CME 462 Process Control
Spring 2014
University of Kentucky College of Engineering, Paducah
Lecture: 9:30AM-10:45AM TR CLC 220
Course Web Page: http://www.engr.uky.edu/~silverdl/CME462/

INSTRUCTOR:	Dr. David L. Silverstein	
	205 Crounse Hall (270) 534-3132 (Office) SilverDL@engr.uky.edu	Office Hours: Open door policy-- when I am there, I am usually available. To guarantee availability, make an appointment.
CATALOG COURSE SUMMARY:	Basic theory of automatic control devices and their application in chemical plants is emphasized. Identification of control objectives, appropriate measurements and manipulations, and possible loops between these, requires integration of the control system with the original process design. Interaction between process units are analyzed using well-known analytical tools and design strategies. Prereq: Consent of Instructor	
TEXT:	Required: *Process Dynamics and Control*, Seeborg, Edgar, & Mellichamp, *3rd Edition* References: *Essentials of Process Control*, William L. Luyben & Michael L Luyben, 1997; *Chemical Process Control*, J. B. Riggs; *Chemical Process Control*, Stephanopolous; *Process Control*, Marlin; *Process Dynamics, Modeling, and Control*, Ogunnaike & Ray; *Process Control Modules*, Doyles; *Learning MATLAB & Learning SIMULINK*, Mathsoft. These texts are either available in the library or may be borrowed on a limited basis from the instructor.	
COURSE OBJECTIVES:	This course is designed to introduce students to the basic concepts of linear systems modeling and control.	
COURSE EXPECTATIONS:	At the conclusion of this course, you should be able to: 1) Apply knowledge of mathematics and science to process dynamics and control. 2) Analyze and interpret different control systems' transient and frequency response data. 3) Design simple control systems for distillation columns and chemical reactors. 4) Identify, formulate, and solve linear control problems. 5) Use engineering tools for control systems.	
COURSE POLICIES:	Attendance is required at all lectures. Unannounced quizzes on reading or lecture material will be administered during classes. Bring your calculators to all classes. Calculators with communication or text storage capability are not permitted on exams. Homework assignments will be distributed in class. Use of tobacco products are not permitted in UK classrooms. Cell phones must be silenced and stowed during class. Homework is due within the first five minutes of the scheduled start of the period for which it is assigned. Late homework will receive no credit. Handwritten homework must be submitted on 8.5"x11" green **engineering paper** (except for computer printouts), **one side** per page. All pages should be **numbered** and contain your **name**. Multiple pages should be secured by **paper clip** and not folded or stapled. Individual solutions should **stand alone--** no reference to the source of the original problem should be required to understand the context and meaning of the solution you present. Each solution should contain a **problem statement**, a list of **assumptions**, a **diagram** (if appropriate), and a solution containing **adequate steps and explanations** to ensure understanding of your solution by the instructor. The final solutions to a homework problem must be **boxed** or otherwise distinguished from the remainder of the problem. Problems solved using a computer must contain all information required to reproduce your solution. Among other things, this means a spreadsheet printout only containing numbers is not sufficient. The formulas used must be included on the printout. All numbers must be identified and labeled with appropriate units. **You must submit the data file electronically along with a printout for problems solved with computers.** Specific guidelines for completing programming problems will be provided with the first programming assignment. Homework assignments are individual tasks. No copying of solutions is permitted. You are, however, encouraged to work in small groups to discuss methods of solving the homework problems. Bear in mind that setting problems up is the most difficult part of most problems, and failure to practice setting problems up independently will likely result in an inability to set problems up on exams. You must indicate whom you work with on assignments completed with assistance	

from a group. Certain assignments may be designated group problems and must be solved as a group. Details on group problems will be provided when assigned.

Any disputes regarding grading must be resolved within 5 school days of the original issuance of the grade. Requests to re-grade a problem may result in the entire assignment being re-graded and adjustments to all scores being made. This can potentially result in a decrease of score. Any grades not challenged within the five school day period are considered final. This applies to both homework and exams.

