

(e) **Quizzes**: Short quizzes will be given in class (short answer/analysis, conceptual, closed-book)

(f) **Exams**: Dates for any exams appear on Canvas schedule; all exams are in-class, closed book/notes

8. Grading: Homework = 25%, Short quizzes = 10%, Exams = 40%, Final exam = 25%

9. Attendance and Behavior: Class attendance and completing homework assignments is expected. You are also expected to show respect and civility in all discourse with fellow students, administrators, and the course instructor.

10. Academic Integrity: University of Texas Honor Code - The core values of The University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the university is expected to uphold these values through integrity, honesty, trust, fairness, and respect toward peers and community. Each student in this course is expected to abide by this honor code. Any work submitted for academic credit must be the student's own work.

11. Course Outcomes: This course addresses the following ABET program outcomes: 1, 6, 7. In particular, attention by the student should be given to Outcome 4, "Ability to set up and conduct experiments, and to present the results in a professional manner."

12. Other University Notices and Policies: Be familiar with the University's official e-mail student notification policy. It is your responsibility to keep the University informed of changes in e-mail address. Students are expected to check Canvas and e-mail on a frequent and regular basis in order to stay current with University-related communications, recognizing that certain communications may be time-critical. (see http://www.utexas.edu/its/help/utmail/1564).

•*Accessibility Services.* UT provides, upon request, appropriate academic adjustments for qualified students with disabilities. Any student with a documented disability (physical or cognitive) who requires academic accommodations should contact the Division of Campus and Community Engagement, Disability and Access (D&A), 512-471-6259,
https://community.utexas.edu/disability.

•*Mental Health and Wellness* UT also provides resources to support the well-being of your academic life and mental health, as well as counseling services.

•*Longhorn Wellness Center.* Creating a culture of student and campus well-being though programs, education, health messages, student engagement and collaboration.
https://healthyhorns.utexas.edu/lwc/index.html

•*Counseling and Mental Health Center.* https://healthyhorns.utexas.edu/cmhc/ *Providing mental health support through assessment and referral, group and individual counseling, psychiatry, and well-being services to the students of UT Austin.

•*Behavior Concerns Advice Line (BCAL).* If you are worried about someone's behavior, use the Behavior Concerns Advice Line to discuss your concerns. Call 512-232-5050 or visit
http://www.utexas.edu/safety/bcal.

Religious Holy Days: University policy requires students to notify their instructors as far in advance of the absence as possible so that arrangements can be made. You will be given an opportunity to complete missed work within a reasonable time after the absence.

•*Drop Policy.* Contact the graduate advisor's office for information about drop policy.

13. Proposed schedule of topics: The schedule provided in Table 1 is a guide. Changes and/or adjustments to topics and assignments may be made based on the pace of the class and on changes in content.

Table 1: Projected schedule of topics and assignments

Week	Day	Topic(s)	Assignment(s)
1		Introduction, definitions, models & feedback Model formulations and conversions	HW 1 HW 2
2		Equilibrium and linearization	
3		Time-domain response Time-domain specifications	HW 3
4		Feedback control relations	
5		Poles, zeros, and stability	Exam 1
6		Error and performance analysis PID control	
7		Root locus Root locus; compensator design	HW 4
8		Design applications	
9		Frequency domain response (using Bode) Nyquist stability criterion	HW 5
10		Compensation, loop shaping Application examples	
11		State-space analysis and design Pole placement	HW 6
12		Optimal control Estimation/observers	
13		Compensation in state-space Application examples	Exam 2
14		Fall break Thanksgiving Holiday	
15		Review Review	
–		Final exam (per university schedule)	Final exam