

**MECH 4310**  
Systems and Controls  
3 Semester Credit Hour  
Spring 2024 Course Syllabus

**Lecture:** Monday and Wednesday, 2:30 – 3:45pm, ECSW 3.210  
**Professor:** Dr. Tyler Summers  
Office: ECSW 2.355F  
Office Hours: Set appointment by emailing Professor  
Email: [tyler.summers@utdallas.edu](mailto:tyler.summers@utdallas.edu)

The information contained in the following link lists the University's syllabus policies and procedures for students and instructors of record.

Please see <http://go.utdallas.edu/syllabus-policies>.

**Course Modality and Expectations:**

**Instructional Mode:** Traditional (in-person)

**Course Platform:** eLearning and Microsoft Teams

**Synchronous:** In-person lectures. Some lectures may be recorded on MS Teams for asynchronous viewing.

**Expectations:** All students are expected to:

- participate in live in-person lectures and/or watch recorded lectures asynchronously in their entirety;
- have regular/frequent access to a computer with Matlab/Python;
- complete assignments and exams per the schedule provided below;
- submit assignments via eLearning;
- watch for emails sent via eLearning announcement with important information; and
- email the instructor with any questions regarding course policies/expectations.

**Prerequisite:** MECH 3340 System Dynamics Modeling and Analysis

**Corequisite:** MECH 4110 Systems and Controls Laboratory

**Textbook:** *Feedback Control of Dynamic Systems*, 8<sup>th</sup> edition; Gene Franklin, J. Powell, Abbas Emami-Naeini; ISBN 978-0-13-468571-7

Note: Earlier editions are similar but may not have the same problem numbers and examples. A hard copy of the textbook is not required.

**Website:** UT Dallas eLearning: <https://elearning.utdallas.edu/>

This site includes all course information and will be used extensively for posting homework assignments, solutions, exams, announcements, etc. **Check it frequently.**

**Course Content:** Introduction to control theory. General structure of feedback control systems. Mathematical models including differential equations, transfer functions, and state space. Transient response and steady-state error. Performance, stability, root locus method, Bode diagram, and Nyquist plot. Compensation design using PID, phase-lead, and phase-lag controllers. State space control design.

- Outcomes:**
1. Demonstrate ability to identify and use appropriate scientific computing tools to design and analyze control systems.
  2. Demonstrate ability to identify the purpose of a feedback control system and explain its concept.
  3. Demonstrate ability to solve problems regarding stability and performance of control systems.
  4. Demonstrate ability to design control laws using root locus and Bode plot methods.

**Tentative Outline:**

Week of	Topics	Text Chapter(s)
Jan. 15	Syllabus/Intro Course Intro	1
Jan. 22	Math/Modeling Review, Stability	2-3
Jan. 29	Performance Specs, Feedback Control Basics	4
Feb. 5	PID Control, Root Locus Design	4
Feb. 12	Root Locus Design	4
Feb. 19	Midterm I, Frequency Response	
Feb 26	Frequency Response and Stability	6
Mar. 4	Frequency Response Design	6
Mar. 11	Spring Break	
Mar. 18	State Space	7
Mar. 25	State Space Design	7
Apr. 1	Midterm II, State Space Design	7
Apr. 8	Optimization	-
Apr. 15	Trajectory Optimization	-
Apr. 22	Model Predictive Control (MPC)	-
Apr. 29	Course Review, Final Exam	

**Lecture:** Weekly in-person lectures, Monday and Wednesday 2:30 – 3:45pm. Some lectures may be recorded on MS Teams for asynchronous viewing. It is expected that students keep up with the class schedule and attend these lectures in their entirety to aid in the completion of homework and exams.