Cheating is strictly forbidden, and anyone found doing so will be turned over to the University Registrar and dealt with in accordance with University policy. Working together on homework is encouraged, but each person must independently write-up their own work and **cite any assistance they have had from classmates**. **Copying homework** (problems, graphs, figures, computer files, etc.) **between individuals is considered cheating**.

GRADING:	Final Exam: 25%
	Hour Exams: 45%
	Homework Assignments 15%
	Lab Reports/Projects 15%

A weighted grade of 90 or above is guaranteed an A, 80 or above at least a B, 70 or above at least a C, and 60 or above at least a D. A grade of E will be assigned to anyone earning a weighted grade below 60.

For grades near the endpoints in the above distribution, consideration will be given to homework performance, class participation, and performance trends as a function of time.

Homework and exam problems will be graded based on the following factors: correct assumptions, correct diagrams, legibility, clarity, neatness, identification of paper, clearly defined answer, correct approach to problem, and the correct answer. These criteria will be weighted according to the instructor's judgment for a particular problem. These criteria will be weighted according to the instructor's judgment for a particular problem. Satisfactory completion of homework may be required to pass the course.

Mid-term grades will be posted in myUK by the deadline established in the Academic Calendar (http://www.uky.edu/Registrar/AcademicCalendar.htm)

HOMEWORK:	Approximately 12 assignments will be given. Some homework assignments will require use of a computer software package. Unless otherwise specified, any suitable software package may be used to complete your homework (Maple, Mathcad, Matlab, C/C++, FORTRAN, Visual BASIC, spreadsheet).
FIRE SAFETY:	In the event of a fire, all students, faculty and staff should leave the building through the nearest exit and gather in the parking lot in front of Crounse Hall. A fire alarm should be treated as indicative of an actual fire.
INCLEMENT WEATHER:	WKCTC inclement weather policy will be followed for this class. If start of classes is delayed due to inclement weather, this class will start at 11AM.
EXAMINATIONS:	There will be three in-class examinations and a final examination. The in-class exams will be cumulative since the previous exam. Hour exams will be closed book, closed notes, unless otherwise specified. No make-up hour exams will be given except with the advance consent of the instructor. The final exam will be comprehensive. There will be no make-up final exam. Exam dates are February 13, 2014; March 13, 2014; and April 24, 2014. These dates may be changed by mutual consent with at least one week warning. The Final Exam will last 2 hours and will begin at 8:00AM on Thursday, May 8, 2009. The date for this exam is scheduled administratively and cannot be changed.
EXCUSED ABSENCES:	Students need to notify the professor of absences prior to class when possible. S.R. 5.2.4.2 defines the following as acceptable reasons for excused absences: (a) serious illness, (b) illness or death of family member, (c) University-related trips, (d) major religious holidays, and (e) other circumstances found to fit "reasonable cause for nonattendance" by the professor. Students anticipating an absence for a major religious holiday are responsible for notifying the instructor in writing of anticipated absences due to their observance of such holidays no later than the last day in the semester to add a class. Information regarding dates of major religious holidays may be obtained through the religious liaison, Mr. Jake Karnes (859-257-2754).

