

SYST 202: Continuous Dynamic Systems Modeling

Spring 2004

Course Overview

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In engineering, it is important to predict the behavior of systems that change in time. Such systems are called *dynamical systems*. This course teaches students to model a large class of physical systems and to solve these systems both analytically and numerically. This course is a follow on to SYST 201; here, the focus is on *continuous* time systems. A supplemental one unit course, SYST 203, teaches students to solve dynamical systems numerically using a computer.

Class Hours: Tuesday and Thursday, 10:30 am – 11:45 am, Robinson B 205

Pre-requisites: SYST 201

Co-requisites: MATH 203 (matrix algebra)
MATH 214 (differential equations)
PHYS 260 (Physics II)

Instructor: John Shortle
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703-993-3571
Science & Tech II, room 313
Office hours: Tue / Thu 9:15 am – 10:15 am

Textbook: C. Close and D. Frederick, *Modeling and Analysis of Dynamic Systems*, 3rd Ed. John Wiley & Sons, 2002.

Course Syllabus

1. *Introduction* – modeling, classification of systems, applications, systems engineering
2. *Systems Modeling* – physical elements, interconnection laws, building models
 - a. Translational Mechanical Systems
 - b. Rotational Mechanical Systems
 - c. Electrical Systems
3. *Systems Analysis*
 - a. Standard Forms – state variables, input-output equations, matrix formulation.
 - b. Block diagrams – using blocks to solve modeling equations, dynamic systems
 - c. Solutions using Laplace transforms – definition, properties, inversion, solving systems.
 - d. Transfer functions – zero-input response, zero-state response, frequency response.
 - e. Feedback modeling

Student Evaluation Criteria

10 homework assignments	15%
Group project	10%
Midterm 1	21%
Midterm 2	21%
Final exam	33%

SYST 202 Schedule for Spring 2003

Tue. Jan. 20	Chap. 1, Chap. 2	
Thu. Jan. 22	Chapter 2	
Tue. Jan. 27	Chapter 2	Hmwk #1 due
Thu. Jan. 29	** No Class **	
Tue. Feb. 3	Chapter 3	Hmwk #2 due
Thu. Feb. 5	Chapter 3 / Career	
Tue. Feb. 10	Chapter 4	Hmwk #3 due
Thu. Feb. 12	Chapter 4	
Tue. Feb. 17	Chapter 5	Hmwk #4 due
Thu. Feb. 19	Chapter 5	
Tue. Feb. 24	Review	Hmwk #5 due
Thu. Feb. 26	Exam 1: Chap. 1-5	
Tue. Mar. 2	Chapter 5	
Thu. Mar. 4	Chapter 6	Hmwk #6 due
Tue. Mar. 9	Spring Break	
Thu. Mar. 11	Spring Break	
Tue. Mar. 16	Chapter 6	
Thu. Mar. 18	Chapter 6	
Tue. Mar. 23	Chapter 7	Hmwk #7 due
Thu. Mar. 25	Chapter 7	
Tue. Mar. 30	Chapter 7	Hmwk #8 due
Thu. Apr. 1	Chapter 8	Group project mid-reports due
Tue. Apr. 6	Review	Hmwk #9 due
Thu. Apr. 8	Exam 2: Chap. 6-8	
Tue. Apr. 13	Chapter 8	
Thu. Apr. 15	Chapter 8	Hmwk #10 due
Tue. Apr. 20	Chapter 14	
Thu. Apr. 22	Chapter 14	Group projects due
Tue. Apr. 27	Chapter 15	
Thu. Apr. 29	Review	Hmwk #11 due
Thu. May 6	Final Exam, 10:30 am – 1:15 pm	