**Homework:** Homework will be assigned via eLearning each week and is due by 2:30am on the assigned due date stated in the course schedule (also found on eLearning). **You will not be given credit for late homework.** However, we recognize that the competing demands of a challenging courseload and extracurriculars can be an unforgiving landscape, and even the most careful of plans can be derailed by an unforeseen event. Therefore, your lowest homework score will be dropped. This policy is intended to cover real problems (illness, accidents, etc.), not poor planning and overcommitment. Plan to do every homework and save your drop for a challenging homework or a crisis that hopefully never comes. To receive credit for homework, your solutions must be neat and organized. You will submit your completed homework via eLearning by attaching a **single pdf file** containing scans or pictures of your homework. While you are encouraged to work together and learn with your fellow students, simply copying homework solutions from others or solution manuals is cheating. Homework solutions will be posted on eLearning after the due date.

**Exams:** There will be **two 75-minute midterm exams** and **one final exam** during the semester.

Exam I: *Tentatively*, February 19, 2023

Exam II: *Tentatively*, April 1, 2023

Final Exam: *Tentatively*, May 1, 2023

**Note:** Midterm Exams I and II and the Final Exam will be open book and open notes. Formulas you are responsible for knowing will be made clear during the lectures. **No make-up exams will be given.** In the event of an excused absence (illness, emergency, holy day absence, etc.; Proper documents should be provided), the weight of the exam will be shifted to the remaining exams.

**Attendance:** Students are expected to attend every class. Each lecture may contain multiple choice questions which you will answer by completing an associated “quiz” on eLearning. The quizzes are graded based on completion (not accuracy) and are denoted as Participation in the following grade breakdown.

**Grades:** Course grades will be computed based on a curve with percentages assigned as follows:

Homework:	20%
Participation:	10%
Midterm Exams:	20% each
Final Exam:	30%

*The previous descriptions and timelines are subject to change at the discretion of the Professor.*

## **Campus Health Promotion**

UT Dallas will follow the public health and safety guidelines put forth by the Centers for Disease Control and Prevention (CDC), the Texas Department of State Health Services (DSHS), and local public health agencies. Check the [Comets United: Latest Updates webpage](#) for the latest guidance on the University's public health measures.

## **Class Recording**

The instructor may record meetings of this course. Any recordings will be available to all students registered for this class as they are intended to supplement the classroom experience. Students are expected to follow appropriate University policies and maintain the security of passwords used to access recorded lectures. Unless the Office of Student AccessAbility has approved the student to record the instruction, **students are expressly prohibited from recording any part of this course. Recordings may not be published, reproduced, or shared with those not in the class, or uploaded to other online environments** except to implement an approved Office of Student AccessAbility accommodation. If the instructor or a UTD school/department/office plans any other uses for the recordings, consent of the students identifiable in the recordings is required prior to such use unless an exception is allowed by law. Failure to comply with these University requirements is a violation of the [Student Code of Conduct](#).

## **Class Materials**

The Instructor may provide class materials that will be made available to all students registered for this class as they are intended to supplement the classroom experience. These materials may be downloaded during the course, however, these materials are for registered students' use only. Classroom materials may not be reproduced or shared with those not in class, or uploaded to other online environments except to implement an approved Office of Student AccessAbility accommodation. Failure to comply with these University requirements is a violation of the [Student Code of Conduct](#).

## **Distance Learning Student Resources**

Online students have access to resources including the McDermott Library, Academic Advising, The Office of Student AccessAbility, and many others. Please see the [eLearning Current Students](#) webpage for more information.

## **Server Unavailability or Other Technical Difficulties**

The University is committed to providing a reliable learning management system to all users. However, in the event of any unexpected server outage or any unusual technical difficulty which prevents students from completing a time sensitive assessment activity, the instructor will provide an appropriate accommodation based on the situation. Students should immediately report any problems to the instructor and also contact the online [eLearning Help Desk](#). The instructor and the eLearning Help Desk will work with the student to resolve any issues at the earliest possible time.

## **Comet Creed**

This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same:

*“As a Comet, I pledge honesty, integrity, and service in all that I do.”*

**Additional Course Policies**

The information contained in the following link constitutes the University’s policies and procedures segment of the course syllabus. Please review the catalog sections regarding the [credit/no credit](#) or [pass/fail](#) grading option and withdrawal from class.

Please go to [UT Dallas Syllabus Policies](#) webpage for these policies.