SYST 320: Dynamic Systems II

Fall 2011

Course Overview

It is often important to predict the behavior of systems that change in time. Such systems are called *dynamic systems*. Examples include mechanical systems (for example, the suspension system of a car), electrical systems (an audio amplifier), fluid systems (an estuary and the rivers that flow into it), biological systems (populations of interacting species), and so forth. A wide variety of these systems can be modeled using the common underlying framework of linear differential equations.

The objective of this course is to teach students to model and analyze a variety of systems using this common mathematical framework. This course follows SYST 220, Dynamic Systems I. The first course covered mechanical systems and fundamental aspects of obtaining solutions using Laplace transforms and block diagrams. This course expands the set of application areas to include electrical systems, fluid systems, and other applications; and it continues the analysis of how systems respond to different external inputs and controls. Key questions addressed in this course are:

- Is a system stable?
- What are fundamental characteristics of the system behavior as a function of time?
- How does the system respond to oscillatory inputs?
- How can external controls be applied to ensure adequate system performance in the presence of uncertain disturbances?
- How should the system be designed to meet specified engineering requirements?

Class Hours: Tuesday, Thursday, 9:00 – 10:15 am.
Location: Krug Hall, 204

Pre-requisites: SYST 220 (dynamic systems I)
MATH 203 (matrix algebra)
MATH 214 (differential equations)
PHYS 260 & 261 (university physics II)

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Teaching Asst.: TBD

Textbook: Palm, W. J. 2008. *System Dynamics*. McGraw-Hill, 2nd edition.

Student Evaluation Criteria

Homework assignments	17%
Professionalism	3%
Group project	10%
Midterm 1	20%
Midterm 2	20%
Final exam	30%

Syllabus and Course Schedule
Last Updated: 8/26/11

Tue. Aug. 30	Chap. 6: Electrical Systems	
Thu. Sep. 1	Chap. 6: Electrical Systems	
Tue. Sep. 6	Chap. 6: Electrical Systems	
Thu. Sep. 8	Chap. 6: Electrical Systems	Hmwk #1 due
Tue. Sep. 13	Chap. 6: Electrical Systems	
Thu. Sep. 15	MATLAB Applications	Hmwk #2 due
Tue. Sep. 20	MATLAB Applications	
Thu. Sep. 22	MATLAB Applications	Hmwk #3 due
Tue. Sep. 27	MATLAB Applications	
Thu. Sep. 28	Chap. 7: Fluid Systems	Hmwk #4 due
Tue. Oct. 4	Exam 1: Chapter 6, MATLAB applications	
Thu. Oct. 6	Chap. 7: Fluid Systems	
Tue. Oct. 11	No Class (Columbus Day)	
Thu. Oct. 13	Chap. 7: Fluid Systems	Hmwk #5 due
Tue. Oct. 18	Chap. 8: Time Domain Analysis	
Thu. Oct. 20	Chap. 8: Time Domain Analysis	Hmwk #6 due
Tue. Oct. 25	Chap. 8: Time Domain Analysis	
Thu. Oct. 27	Chap. 8: Time Domain Analysis	Hmwk #7 due
Tue. Nov. 1	Chap. 9: Frequency Domain Analysis	
Thu. Nov. 3	Chap. 9: Frequency Domain Analysis	Hmwk #8 due
Tue. Nov. 8	Chap. 9: Frequency Domain Analysis	
Thu. Nov. 10	Chap. 9: Frequency Domain Analysis	Hmwk #9 due
Tue. Nov. 15	Exam 2: Chapters 7, 8, 9	
Thu. Nov. 17	Chap. 10: Control Systems	Hmwk #10 due
Tue. Nov. 22	Chap. 10: Control Systems	
Thu. Nov. 24	No Class (Thanksgiving)	
Tue. Nov. 29	Chap. 10: Control Systems	
Thu. Dec. 1	Chap. 10: Control Systems	Project due
Tue. Dec. 6	Chap. 10: Control Systems	
Thu. Dec. 8	Review	Hmwk #11 due
Thu. Dec. 15	Final Exam, **7:30 – 10:15 am**, Chap. 6-10	