Chemical Engineering 446
Process Control
Fall 2014

Course Description: Design and analysis of feedback control systems in chemical and biological systems. Topics include formulation of dynamic models, time and Laplace domain analysis of open-loop and closed-loop systems, design of single variable and multivariable controllers, and computer simulation of control systems.

Course Objectives: Upon completion of this course, students should:

1. Understand the importance of system dynamics and feedback control in Chemical Engineering.
2. Be able to develop fundamental and empirical models with time dependence.
3. Be able to analytically solve linear dynamic models and to use computer-based tools for dynamic model simulation.
4. Be able to analyze open-loop and closed-loop system properties such as stability and performance.
5. Be able to perform model-based design and tuning of PID controllers and other types of single variable controllers.
6. Be able to identify and solve multivariable control problems and to use computer-based tools for control system simulation.
7. Understand the impact of open-loop dynamics and feedback control on process operability and safety.
8. Develop good engineering practices for composing and solving problems, particularly open-ended problems requiring computer solutions.
9. Be prepared to use the principles and tools learned in this class to solve problems not covered in detail as part of this course and to continue learning related materials as needed in the future.

These objectives are intended to address the ABET outcomes of (a) Technical Knowledge, (c) Design, (e) Problem-Solving, (g) Communication, (h) Global/Societal Impact, (i) Life-Long Learning, (j) Contemporary Issues and (k) Applications.

Prerequisites: ChE 338 and ChE 361. Corequisites: ChE 444.
CLASS TIMES: Tuesdays and Thursdays, 10:00–11:15 am, ISB 221; Fridays, 10:10–11:00 am, ISB 221 (as scheduled).

INSTRUCTOR: Prof. Michael A. Henson, N527 Life Science Laboratory, henson@ecs.umass.edu.

TEACHING ASSISTANTS: TBA

REQUIRED TEXT:


GRADING: Homeworks – 10%
          Project – 10%
          Midterm exams – 45%
          Final exam – 35%

EXAMS: All exams will be open book. The only materials allowed to be used during exams are the textbook, lecture notes and your completed homework assignments.

HOMEWORKS: Homeworks will be assigned roughly weekly throughout the semester. Written homeworks will not be collected and graded, but students will need to complete these short assignments to be successful on the exams. Matlab homeworks will be assigned every few weeks and must be submitted for grading. These homeworks can be completed and submitted by two-member groups. All assignments are due at the beginning of class one week after they are assigned. No late homeworks will be accepted. Solutions must be presented in a neat and clear manner. Each student will need to obtain a student license for Matlab/Simulink ($99) and the associated toolboxes that are provided at no additional charge. Details on the student license are provided here: www.mathworks.com/academia.

PROJECTS: A Matlab project will be due near the end of the semester. These projects must be conceived and completed by four-member groups. Each group will be required to propose an original topic approximately one-half through the semester for approval by the instructor.

COURSE MATERIALS: Lectures, homework assignments and other course materials will be posted on the course webpage. The URL for the webpage is www.ecs.umass.edu/che/che361.

ATTENDANCE: You are expected to attend all required classes. The Student Handbook, Section VIII, outlines the procedures for dismissal from the course for non-attendance. Attendance in the lectures is very important. The lectures are used to present new information and provide background for the assignments. You are responsible for all of the material presented in lectures.
ACADEMIC HONESTY: Academic honesty is extremely important. You must be sure to do your own work and protect your work from plagiarism by others. If there is any evidence that the Academic Honesty Policy has been violated, you may be subject to severe penalties, ranging from receiving a grade of F for the course to dismissal from the University.