	Students are expected to withdraw from the class if more than 20% of the classes scheduled for the semester are missed (excused or unexcused) per university policy. Students may be asked to verify their absences in order for them to be considered excused. Senate Rule 5.2.4.2 states that faculty have the right to request "appropriate verification" when students claim an excused absence because of illness or death in the family. Appropriate notification of absences due to university-related trips is required prior to the absence.
ACADEMIC INTEGRITY:	Per university policy, students shall not plagiarize, cheat, or falsify or misuse academic records. Students are expected to adhere to University policy on cheating and plagiarism in all courses. The minimum penalty for a first offense is a zero on the assignment on which the offense occurred. If the offense is considered severe or the student has other academic offenses on their record, more serious penalties, up to suspension from the university may be imposed. Plagiarism and cheating are serious breaches of academic conduct. Each student is advised to become familiar with the various forms of academic dishonesty as explained in the Code of Student Rights and Responsibilities. Complete information can be found at the following website: http://www.uky.edu/Ombud. A plea of ignorance is not acceptable as a defense against the charge of academic dishonesty. It is important that you review this information as all ideas borrowed from others need to be properly credited. Part II of Student Rights and Responsibilities (available online http://www.uky.edu/StudentAffairs/Code/part2.html) states that all academic work, written or otherwise, submitted by students to their instructors or other academic supervisors, is expected to be the result of their own thought, research, or self-expression. In cases where students feel unsure about the question of plagiarism involving their own work, they are obliged to consult their instructors on the matter before submission. When students submit work purporting to be their own, but which in any way borrows ideas, organization, wording or anything else from another source without appropriate acknowledgement of the fact, the students are guilty of plagiarism. Plagiarism includes reproducing someone else's work, whether it be a published article, chapter of a book, a paper from a friend or some file, or something similar to this. Plagiarism also includes the practice of employing or allowing another person to alter or revise the work which a student submits as his/her own, whoever that other person may be. Students may discuss assignments among themselves or with an instructor or tutor, but when the actual work is done, it must be done by the student, and the student alone. When a student's assignment involves research in outside sources of information, the student must carefully acknowledge exactly what, where and how he/she employed them. If the words of someone else are used, the student must put quotation marks around the passage in question and add an appropriate indication of its origin. Making simple changes while leaving the organization, content and phraseology intact is plagiaristic. However, nothing in these Rules shall apply to those ideas which are so generally and freely circulated as to be a part of the public domain (Section 6.3.1). Please note: Any assignment you turn in may be submitted to an electronic database to check for plagiarism.
ACCOMODATION S DUE TO DISABILITY:	If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (Room 2, Alumni Gym, (859) 257-2754, email address: jkarnes@email.uky.edu) for coordination of campus disability services available to students with disabilities. See Denise Brazzell for more information.

Course Schedule

Period	Date	Reading Assignment	Problems Due
Lecture	01/14	Chapter 1: Introduction	
Lecture	01/16	Chapter 2: Modeling	
Lecture	01/21	MLK Holiday	
Lecture	01/23	Chapter 3: Laplace Transforms	Problem Set #1
Lecture	01/28	Chapter 4: Transfer Functions	
Lecture	01/30	Chapter 5: 1st and 2nd Order Dynamics	Problem Set #2
Lecture	02/04		
Lecture	02/06		Problem Set #3
Lecture	02/11	Chapter 6: Higher Order Processes	Problem Set #4
EXAM	02/13	EXAM 1: Chapters 1-5	
Lecture	02/18	President's Day Holiday	
Lecture	02/20		
Lecture	02/25	Chapter 7: Empirical Models	Problem Set #5
Lecture	02/27	Chapter 8: Feedback Control**	
Lecture	03/04	Chapter 9: Instrumentation	Problem Set #6
Lecture	03/06	Chapter 10: Control System Design	
Lecture	03/11	Chapter 11: Stability	
EXAM	03/13	EXAM 2: Chapters 6-10	
Holiday	03/18	Spring Break	Problem Set #7
Holiday	03/20	Spring Break	
Lecture	03/25		
Lecture	03/27		Problem Set #8
Lecture	04/01	Chapter 12: PID Controller Design	
Lecture	04/03		Problem Set #9
Lecture	04/08	Chapter 15: Feedforward Control**	
Lecture	04/10	Chapter 13: Frequency Domain	
Lecture	04/15	Chapter 14: Frequency Based Design	Problem Set #10
Lecture	04/17		
Lecture	04/22	Chapter 16: Advanced Control Strategies	Problem Set #11
EXAM	04/24	EXAM 3: Chapters 11-15	
Lecture	04/29	Chapter 18: Multivariable Control	
Lecture	05/01	Chapter 19: Optimization of Chemical Processes	Problem Set #12
EXAM	05/08	COMPREHENSIVE FINAL EXAM	8:00AM-10:00AM

All material on this schedule is subject to change at instructor's discretion for pedagogical reasons.