

EEL 4610 Official Syllabus

Title of Course: State Variable Methods in Linear Systems

EEL 4610 Section #

Class Periods: MWF, period 8, 3:00-3:50PM

Location: CHE 316

Academic Term: Spring 2020

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Instructor

- Name: Dr. Jacob Hammer
- Email Address: hammer@mst.ufl.edu
- Office Phone Number: 352-392-4934
- Office Hours: MWF 3:50-4:40PM in NEB 563

Teaching Assistants

Please contact through the Canvas website

N/A

Course Description

Linear algebra and state variable methods for design and analysis of discrete and continuous linear systems.

Course Pre-Requisites / Co-Requisites

Linear Control Systems EEL 4657

Course Objectives

To teach engineering students the use of state variable methods in the design and analysis of linear control systems.

These objectives will be accomplished through instruction in the following topics

- Realization theory and implementation (5 weeks).
- Controllability of linear systems.
- State feedback and stabilization of linear systems
- Linear observers.
- Observability of linear systems.
- Combining observers and controllers.
- Stabilizability and detectability of linear systems.

Materials and Supply Fees

N/A

Professional Component (ABET)

This course consists of 1.5 credits of Engineering Design and 1.5 credits of Engineering Science

Relation to Program Outcomes (ABET)

a - an ability to apply knowledge of mathematics, science, and engineering

c - an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

d - an ability to function on multi-disciplinary teams

e - an ability to identify, formulate, and solve engineering problems

i - a recognition of the need for, and an ability to engage in life-long learning

j - a knowledge of contemporary issues

k - an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

EE Program Criteria

EE2 - knowledge of mathematics, basic and engineering sciences necessary to analyze and design complex systems

EE3 - knowledge of advanced mathematics including linear algebra, complex variables and discrete mathematics

Required Textbooks and Software

- Title: Linear Systems
- Author: T. Kailath
- 1980, First Edition, Prentice-Hall, Inc.
- ISBN number: 0135369614
- Software: N/A

Recommended Materials

- Title: N/A
- Author:
- Publication date, edition, and publisher:
- ISBN number:

Course Schedule

| | |
|-------------|---------------------------------------|
| Week 1: | Introduction |
| Week 2: | Background |
| Week 3: | Realization of Linear Systems |
| Week 4: | Observability |
| Week 5: | Reachability |
| Week 6: | Constructibility |
| Week 7: | Controllability |
| Week 8: | Discrete-time systems |
| Week 9: | Linear State Feedback |
| Week 10-11: | Asymptotic Observers |
| Week 12-13: | The Observer-Controller Configuration |
| Week 14: | Review |

Attendance Policy, Class Expectations, and Make-Up Policy

Regular attendance is recommended, but no attendance will be taken.

Students must coordinate with instructor before missing an exam.

Makeups will be offered for excused absences and missed homework.

Excused absences are consistent with university policies in the undergraduate catalog (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx> ([Links to an external site.](#))[Links to an external site.](#)) and require appropriate documentation.

Students must possess portable computers and bring them to class upon announcement.

Evaluation of Grades:

Include the methods by which students will be evaluated and their grade determined.

| Assignment | Percentage of Final Grade |
|--------------------|----------------------------------|
| Homework Sets (10) | 10% |
| Quizzes (4) | N/A |
| Midterm Exam | 35% |
| Final Exam | 55% |
| Review Paper | N/A |
| Presentation | N/A |
| TOTAL | 100% |

Grading Policy:

NOTE: This grading scale is only an example and should not dictate the scale or weights chosen for a course

| Percent | Grade | Grade Points |
|----------------|--------------|---------------------|
| 93 - 100 | A | 4.00 |

| | | |
|---------|----|------|
| 90 - 92 | A- | 3.67 |
| 87 - 89 | B+ | 3.33 |
| 83 - 86 | B | 3.00 |
| 80 - 82 | B- | 2.67 |
| 77 - 79 | C+ | 2.33 |
| 73 - 76 | C | 2.00 |
| 70 - 72 | C- | 1.67 |
| 67 - 69 | D+ | 1.33 |
| 63 - 66 | D | 1.00 |
| 60 - 62 | D- | 0.67 |
| 0 - 59 | E | 0.00 |

A "C-" will not be a qualifying grade for critical tracking courses. In order to graduate, students must have an overall GPA and an upper-division GPA of 2.0 or better (C or better). Note: A "C-" average is equivalent to a GPA of 1.67, and therefore, it does not satisfy this graduation requirement.

Note: This course is co-listed with the graduate class EEL 5182. The homework portion of the graduate section will involve additional work and more advanced concepts with respect to the undergraduate section. The exams will also involve more advanced concepts with respect to the undergraduate section.

More information on UF grading policy may be found at: <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx> (Links to an external site.)[Links to an external site.](#)

Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu/evals> ([Links to an external site.](#))[Links to an external site.](#). Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/> ([Links to an external site.](#))[Links to an external site.](#).

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://www.dso.ufl.edu/sccr/process/student-conduct-honor-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.

Software Use

All faculty, staff and student 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.

Campus Resources:

Health and Wellness

U Matter, We Care:

If you or a friend is in distress, please contact umatter@ufl.edu or 352-392-1575 so that a team member can reach out to the student.

Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc> ([Links to an external site.](#))[Links to an external site.](#), and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

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/> ([Links to an external site.](#))[Links to an external site.](#)

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. <https://lss.at.ufl.edu/help.shtml> ([Links to an external site.](#))[Links to an external site.](#)

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/> ([Links to an external site.](#))[Links to an external site.](#)

Library Support, <http://cms.uflib.ufl.edu/ask> ([Links to an external site.](#))[Links to an external site.](#) 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/> (Links to an external site.)Links to an external site.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. <https://writing.ufl.edu/writing-studio/> (Links to an external site.)Links to an external site.

Student Complaints

Campus: https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf (Links to an external site.)Links to an external site..

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process> (Links to an external site.)Links to an external site..

Please see course description.

Commitment to a safe and inclusive learning environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination.

It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

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 Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@ufl.edu

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**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu