SYST 220: Dynamic Systems I
Course Overview, Spring 2015

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 dynamic systems using a common mathematical framework of linear differential equations. Methodological topics include solution methods, block diagrams, state-variable models, and simulation. Applications focus on physical mechanical systems, both translational and rotational. Models in discrete time are also covered in variety of application domains.

Class Hours: Tuesday, Thursday, noon – 1:15 pm.
Location: Art and Design Building, room 2003

Pre-requisites: MATH 114 (analytic geometry and calculus II)
PHYS 160 (university physics I)
Co-requisites: MATH 203 (linear algebra)
SYST 221 (systems modeling laboratory)

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Teaching Asst.: TBD

Textbook: Palm, W. J. 2014. *System Dynamics*. McGraw-Hill, 3rd edition.

Student Evaluation Criteria

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

Syllabus and Course Schedule

Last Updated: 1/5/15

Date	Topic	Reading	Assignment
Tue. Jan. 20	Introduction: Dynamic systems		
Thu. Jan. 22	Linear models		
Tue. Jan. 27	Modeling from data		Hmwk #1 due
Thu. Jan. 29	Solution methods		
Tue. Feb. 3	Solution methods		Hmwk #2 due
Thu. Feb. 5	Solution methods		
Tue. Feb. 10	Solution methods		Hmwk #3 due
Thu. Feb. 12	Solution methods		
Tue. Feb. 17	Modeling of rigid-body mechanical systems		Hmwk #4 due
Thu. Feb. 19	Modeling of rigid-body mechanical systems		
Tue. Feb. 24	Modeling of rigid-body mechanical systems		Hmwk #5 due
Thu. Feb. 26	Exam 1: Chapters 6, 7, 8		
Tue. Mar. 3	Modeling of rigid-body mechanical systems		
Thu. Mar. 5	Spring and damper elements		Hmwk #6 due
Tue. Mar. 10	No class (spring break)		
Thu. Mar. 12	No class (spring break)		
Tue. Mar. 17	Spring and damper elements		
Thu. Mar. 19	Spring and damper elements		
Tue. Mar. 24	Spring and damper elements		Hmwk #7 due
Thu. Mar. 26	Block diagrams, state-variable models, simulation		
Tue. Mar. 31	Block diagrams, state-variable models, simulation		Hmwk #8 due
Thu. Apr. 2	Exam 2: Chapters 7, 8, 10		
Tue. Apr. 7	Block diagrams, state-variable models, simulation		
Thu. Apr. 9	Block diagrams, state-variable models, simulation		
Tue. Apr. 14	Discrete dynamic systems		Hmwk #9 due
Thu. Apr. 16	Discrete dynamic systems		
Tue. Apr. 21	Higher order linear systems		Project due
Thu. Apr. 23	Higher order linear systems		
Tue. Apr. 28	Nonlinear dynamic system		Hmwk #10 due
Thu. Apr. 30	Nonlinear dynamic system		
Thu. May 7	Final Exam, **10:30 – 1:15**, Chap. 6-10		