SYST 611
Fall 2011

Instructor: Dr. Frederick Wieland
Innovation Hall 204
4:30-7:10 PM Tuesdays

Overview

This course is a course in the mathematics of dynamic systems. A "dynamic system" is a system that evolves in time—one or more of the state variables of the system changes as a function of time. We will study both discrete and continuous dynamic systems, with an emphasis on how to control those system (a subject known as "control theory"). The mathematical properties of dynamic systems will be studied, and by the course end you will have a deeper insight into the nature of dynamic systems, how to design them, and how to control them.

Textbooks

Required text:

> David G. Luenberger, "Introduction to Dynamic Systems: Theory, Models, and Applications"

Optional text:

> Joseph J. DiStefano III, Allen R. Stubberud, and Ivan J. Williams, "Feedback and Control Systems," Schaum's Outline Series.

Prerequisite Knowledge

Course SYST 500. You should have a thorough foundation in algebra, as well as knowledge of linear algebra (see Luenberger chapter 3), and some understanding of differential equations (although we will thoroughly study both them and difference equations during this class).

Course Outline

Date	**Topic**	**Readings (**L=Luenberger)
8/30	Partial Fraction Expansion	L 263-266
9/6	Difference equations and the Z-transform	L section 2.1-2.7, L pages 138-139, and sections 8.2-8.3. You should already be familiar with the topics in Luenberger chapter 3.
9/13	Models using difference equations; state variable representation	L sections 4.1-4.5, plus some miscellaneous topics from the previous reading
9/20	Continous-time differential equations and the LaPlace transform	L 2.8-2.10 and L 4.6-4.7, and L pages 139-141, and L section 8.5.
9/27	Models using differential equations; state variable representation	Miscellaneous topics from previous readings

10/4	Equilibrium points and stability of difference and differential equations; midterm review	L 5.9-5.12
10/11	Diagrammatic representation of systems; intro to control theory; Midterm review	
10/18	**Midterm Exam**	
10/25	Control Theory	L 8.6-8.10
11/1	Markov Chains	L Chapter 7 (entire)
11/8	Nonlinear Systems I—equilibrium and stability	L Chapter 9 (entire, over two weeks)
11/15	Nonlinear Systems II—linearization and example models	L Chapter 9
11/22	Models of linear and nonlinear systems	L Chapter 10
11/29	Final exam review	
12/6	Reading Week	
12/13	**Final Exam**	

Course Policies

- Homework will be issued weekly, and should be submitted on-line through the "Blackboard" system. If you are having trouble accessing the Blackboard system, then please contact the GMU Blackboard help desk.
- If you write your homework by hand, please use a dark pen or pencil on a blank white sheet of paper. It shows up best in the scan.
- Homework is due at the beginning of the next class after it has been assigned. Late homeworks are not accepted. Even if you are traveling, you should be able to access the internet and upload your homework.
- Midterm and Final Exams will be in-class.
- If GMU is closed, for example because of inclement weather, then homework due that day is automatically due the next time class meets.
- Class attendance is optional, although most students find it helpful to attend the live lecture.
- Grading policy is as follows:
    - Homework: 30% of the grade. Your lowest homework score is dropped before the homework grade is averaged.
    - Midterm: 30% of your grade.
    - Final exam: 40% of your grade.
- Contacting instructor and office hours. Extra help can be arranged at your convenience by emailing the instructor.
- **Emailing instructor**. The instructor's email address is fredwieland@hotmail.com. Please put the words "SYST 611" as the first words in the subject line of the email so that the instructor will read the message. Email messages are answered within one business day, but they are not necessarily answered the same day (or on weekends), although they might be.