

Chemical Engineering 436
Process Dynamics and Control
MWF - 1:00 pm, 256 CB
Fall 2010

Professor: T.H. Fletcher - 350K CB (801-422-6236) tom_fletcher@byu.edu

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Texts:

1. D.E. Seborg, T.F. Edgar, E.A. Mellichamp, F. J. Doyle, Process Dynamics and Control, 3rd edition, John Wiley & Sons, NY, 2011.*
2. D. Cooper, Practical Process Control Using Loop-Pro Software, Department of Chemical Engineering, University of Connecticut, 2005 (pdf file on Blackboard).

*I have tried to make homework and reading assignments so that the 2nd edition can be used.

Catalog Description:

ChE 436: Process Control and Dynamics (3 credit hours). Prerequisite: Math 334; ChEn 376, 478 (386). Process systems, associated control systems, and instrumentation. Use of Laplace transforms and complex variables.

Course Objectives:

It is the intent of this course to help the student to:

1. Understand and be able to describe quantitatively the dynamic behavior of process systems.
2. Learn the fundamental principles of classical control theory, including different types of controllers and control strategies.
3. Develop the ability to describe quantitatively the behavior of simple control systems and to design control systems.
4. Develop the ability to use computer software to help describe and design control systems.
5. Learn how to tune a control loop and to apply this knowledge in the laboratory.
6. Gain a brief exposure to advanced control strategies.

Grading:

Homework/Quizzes	20%
Project	10%
Exams	45%
Final Exam	25%

College Lectures

Students are required to attend two lectures during the semester. The college lectures this semester are on Oct. 7 and Nov. 4 this semester. You may also fulfill this requirement by attending graduate seminars in Chemical Engineering or other departments (with prior approval). Your grade will be lowered 5% (e.g., from a B+ to a B) if you do not attend 2 lectures (2.5% if you only attend one lecture). You will need to email the information about the lecture to the TAs, including date, person speaking, and topic. You may also write this on the homework.

Reading:

Reading the textbook(s) is *essential* to passing this class. The packet material is quite easy to read, but the textbook is slightly more difficult. Students are expected to read the material before the lecture, then get clarifications on the reading, and then do the homework. The responsibility of learning is then on the student!

Reading questions are available at <http://www.et.byu.edu/~tom/classes/436/reading.html>. However, based on student input over the last few years, I am not requiring written responses to the reading questions. I will change this policy if students do not read the assignments.

Quizzes:

Unannounced quizzes will be given on the assigned reading material for that day. The number of quizzes will increase as student preparation for classes decreases. Motto: BE PREPARED! *Quizzes will not be rescheduled*, and extra credit is not available (but quizzes constitute only 1% of the homework grade). The quizzes are intended to: 1) provide an opportunity for you to practice responding to questions under time pressure, 2) provide encouragement for you to keep up with the course material, 3) encourage attendance.

Exams:

There will be three exams given during the semester. These exams may be closed book and/or open book, in-class or in the testing center, as specified by the instructor prior to the exam. Computers will not be used on the exams. Exams will only be given after the scheduled date by special permission. Students with conflicts should arrange to take the exam prior to the scheduled date.

Use of exams from previous semesters will be considered as an honor code violation and treated accordingly. If you have them, please discard them now.

Homework:

The purpose of the homework in this class is to reinforce concepts discussed in the reading material and re-emphasized in class. Unfortunately, due to time constraints, students often view homework as busywork necessary to get a grade. Getting the answer becomes all important rather than learning the concept. Therefore, the first part of each homework assignment will be to write a sentence or two stating the purpose of the problem, and what concept was being reinforced. In other words, state why this homework problem added to your education. Five percent of the homework grade will be given for this qualitative statement of purpose on each assignment. Try it, you'll like it!

Homework is due at the beginning of the class period. Late homework may be handed in for half credit before the next exam. When you go on an interview trip, please work the homework in advance to avoid the late penalty. Solutions to the problems will be available on Blackboard after problems have been graded. The solution key may be consulted when doing late homework. Don't forget to write the purpose of the assignment first!

Project:

You will be required to complete a group project in the lab as part of this course. Groups will consist of 3-4 students, and one report will be submitted for the group. Homework assignments will be reduced during the time which the project is assigned. You do not have to write a purpose for the lab. It will be necessary to schedule your time in the laboratory since facilities are limited. Please be considerate of others as you schedule and use lab time to complete the group project.

Computer Tools:

We will be using a computer software package called "Control Station" which was written by Doug Cooper at the University of Connecticut for *teaching* process control. This program can be accessed on the RGS system. You can access this in the UO lab, or download the RGS server from the CAEDM site. Our license agreement allows you to use this program while in this class, but not for other purposes. The use of MATHCAD and other packages (MATLAB, etc.) will be used later in the course. Please remember that copying computer files for homework will be considered an honor code violation. You need to do turn in your own version of the work, even if you work with other students.

Citizenship:

I will come prepared to each class, ready to help explain the material covered in the reading. I appreciate attentive students who respect my time and the time of other students. I am annoyed, as are other students, by inconsiderate students who continually disrupt class. I reserve the right to lower the cumulative scores of disruptive students by up to 5%.

Honor Code:

Elder Henry B. Eyring has encouraged us to make this the type of university where Christ would like to come. He is also very interested in justifying the tithing money of faithful members of the church. It is such a pleasure to work at this university with such great young men and women. Please remember to adhere to the Honor Code and the Dress and Grooming Standards. Unfortunately, not all students have the same commitment, and hence violations will be dealt with appropriately.

Study Habits:

Grade Expectations

- A **Read material in advance**, including the reading questions. Be attentive and ask questions in lectures, understand and do all homework on time, study hard for exams well before the exam starts, work hard and perform well on exams.
- B Skim material in advance, attend lectures and try to stay awake, depend on TA for homework help, casually study for the exam by working the practice exam instead of learning concepts.
- C Never read book, work on Separations or other homework during class, skip some homework assignments, start cramming for the exam the night before the exam.

D Skip class, don't turn in homework or turn it in late, start learning during the exam.