

# SYST 320: Dynamic Systems II

## Course Overview, Fall 2013

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.

The objective of this course is to model and analyze a variety of systems using a common mathematical framework of linear differential equations. 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: Innovation Hall, 206

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

Instructor: John Shortle

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Phone: 703-993-3571

Room: Nguyen Engineering Building, room 2210

Office hours: Tue 3:30 – 4:30 pm, Wed 2 – 3 pm.

Teaching Asst.: TBD

E-mail:

Room: Nguyen Engineering Building, room 2216

Office hours:

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

### Student Evaluation Criteria

Homework assignments	12%
Professionalism	3%
Group project	10%
Midterm 1	20%
Midterm 2	20%
Final exam	35%

### Syllabus and Course Schedule Last Updated: 8/5/13

Tue. Aug. 27	Chap. 6: Electrical Systems	
Thu. Aug. 29	Chap. 6: Electrical Systems	
Tue. Sep. 3	Chap. 6: Electrical Systems	
Thu. Sep. 5	Chap. 6: Electrical Systems	Hmwk #1 due
Tue. Sep. 10	Chap. 6: Electrical Systems	
Thu. Sep. 12	Chap. 6: Electrical Systems	Hmwk #2 due
Tue. Sep. 17	Chap. 9: Time Domain Analysis	
Thu. Sep. 19	Chap. 9: Time Domain Analysis	Hmwk #3 due
Tue. Sep. 24	Chap. 9: Time Domain Analysis	
Thu. Sep. 26	Chap. 9: Time Domain Analysis	Hmwk #4 due
Tue. Oct. 1	Chap. 9: Time Domain Analysis	
Thu. Oct. 3	Chap 7: Fluid Systems	Hmwk #5 due
Tue. Oct. 8	Exam 1: Chapters 6, 9	
Thu. Oct. 10	Chap 7: Fluid Systems	
Tue. Oct. 15	No Class (Columbus Day)	
Thu. Oct. 17	Chap 7: Fluid Systems	Mid-project report due
Tue. Oct. 22	Chap 7: Fluid Systems	
Thu. Oct. 24	Chap. 10: Control Systems	Hmwk #6 due
Tue. Oct. 29	Chap. 10: Control Systems	
Thu. Oct. 31	Chap. 10: Control Systems	Hmwk #7 due
Tue. Nov. 5	Chap. 10: Control Systems	
Thu. Nov. 7	Chap. 8: Frequency Domain Analysis	Hmwk #8 due
Tue. Nov. 12	Chap. 8: Frequency Domain Analysis	
Thu. Nov. 14	Chap. 8: Frequency Domain Analysis	Hmwk #9 due
Tue. Nov. 19	Exam 2: Chapters 7, 8, 10	
Thu. Nov. 21	Chap. 8: Frequency Domain Analysis	
Tue. Nov. 26	Chap. 8: Frequency Domain Analysis	Project report due
Thu. Nov. 28	No Class (Thanksgiving)	
Tue. Dec. 3	Applications	
Thu. Dec. 5	Review	Hmwk #10 due
Thu. Dec. 12	Final Exam, <b>7:30 – 10:15 am</b> , Chap. 6-10	

### Computing Resources

Volgenau School Computing Resources has answers to many questions about school systems on their web site: <http://labs.vse.gmu.edu> and will try to help you if you have problems connecting to school computing systems. However, they will not provide assistance with general computing questions or course assignments. Please contact your instructor or GTA if you have any questions about how to use software to complete your assignments.

### Diversity Statement

The GMU diversity statement can be found at  
<http://diversity.gmu.edu/docs/DIVERSITY%20STATEMENT.pdf>

### Campus Resources.

Syllabi should include information on relevant campus policies and resources for students, including adherence to the Honor Code. Typically this includes information about Academic Integrity, use of GMU email accounts, the Writing Center, University Libraries, Counseling and Psychological Services (CAPS), and the Office of Disability Services. Links to the University Catalog and the University Policies website for all other university academic and non-academic policies may also be included.

University Catalog: <http://catalog.gmu.edu>

University Policies: <http://universitypolicy.gmu.edu>