

## Dynamics and Control System Design Laboratory

EML 4314C All Sections

**Class Periods:** MW, 2<sup>nd</sup> period, 8:30 AM – 9:20 AM (Lectures)

**Location:** Weil 270 (Lectures) and NEB 112 (Labs)

**Academic Term:** Fall 2024

### Instructors:

Rushikesh Kamalapurkar

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Office Hours: MW 9:35 AM – 11:00 AM

Shannon Ridgeway

[scer@ufl.edu](mailto:scer@ufl.edu)

Office Hours: TWR during open lab times, NEB 112

### Teaching Assistant/Peer Mentor/Supervised Teaching Student:

Please contact through the Canvas website

- Will be listed on Canvas

### Course Description

Experiments on dynamic systems in mechanical and aerospace engineering and design of relevant control systems.

Credits: 3

### Course Pre-Requisites / Co-Requisites

EML 3301C, EML 4312

### Course Objectives

This course provides a control system design experience. Students will learn how to apply control system theory and engineering laboratory fundamentals to model and characterize dynamic systems and synthesize single-input/single-output and multiple-input/multiple-output control systems using classical and state-space control methods. During the course, students will design and implement control systems for several mechanical systems. During this course, the students are expected to augment their understanding of the theory of identification and control of dynamical systems with experimental knowhow. In addition, they will also develop/improve their communication skills to relay their ideas verbally (through group and TA interactions) and in written form (on lab reports).

### Materials and Supply Fees

See course catalog/UF registrar

### Relation to Program Outcomes (ABET):

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	High
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	High
3. An ability to communicate effectively with a range of audiences	Medium
4. An ability to recognize ethical and professional responsibilities in engineering situations and make	

informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	Medium
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	High
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	

\*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

### **Required Textbooks and Software**

- No texts are required for the course – reference material will be provided on the course web site on Canvas
- We will use Matlab and LabVIEW extensively. You can access Matlab through UF Apps, and we will provide a LabVIEW license key to you that is paid for through the course lab fee.

### **Recommended Materials**

- Undergraduate textbooks on control theory:
  - Introduction to Feedback Control Using Design Studies
    - Randal W. Beard, Timothy W. McLain Cammy Peterson Marc Killpack
    - Unpublished, freely available online
    - [https://github.com/byu-controlbook/controlbook\\_public](https://github.com/byu-controlbook/controlbook_public)
  - Textbooks by Norman Nise, Katsuhiko Ogata, and Richard Dorf + Robert Bishop
- Advanced material if you want to pursue graduate school:
  - Linear Systems Theory: Second Edition
    - João P. Hespanha
    - Princeton University Press
    - ISBN: 9780691179575

### **Required Computer**

See the UF MAE student computing requirements: <https://mae.ufl.edu/students/undergraduate/computer-requirements/> (Windows only, MacBooks are not supported in this course).

### **Course Schedule**

A tentative course schedule will be posted on the main page of the course web site on Canvas. Any changes to the dates/times/locations of course-related events will also be communicated via Canvas.

### **Important Dates**

See the course schedule on Canvas.

### **Attendance Policy, Class Expectations, and Make-Up Policy**

- Lectures:
  - Class lectures will be delivered in person. It is the student's responsibility to keep up with lectures. There may be in-class Canvas quizzes that will cover lecture material, and these will count towards the HW/Quiz component of the course grade.
  - If you miss a lecture due to illness, family emergencies, or pre-planned absences, the instructor may be able to provide access to either a recorded lecture or a copy of the lecture notes, if available.

- Labs:
  - Lab sections will be implemented either in person or as TA office hours, as posted on Canvas. Attendance is not restricted but preference/priority will be given to students registered in that lab section.
  - There will be NO scheduled make-up laboratories. It is the student's responsibility to honor and respect the given deadlines and meeting times. If you have a scheduled professional activity (e.g., a conference) which conflicts with an important course date, please communicate with the instructor as early in the semester as possible to schedule some accommodation
- Lab reports and homework assignments:
  - If you do not submit your lab report or homework assignment when it is due, you can still submit it via Canvas for two more days. Unless you have prior written (email is fine) permission to submit a late assignment, the penalties for late submission will be as follows:
    - Late submissions within one hour of the deadline: 3% of your earned grade.
    - Late submissions past one hour but within 24 hours of the deadline: 15% of your earned grade.
    - Late submissions past 24 hours but within 48 hours of the deadline: 50% of your earned grade.
    - Past 48 hours, your assignment will not be graded.

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies:

<https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>

### ***Evaluation of Grades***

<b>Assignment</b>	<b>Total Points</b>	<b>Percentage of Final Grade</b>
Homework assignments, quizzes, and lab milestones	Varies by assignment	15%
Lab Reports (3)	100 each	40% (13.3% x3)
Midterm Exams (2)	100 each	25% (12.5% x2)
Final Project Report	100	20%
		100%

### ***Grading Policy***

(Minimum percentage required with no rounding up. E.g., 89.79999 = B+)

<b>Percent</b>	<b>Grade</b>	<b>Grade Points</b>
89.8 - 100	A	4.00
87 - 89.8	B+	3.33
79.8 - 87	B	3.00
77 - 79.8	C+	2.33
69.8 - 77	C	2.00
67 - 69.8	D+	1.33
59.8 - 67	D	1.00
0 - 59.8	E	0.00

More information on UF grading policy may be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

### ***Students Requiring Accommodations***

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is

important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

### ***Course Evaluation***

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

### ***In-Class Recording***

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

### ***University Honesty Policy***

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<https://sccr.dso.ufl.edu/process/student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

### ***Commitment to a Safe and Inclusive Learning Environment***

The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University’s core values, including the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information, and veteran status.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Undergraduate Coordinator
- HWC OE Human Resources, 352-392-0904, [student-support-hr@eng.ufl.edu](mailto:student-support-hr@eng.ufl.edu)
- Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, [pld@ufl.edu](mailto:pld@ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto:nishida@eng.ufl.edu)

### **Software Use**

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

### **Student Privacy**

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

### **Campus Resources:**

#### Health and Wellness

##### **U Matter, We Care:**

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

**Counseling and Wellness Center:** <https://counseling.ufl.edu>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

##### **Sexual Discrimination, Harassment, Assault, or Violence**

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the [Office of Title IX Compliance](https://title-ix.ufl.edu), located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, [title-ix@ufl.edu](mailto:title-ix@ufl.edu)

##### **Sexual Assault Recovery Services (SARS)**

Student Health Care Center, 392-1161.

**University Police Department** at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

#### Academic Resources

**E-learning technical support**, 352-392-4357 (select option 2) or e-mail to [Learning-support@ufl.edu](mailto:Learning-support@ufl.edu). <https://elearning.ufl.edu/>.

**Career Connections Center**, Reitz Union, 392-1601. Career assistance and counseling; <https://career.ufl.edu>.

**Library Support**, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

**Teaching Center**, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.

<https://teachingcenter.ufl.edu/>.

**Writing Studio, 302 Tigert Hall**, 846-1138. Help brainstorming, formatting, and writing papers.

<https://writing.ufl.edu/writing-studio/>.

**Student Complaints Campus:** <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>; <https://care.dso.ufl.edu>.

**On-Line Students Complaints:** <https://distance.ufl.edu/getting-help/>; <https://distance.ufl.edu/state-authorization-status/#student-complaint>.