ECE 460/ ECE 365/ ME 442 – Control Systems

Summary:
ECE 460/ ECE 365/ ME 442 is the introductory Control Systems course at the University of Michigan – Dearborn. This course will cover the so-called "classical" transfer function and frequency domain approaches to control theory. Furthermore, topics from "modern" (the state space variable approach) control theory will be introduced.

The subjects covered will include: Laplace transforms, transfer functions, the study of first and second order systems, modeling of mechanical and electrical systems, stability, control system design, steady state error analysis, root locus analysis and design, compensators, and frequency response.

Instructor: Chris Kreucher (BSEEE '97, MSEEE '98) is currently a research scientist at Veridian-ERIM International, located in Ann Arbor, Michigan.

Contact information: 1) Email **ckreuche@umich.edu.**
2) Drop off materials for me to the ECE office and they will be put in my mail box (make sure they are time/date stamped!); leave messages for me there as well if necessary: (313) 593-5420.

Office Hours: Mon. 6:00-7:00pm, **and by arrangement** – 215B ELB.

Required Text: Control Systems Engineering 3rd edition, Norman S. Nise (2nd edition acceptable)
Note: MatLab™ student edition is "recommended" in the bookstore. The software is available on campus in most of the engineering computing labs.

Course Schedule: Lecture Mon, Wed 4:40-6:00pm

First Class	Mon Jan 8, 2001	Spring Recess	March 4-11, 2001
MLK Day	Mon Jan 15, 2001	Drop Day	Mon March 19, 2001
Mid Term	Wed Feb 28, 2001	Last Class	Mon April 23, 2001

Course Format:
1) There will be 2 lectures each week, Mondays and Wednesdays 4:40-6:00pm. Attendance is ***expected*** and, although not specifically taken into account in the grading policy, will be used as the first factor if any judgment calls are necessary when assigning grades or granting extensions.
2) There will be a short 5-10 minute quiz most Wednesdays at 4:40, typically on the preceding weeks' lectures. *Attending* the lectures, *reading* the assigned material, and *completing* the required homework is the best way to prepare for the quizzes.
3) Homework assignments will be assigned but not collected. It is expected that the students complete the homework and additional problems as necessary. **If the quiz grades indicate that the students are not completing the homework assignments, homeworks will be collected**.
4) It is my policy *not* to give make up quizzes or exams. However, limited exceptions will be made if and only if a pre-arrangement is made.

Grading:

1)	Approximately Ten Quizzes + Homeworks (if necessary)	20 %
2)	Lab and Design Project(s)	30 %
3)	Midterm Exam	25 %
4)	Final Exam	25 %

Topics:
We will cover most of the material in chapters 2, 4, and 6-10 along with selected materials from chapters 3, 5, 11 and 12.

Topic	Chapter
1. Introduction, Complex Numbers, Signals and Systems	*, 1
2. Laplace Transforms	*, 2
3. The Transfer Function Concept	2
4. Poles, Zeros, and The System Response	4
5. First and Second Order Systems – Introduction	4
6. Generalized Second Order Systems	4
7. Effect of Additional Poles and Zeros	4
8. Modeling of Electrical and Mechanical Systems	2
9. Block Diagram Simplification/Analysis of FB Systems	5
10. System Stability: Hurwitz Criterion	6
Midterm Exam	
11. Steady State Errors and Disturbances	7
12. Root Locus Analysis	8
13. Design via Root Locus Techniques	9
14. Frequency Response Analysis	10
15. Design via Frequency Response Techniques	11
16. State Space Representation and Design	3, 12

* - Supplemented by class notes

General Notes:

1) Following the honor code is of the utmost importance. All assignments must have the words "I have neither given nor received aid in the preparation of this graded assignment" (or their equivalents) prominently displayed. The students signature must be provided to signify the veracity of the statement.
2) **So that there is no possibility of misinterpretation, the honor code in this class mandates that all quizzes and exams be completed *solely* by the student whose name appears on the assignment. Furthermore, all homework assignments/projects are to be done *individually* unless the instructor explicitly says otherwise. Use of non-living resources such as textbooks, Schaum's outlines, calculators, and computers is acceptable. Getting help from the instructor when necessary is *strongly recommended.* Group studying and problem solving is encouraged unless said problems are to be turned in for credit.**
3) Use of the commercial software package *MATLAB* is required for successful completion of this course. Its use will be covered in lab for those who have not become acquainted with it.
4) The lab instructor has complete autonomy in the lab portion of this course. His grading policy and report requirements will be set forth during lab. Honor code requirements for that portion of the course will be expounded by him, if there is any room for interpretation.
5) This class should be a fun and rewarding experience for all involved. It is my goal that every student enjoys all of the material so that he/she may do well on all of the assignments, quizzes and exams. This material is the very important, so true learning of the concepts (and not just memorization or monkey see-monkey do) is important. If at any time you feel you do not understand a topic or problem, or have *any other concern what so ever*, please see me before/after class, during office hours or send an email and an arrangement will be made.