CYSE 220
SYSTEM MODELING

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George Mason University
http://mason.gmu.edu/~pcosta

Course Description

Spring 2016 – CRN 17632

Introduces modeling of dynamical systems. Formulation of mathematical models from system descriptions, including computer, economic, transportation, electrical power and mechanical systems. Analytical and numerical methods for solving models and studying their behavior. Discrete-time and continuous time systems. Linear and nonlinear systems. Introduction to computer modeling using MATLAB.

Class Details

Prerequisites: Grade C or higher on MATH 203 and PHYS 160

Classes
 * Room 203 of the Innovation Hall.
 * Mondays and Wednesdays, from 10:30 a.m. to 11:45 a.m.

Office hours
 * Room 2227 of the Engineering Building.
 * Mondays, from 2:00 p.m. to 4:00 p.m., or by appointment.
 * Dr. Costa's contact data: (703) 993-9989 / pcosta@gmu.edu

Administrative
 * Registration and drop without tuition penalty deadline: Jan 26th.
 * Drop with 33% tuition penalty: Feb 2nd.
 * Final Drop deadline (66% tuition penalty): Feb 19th.

Course Logistics

1. All course communication will be done via the Blackboard system. Students are expected to have access and be able to use the system before classes start. Blackboard is accessible via the MyMason portal at https://mymasonportal.gmu.edu/. Instructions for using the Blackboard system are provided in the "resources" link at the bottom of the portal page.

2. 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 have problems connecting to school computing systems. However, they will not provide assistance with general computing questions or course assignments. Please contact me if you have any questions about how to use software to complete your assignments.

3. Accommodations for disability: If you have a documented learning disability or other condition that may affect your academic performance you should: a) make sure this documentation is on file with Office for Disability Services (SUB I, Rm. 4205; 993-2474; http://ods.gmu.edu) to determine the accommodations you need; and b) let me know about your accommodation needs as soon as possible. If you have contacted the Center for Disability Services and are waiting to hear from a counselor, please keep me updated during the whole process.

4. Inclement weather: Class sessions may be held remotely (via Blackboard Collaborate) due to inclement weather or other University emergencies. Check the Announcements area of the course website for updates.

5. Students are expected to be able to attend classes held online via Blackboard Collaborate, as well as quizzes or other activities associated with such classes (e.g. snow days).

Expected Behavior

1. Attendance in class is essential. If you need to miss a class, you must contact me in advance.

2. You are allowed to enter or leave at any time, provided you do your best to avoid disrupting the activity going on.

3. Please make sure you have your cell phone, tablet, pager, etc., in silent mode. Should you find yourself in *extreme* need to answer an incoming call, just leave the room to do so.

4. With a few exceptions, almost all of the course deliverables are submitted electronically (e.g. class-work and homework), scheduled in advance, and with some flexibility for students to change. Should any scheduled event impact a student's participation in class activities and assignments, it is the student's responsibility to coordinate with me in advance.

5. Students are permitted to interact on homework assignments, but your write-up must be your own. Assignments are intended to provide practical, hands-on experience with the ideas presented in the course.

6. Late assignments, when properly justified, will receive reduced credit in accordance with the late assignment policy (below in this document). No points will be awarded if the assignment is turned in after solutions have been posted.

7. Religious observances are one common example of events that might impact students' activities. Students are responsible for planning ahead. Please, refer to the GMU's calendar of religious holidays at http://ulife.gmu.edu/religious_calendar.php.

8. Academic Policy: All academic policies as given in the Honor System and code will be strictly followed. These are available at http://catalog.gmu.edu/content.php?catoid=19&navoid=4113.

9. General Policies: All general policies defined in the University Catalog are in place for this course. You can access those at http://catalog.gmu.edu/content.php?catoid=19&navoid=4114.

10. George Mason University is an Honor Code university. Please see the Office of Academic Integrity website (http://oai.gmu.edu/the-mason-honor-code-2/) for a full description of the honor code and the honor committee process.

