Syllabus for EGR 386, Section 1
Feedback Control and Modeling for Engineers
Spring Semester 2010
Monday, Wednesday, Friday
1:00-1:50 PM
Room EGC 217

Instructor: Hodge Jenkins, Ph.D., P.E., Associate Professor
Department of Mechanical Engineering

Office: Suite 101-D, School of Engineering
Hours: As posted, drop by, or by appointment

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Textbooks and Supplies:
Required: Modern Control Engineering 4th Edition
By Katsuhiko Ogata, Prentice Hall, 2002,

Recommended: MATLAB® & Simulink® Student Version

Web Sites: http://faculty.mercer.edu/jenkins_he/EGR386.htm

Catalog Description:
Solving linear time-invariant differential equations using Laplace transforms. Transient response for first and second order systems, including time constants, damping ratio, natural frequencies, overshoot and settling time. Relative and absolute stability. Analytical and empirical modeling of engineering systems. Control engineering topics including block diagrams, Routh Hurwitz, root locus and bode plots. Introduction to PID and lead/lag compensators and to design of feedback control systems with root locus, bode and or simulation.

Course Objectives:
This course introduces students to the foundations of feedback control theory and analysis of systems. Upon successful completion of this course, students should be able to perform the following:

1. Design a basic compensator for a control system.
2. Develop transfer functions for closed loop dynamic systems.
3. Determine the transient response of first, second, and higher order systems.
4. Use traditional modeling and design tools for controls systems, including Bode Plots and Root-Locus Plots.
5. Understand the performance versus stability tradeoffs common to control system design.
6. Develop insight into the use of differential equations and Laplace Transforms for analysis and design of systems.

**Prerequisites:** MAT 330  
**Corequisites:** EGR 236, EGR 245

**Grading:**

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Homework</td>
<td>10%</td>
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<tr>
<td>Quizzes</td>
<td>15%</td>
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<tr>
<td>Test 1</td>
<td>15%</td>
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<td>Test 2</td>
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<td>Test 3</td>
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<tr>
<td>Final Exam</td>
<td>30%</td>
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Grade Averages: A (90-100), B (80-89), C (70-79), D (60-69), F(<60)

**Homework:**

While homework is a part of the course grade, performing the homework is the only way to have a firm understanding of feedback control. Assigned homework will be periodically collected at the beginning of class on the date due. Note: Quizzes will often be homework problems or similar to them.

Homework must be done in an organized manner. Generally, leave variables in the equations until the solution is found, then substitute the values for the variables to obtain the specific answer in the correct units. Problem solutions should include sketches, diagrams, coordinate systems, governing equations. Show all work. Equations and solutions must follow logically, step by step. Thus, your complete solution is supported by what you have presented.

You may work together in small groups, but copying is not permitted. Each student must turn in his own work. DO NOT COPY HOMEWORK. Solutions will be placed in the library on 2-hour reserve.

**Quizzes:**

A short, 10 to 15-minute problem or question will be handed out periodically. Quizzes may or may not be announced. Quizzes will be closed notes and closed book, unless otherwise stated. A calculator is recommended.

**Tests:**

There will be three 50-minute tests of approximately 3 to 4 problems during the semester. Problems will be similar to the homework and quizzes. All tests will be closed-notes and closed book, unless otherwise stated. A calculator is recommended. No make-up tests will be given without a documented excuse.

**Final Exam:**

There will be a comprehensive final exam. It will be closed-notes and closed-book, unless otherwise stated. It will consist of approximately 6 to 8 problems similar to those on the tests, homework or quizzes. The final exam will be given as follows:

*Friday, May 7, 9:00 a.m. - 12:00 p.m.*

**Software:**

You will use software to perform calculations, simulations, and plotting in some homework and in the project. MATLAB and SIMULINK are recommended for this purpose. Other software may be used (e.g., Octave).
Course Standards:

1. **Assignments are due at the beginning of the class period on the date due.** In an exceptional circumstance you may petition to hand in an assignment late. If granted, the grade will be reduced one letter grade per day late.

2. **Attendance is required** due to the large amount of in-class work and team activities we will be doing. You can’t “make up” experiential learning. More than three absences will result in grade penalties. It is especially important that you be present when your classmates give peer reviews and oral presentations, since you will be giving written feedback. Absences during peer reviews and oral presentations will be counted as double.

3. **Grading** encompasses every aspect of the course, from participation through final products. You can assume that every task requested directly or indirectly factors into your grade. For example, having your work prepared for your group is as important as having it ready for me. Regular feedback will be given on documents handed in.

4. You are encouraged to schedule a **conference** at any point that you need it. You are encouraged to schedule a **conference** at any point that you need it. If you need to see me, catch me after class, call or e-mail me to schedule a time.

5. Please turn off cell phones and pagers before entering the classroom.

6. The **honor code** provisions as outlined in the *Bulletin* and in the student handbook, *The Lair*, will be assumed for everyone. It should be clear from class discussion which projects will be collaborative and which ones must be individual. When in doubt, please ask to avoid potentially embarrassing situations. Plagiarism is a violation of the honor code and is prohibited.

7. Students requiring accommodations for a disability should inform the instructor at the close of the first class meeting or as soon as possible. If you are not registered with Disability Services, the instructor will refer you to the Disability Support Services office for consultation regarding documentation of your disability and eligibility for accommodations under the ADA/504. In order to receive accommodations, eligible students must provide each instructor with a “Faculty Accommodation Form” from Disability Services. Students must return the completed and signed form to the Disability Services Coordinator on the 3rd floor of the Connell Student Center. Students with a documented disability who do not wish to use academic accommodations are also strongly encouraged to register with Disability Services and complete a Faculty Accommodation Form each semester. For further information, please contact Carole Burrowbridge, Disability Services Coordinator, at 301-2778 or visit the website at [http://www.mercer.edu/stu_support/swd.htm](http://www.mercer.edu/stu_support/swd.htm)

8. This syllabus is subject to change.

**Electronic Communication:**
Electronic communication is an important adjunct to face-to-face communication, including from professor to students, students to professor, and students to students. You must have regular access to your e-mail. If you do not have an active e-mail address on the first day of class, please secure one. Access to the Web and to the Internet is also integral to the class work. A number of laboratories on campus will provide access, in addition to EGC 102 and EGC 216. Information will be periodically given via e-mail. You must check your Mercer student e-mail regularly.