

Syllabus: ME 3210: System Dynamics, Spring 2015

January 15, 2016

Instructor

Joseph C. Slater, PhD, PE
238 Russ Engineering Center
937-775-5005

<http://www.cecs.wright.edu/~jslater>

Helpful materials are available through the [course page](#):

Objectives

System Dynamics introduces students to the system level modeling of dynamic engineering systems including, but not restricted to, linear and rotational mechanical, fluid, thermal, and electrical systems. Modeling of control devices (e.g. motors, heaters and pumps) is addressed.

The course focuses on a) the development of governing equations, and b) the solution of governing equations. Development of governing equations is by methods appropriate to each subfield. The unifying system level analysis will be taught a) via time domain solutions, b) frequency (Laplace domain) solutions, and c) numerical simulation in [Simulink](#) (a modern system simulation tool).

Office Hours

Tentative: Will change depending on student schedules. Tentatively 3:30-4:30 PM, Tuesday and Thursday, and by appointment. Please use email to contact me when you have questions, and to set up appointments. I check my email throughout the day. You will get a quicker response by email than by any other mode of communication.

Text

System Dynamics, William J. Palm, III.

Prerequisites

EE 2010, ME 2210, ME 3120, MTH 2350

Course Contents

1. Introduction to Modeling and Analysis, (Chapter 1)
2. Modeling of Rigid Body Dynamics, (review of Dynamics, Chapter 3)
 - (a) If you cannot draw a free body diagram well, your grade and performance will suffer greatly. Addressing this early and aggressively will almost ensure success in the course.
3. Dynamic Response and the Laplace Transform Method (Chapter 2 & Chapter 8)
4. Spring-Damper Elements in Mechanical Systems (Chapter 4)
5. Block Diagrams, State-Variable Models & Simulations (Chapter 5)
6. Electric and Electro-mechanical systems (Chapter 6)
7. Fluid/Thermal Systems (Chapter 7)
8. System Analysis in the Time Domain (Chapter 8)
9. System Analysis in the Frequency Domain (Chapter 9)

Grade composition

Professionalism:	10%
Homework:	10%
Quizzes and Exams:	80%

Homework

Homework problems will be assigned on the course web page. Homework is tentative until Thursday at 5 PM. Homework problem solutions are collected at the beginning of the last lecture each week. You will be given no less than one week to do them. If there is a test scheduled on a day homework is due, the

homework will be collected the following lecture. Each homework problem is worth 1 point unless otherwise noted. More difficult problems may be weighted accordingly. You are encouraged to work together in small groups, but keep in mind that homework is assigned in order to help you learn and keep up with the course material. Please see me if you need help with the homework. This class is a cooperative effort between you and me. You are also encouraged to do additional problems out of the text for practice on your own. Use of the solution manual, should you obtain it, is considered cheating.

Exams and Quizzes

There will be seven quizzes and final exam graded on a straight, scale ($\geq 90 = A, \geq 80 = B, \geq 70 = C, \geq 60 = D, < 59 = F$). The final exam will count equal-weight to four quiz grades. The lowest exam grade of the four will be dropped. An 8.5 in. by 11 in. formula sheet may be used provided there are no derivations, definitions or solved problems on the sheet. It must be turned in with the exam. Tests will be graded and returned as soon as possible. Solutions will be discussed during the lecture following the exam if time permits. All grading discrepancies must be brought up in writing no later than one week after the exam is returned. A simple note describing your contentions will do.

Professionalism

Professionalism is a measure of your behavior regarding expected practice as a professional. This includes aspects such as attendance, note taking, consistency of performance, tenacity in problem solution, leadership, legibility and organization of problem solutions, clarity of communication, seeking assistance as prudent, etc. For details on expected behavior, please consult *The Unwritten Rules of Engineering* by W.J. King, with revision by J.G. Skakoon. This book is available at the library. However, for your own professional development, I highly recommend that you [own a personal copy](#).

You will be presumed to be acting professional unless I have evidence otherwise.

One point will be automatically be lost from your professionalism score each time you receive less than a 70% on an quiz *and* do not see me personally within one week after receiving the exam grade to clear up confusion. (If your grade is higher, you will receive the point automatically)

Attendance is required. One point will be lost each time I take attendance and you are not there. I will spot check attendance as much as I feel necessary.

Students who received all professionalism points in the past have done far better than the rest of the class.

Programming/Computer Usage

Programming will be done in [Simulink](#) (in [MATLAB](#)) and in [MATLAB](#). Please consult [MATLAB](#) help and [Google](#). It is highly recommended that you learn to use [Simulink](#) as soon as possible. [MATLAB](#) and [Simulink](#) are free installations for WSU students via the [MATLAB Student Licensing](#) page. Run [Simulink](#) by typing simulink at the [MATLAB](#) prompt. The best way to learn it is to play around with it, and look at some of the examples provided in [Simulink](#).

Problem Solutions

All problem solutions, whether on homework, quizzes, or exams, should be neat and orderly. They should begin with a brief problem statement and figure. Elaborate drawings are not expected, but neat drawings including pertinent information are.

Important Dates

Jan. 21:	Quiz 1
Feb. 4:	Quiz 2
Feb. 18:	Quiz 3
Mar. 10:	Quiz 4
Mar. 24:	Quiz 5
Apr. 7:	Quiz 6
Apr. 21:	Quiz 7
Apr. 28, 2:45 pm - 4:45 pm:	Final Exam