> **Exercise planning, be proactive and do your best to stay ahead of schedule.**

Course Outline:

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Class 1	1/20	Syllabus review, Introduction to Continuous and discrete dynamical systems. Introduction to the MATLAB environment.
~~Class 2~~	~~1/25~~	Cancelled due to snowstorm.
~~Class 3~~	~~1/27~~	Cancelled due to snowstorm.
Class 2	2/1	Writing MATLAB scripts, fprintf command, file commands.
Class 3	2/3	Plotting and formatting graphs, built-in library functions.
Class 4	2/8	Introduction to Dynamic Systems Modeling.
Class 5	2/10	Review of Homework 1. Modeling from data. Examples from Chapter 1 (including polynomials, curve fitting, interpolation).
Class 6	2/15	
Class 7	2/17	Differential equations.
Class 8	2/22	Differential equations.
Class 9	2/24	Laplace transform
Class 10	2/29	Laplace transform
Class 11	3/2	Solving Equations with the Laplace Transform
Spring Break		No classes on 3/7 and 3/9.
Class 12	TBD	Via DE asynchronous.
Class 13	3/14	Midterm Review
Class 14	3/16	Midterm
Class 15	3/21	Partial-fraction expansion, response parameters and stability
Class 16	3/23	Partial-fraction expansion, response parameters and stability
Class 17	3/28	Transfer Functions

| Class 18 | 3/30 | Transfer Functions |
Class 19	4/4	The ode45 solver: first order differential equations
Class 20	4/6	The ode45 solver: first order differential equations
Class 21	4/11	Block diagram models
Class 22	4/13	State-variable methods
Class 23	4/18	Introduction to Simulink
Class 24	4/20	Linear Models in Simulink
Class 25	4/25	More blocks, sine, cosine
Class 26	4/27	Higher order linear systems
Class 27	5/2	Nonlinear dynamic systems
Class 28	5/4	Course review
Final Exam	5/6	Friday, 10:30 a.m. to 1:15 p.m.

Textbook
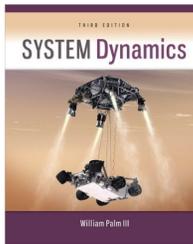
System Dynamics, William J. Palm III.
McGraw Hill; 3rd edition (March 19, 2013). 928 pp.
ISBN-10: 0073398063.
ISBN-13: 978-0073398068.

Students are encouraged to also refer to the following resources:
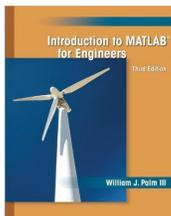
Introduction to MATLAB for Engineers (Paperback),
William J. Palm III. McGraw-Hill Science; 3rd edition (February 8, 2010).
ISBN-10: 0073534870.
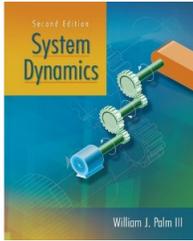
System Dynamics, William J. Palm III.
McGraw Hill; 2nd edition (January 26, 2009). 848 pp.
ISBN-10: 0073529273.
ISBN-13: 978-0073529271.

Introduction to MATLAB for Engineers (Paperback),
William J. Palm III. McGraw-Hill Science; 3rd edition (2012).
ISBN-10: 1259012050
ISBN-13: 978-1259012051

Software

MATLAB with Simulink, V.14 with service pack 05 or later

Grading

The grading structure of this course is as follows:

- Assignments (35% of grade)
- Midterm (30% of grade)
- Final Exam (35% of grade)

Assignments

There will be assignments posted via Blackboard during the course. Each assignment will have its respective due date defined during the announcement. I might sometimes not grade the assignments in detail, but will always use it to gain insight on how well students are understanding the subject. Past experience consistently shows that students who didn't keep up with the assignments have had a hard time with the exams.

Assignments must be submitted via Blackboard and can be of three types:

Homework Assignment: Each homework assignment is out of 100 points. Unless stated otherwise, I will present the solutions at the beginning of the next class after the assignment was handed. If you submit your assignment after it is due but before I post the solutions you can earn a max of 70 points. After the solutions are posted no points are given.

Classwork Assignment: Each classwork assignment is out of 50 points and it is due by the end of the class. I will post the solutions usually in the same day.

Tests, Quizzes, or Challenges: These are conducted in class and each will be out for an amount of points to be disclosed prior to the class. The details of each test, quiz, or challenge will be explained during its respective announcement.

Files should be named with the following convention:

CYSE220_AssigmentTypeAndWeek_LastnameFirstname.
Examples: *CYSE220_*Hwk02_DoeJohn, *CYSE220_*CW02_PoppinsMary, etc.

Always check for grades on Blackboard. If you don't see the grade, report to me by the next class after assignments have been returned. I will not entertain missing grade requests that come later in the semester.

Exams

Both the Midterm and the Final will be in-class exams.

Midterm: 3/16, 10:30 am – 11:45pm, Innovation Hall room 203

Final: 5/6, 9:45 am – 11:45am, Innovation Hall room 203

BEST WISHES FOR A GREAT SEMESTER!!!

Sunday, February 14, 2016.