

## EEL5182: State Variable Methods in Linear Systems – Spring 2019

*Modifications to this syllabus may be required during the semester. Any changes to the syllabus will be posted on the course web site and will be announced in the classroom.*

1. **Class Time:** T 01:55-02:45pm and R 01:55-03:50
2. **Class Location:** FLI 0101
3. **Final Exam Time & Date:** No Final Exam
4. **Mid Term Exams Location:** Tentatively in the classroom. Please pay attention to class announcements before the exam date.
5. **Pre-requisites:** Undergraduate level control theory, basics of linear algebra, and differential equations. The students are expected to have basic understanding of dynamics, transfer functions, feedback and forward, Bode plots, poles and zeros, and PID. Basic familiarity with Matlab is also required.
6. **Course Objectives:** This course provides a graduate-level introduction to state space method and its application in control theory. Some of the topics covered in this course are: the concept of state and state space representation, linear and nonlinear systems, linearization, feedback linearization, linear algebra and linear operators, Jordan form, causality, Laplace transform, state transition matrix, solution of linear state equations, discrete time systems and Z-transforms, realization, minimal realization, Lyapunov stability theory, BIBO stability, controllability, observability, feedback controller design, eigenvalue placement by state and output feedback, stabilization, state observer design (full and reduced order), tracking, disturbance rejection, basics of optimal control, Riccati equation, infinite horizon problems. The material is mostly focused on linear time invariant (LTI) and Linear time variant (LTV) systems but it will also cover some introductory discussions of nonlinear effects and methods in dynamical systems.
7. **Instructor:** Kamran Mohseni, Ph.D.
  - a. Office location: NEB 141
  - b. Office Hours: Immediately after the class on Tuesdays 02:45-03:55.
  - c. Please make all the communications through canvas. Please allow at least 48 hours for a response from the TA or the instructor. Please note that we do not do HW by emails. Please come to the TA or instructor's office hours.
  - d. Web site: on Canvas
8. **Teaching Assistants** Kevin Nelson, Not sure we have a TA this semester (depends on the number of students at the end of the first week)
  - a. TA Office: TBD
  - b. TA Office Hours: Mondays 1-2pm, Fridays 10-11am
  - c. TA Email: [kjnelson@ufl.edu](mailto:kjnelson@ufl.edu)
- **Textbooks:** There is no required textbook for this course. Here are three recommended books
  - a. J. Hespanha, Linear System Theory, Princeton University Press, 2009.
  - b. C-T, Chen, Linear System Theory and Design, 3rd Ed., Oxford University Press, 1999.
  - c. T. Kailath, Linear Systems, Printice Hall, 1980.If you need some refreshing of your memory on undergraduate level materials you could consult any of the following books:
  - a. N.S. Nise, Control Systems Engineering, Wiley.

b. R.C. Dorf and R.H. Bishop, Modern Control Systems, Prentice Hall.

- **Assessment Methods and Grading:** Homework and assignments are due at the beginning (not the end) of the lecture period on the due date. Note that HW sets should be uploaded by the deadline on canvas. random number of HW problems in each set will be graded. Your grade for this course will be determined based on your performance on homework and exams as follows:

Exam 1	(March 10, date might change later)	35%
Exam 2	(April 21, date might change later)	35%
No final Exam		
Homework		30%

If a student feels that an exam or homework is graded unfairly, or if there is an error in the grading, it should be brought to the attention of the TA of the course grader within one week after the graded material is handed back. Scores will not be reconsidered beyond one week after they are handed back.

- **Make-up Policy:** No late assignments will be accepted. Makeup exams are not normally allowed except in rare cases such as medical emergency and requires documentations to verify the incident. If that is the case, you must contact the instructor prior to the exam.
- **Honesty Policy** – All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others. Using unauthorized materials (eg solutions from previous years or downloaded on the web are violations of the honor code).
- **Accommodations for Disabilities:** Students with disabilities who are requesting classroom accommodation must first register with the Dean of Students Office and obtain the required documentation for submittal to the Instructor. Do this **soon**.
- **Some Additional Items:**
  - announcements during lectures or by email will supersede this written document
  - all homework must be according to their instructions and submitted by the deadlines
  - exam formats, regulations, and dates will be announced in lectures
  - students are responsible for all lecture announcements and all ufl.edu emails
  - if you are too stressed or having too many problems, please use UF's many facilities
  - all the standard UF "boilerplate" you received in other syllabi on honesty policy, software use, student privacy, health and wellness resources, academic resources, etc., also apply in this course. Follow the policies and use the resources.

## Notes on Homework Sets and Their Solutions

### Policies/Procedures:

1. Homework assignments will be assigned in the class or on the website
2. You are expected to return solutions to all HW sets. However, grading might be conducted only on selected problems.
3. Students are encouraged to discuss the general principles involved in the homework sets with one another, but the solution of each problem must be completed individually.
4. Solution to some selected problems could be available after the due date.

### Format

1. Use 8.5" x 11" paper and write on one side.
2. Write down your name on the 1<sup>st</sup> page and on every subsequent pages. The naming format should be: **First Name Last Name**
3. Do not use pages torn from a spiral notebook.
4. Use a stapler (**no exceptions**). Do not staple over the problem numbers, allow a 1" margin so that it's visible when the pages are stapled.
5. Start each problem on a new page.
6. Put the problems in numerical order.
7. Attach a listing of any computer program(s) used in the solution.
8. Use good penmanship, as illegible writing cannot be graded.
9. Not following these instructions could results in significant grade reduction.

### HW Feedback

On top of the first page of your HW set please write:

- How many hours it took you to read and do the HW of that week.  
That will help me to adjust the work load.