ChE 441
Process Control
Fall, 2010

Washington State University
Voiland School of Chemical Engineering and Bioengineering
Richard L. Zollars

Instructor: Richard L. Zollars, Dana 114

Text: Process Dynamics and Control, 3rd Edition, Dale E. Seborg, Thomas F. Edgar, Duncan A. Mellichamp, Francis J. Doyle, John Wiley and Sons, New York, 2011 (ISBN 978-0-470-12867-1).

Website for Course: http://www.chebe.wsu.edu/~rzollars/che441.htm.

Course Objectives: At the completion of this course you should be able to:

1) analyze the dynamics of process operations

2) understand the dynamic response of various operations

3) understand controllers for process operations based on both theoretical and empirical process characterization

Course Syllabus:

Introduction (2 class periods)

Tuning Feedback Controllers (6 class periods)

Dynamic Response of Chemical Processes (7 class periods)

Mathematical Tools for Control System Analysis (6 class periods)

Basic Components of Control Systems (2 class periods)

Design of Single-Loop Feedback Control Systems
- Analysis of a Feedback Control Loop (2 class periods)
- Stability of Feedback Systems (4 class periods)

Additional Control Techniques
- Feed Forward Control (3 class periods)
- Cascade Control (3 class periods)
- Model Based Control (3 class periods)

Policies and Procedures:

1) There will be two hour exams and a final exam in this class. All exams will be open book, open notes exams. Each exam will be given equal weight in determining the class grade. The tests will be graded on a mastery basis – no curving. Thus it is possible for everyone in the class to get an "A", or a "C".

2) No make-up exams will be given except for legitimate medical excuses. All make-ups will be covered by a single exam given near the end of the semester. If you know ahead of time that you are going to be away for one of the exams (again only for legitimate reasons such as interview trips) an exam period prior to the normal exam period will be arranged.

3) During this class we will use a number of software packages, including the control system simulator Control Station. Tutorial classes covering the basics of the software to be used will be arranged as necessary.

4) Homework assignments are due at the start of the class period that they are supposed to be turned-in. Any questions about the homework will be addressed after their submission.

5) There will be a "laboratory" component of this class that will be conducted via both Control Station and with collaboration with the University of Tennessee (Chattanooga). As with the laboratory components of other classes the work that you do is expected to be your own.

6) All forms of cheating (e.g., plagiarism, copying, communicating with others during an exam) are not acceptable in this class. Anyone caught doing so will receive an F and will be referred to the Office of Student Conduct.

7) The grade for the course will be determined on the following basis: homework – 25%, hour exams – 50%, final exam – 25%.

Department Programmatic Objectives Met:

At the completion of this course students will have demonstrated the following skills as described in the Program Statement for the Voiland School and by ABET. Students will have:

c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
e) an ability to identify, formulate, and solve engineering problems
k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Software Usage:

Matlab (Simulink), Control Station, Mathematica (optional), MathCAD (optional)

Students with Disabilities:

Reasonable accommodations are available for students with a documented disability. If you have a disability and may need accommodations to fully participate in this class, please visit the Disability Resource Center (DRC). All accommodations MUST be approved through the DRC (2nd Floor, Washington Building). Please stop by or call 509-335-3417 to make an appointment with a disability specialist.

Campus Safety Issues:

All students should be familiar with the Campus Safety Plan and the University Emergency Management system. Details on these can be found at http://safetyplan.wsu.edu and http://oem.wsu.edu/emergencies, respectively. Everyone is encouraged to go to http://my.wsu.edu and, under the Emergency Notification box, enter their emergency contact information.