ChE-420
Introduction to Process Control
Fall 2013

Chemical Engineering Department

University of Waterloo

Calendar Description:

Laplace transform techniques. Proportional-integral-derivative control. Frequency response methods. Stability analysis. Controller tuning. Process control simulation and computer control systems. Process identification.

Course Instructor:
Luis Ricardez, laricard@uwaterloo.ca,
Office: E6-3014, X 38667.
Office hours: Mondays 4:00-5:00 pm.

Teaching Assistant:
Bhushan Patil, bpatil@uwaterloo.ca
Office number: 3106, X 31630.
Office hours: Mondays 1:00-2:00pm.

Course Website:

htpp://www.learn.uwaterloo.ca

Lectures: Mondays, 9:30-11:20pm, E6-2024
Fridays, 8:30-9:20am, E6-2024

Tutorials: Fridays, 9:30-10:20am, E6-2024

Important Dates:

Midterm Exam:

Monday, Oct. 28th, 9:30-11:20pm, E6-2024.

Final Exam:

2.5 hr, dates and location TBA

Holiday (Thanksgivings day):

Monday October 14th (Lectures cancelled)

Textbook:

Seborg, D., Edgar. T.F., Mellichamp, D.A. and Doyle III, F.J., Process Dynamics and Control, 3rd Edition, John Wiley & Sons, Hoboken, USA, 2010.

Suggested Reference:

1. Stephanopoulos, G., Chemical process control: an introduction to Theory and Practice, Prentice-Hall, Englewood Cliffs, USA, 1984.
2. Moore, H., MATLAB for Engineers, 2/E, Pearson education, 2008.

Course Software:

MATLAB R2012a or b (Available on engterm.uwaterloo.ca)

Course Grading Breakdown:

5-6 Assignments:	10 %
Midterm:	40 %
Final:	50 %
Total:	100 %

COURSE TOPICS

Part I. Introduction to Process control (Chapters 1 and 2 in the textbook)

- Motivation to apply process control in chemical processes.
- The hierarchy of process control activities.
- Preliminary information to perform process control.
- Dynamic process models in chemical processes.

Part II. Dynamic behaviour of chemical processes (Chapters 3-7 in the textbook)

- Laplace Transform.
- Transfer function models.
- First order process models.
- Second order and higher order process models.
- Systems Identification.

Part III. Feedback process control (Chapters 8-12, 14 in the textbook)

- Stability analysis in dynamic systems.
- Feedback controllers.
- Methods for tuning feedback controllers.
- Control Instrumentation.
- Frequency Response Analysis.

Classroom Responsibilities:

http://www.eng.uwaterloo.ca/~ugoffice/course_responsibilities.html

Academic Integrity, Grievance, Discipline, Appeals and Note for Students with Disabilities: see www.uwaterloo.ca/accountability/documents/courseoutlinestmts.pdf The text for this web site is listed below:

Institutional-required statements for undergraduate course outlines approved by Senate Undergraduate Council, April 14, 2009

Academic Integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [Check www.uwaterloo.ca/academicintegrity/ for more information.]

Grievance: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4, http://www.adm.uwaterloo.ca/infosec/Policies/policy70.htm. When in doubt please be certain to contact the department's administrative assistant who will provide further assistance.

Discipline: A student is expected to know what constitutes academic integrity to avoid committing academic offenses and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offense, or who needs help in learning how to avoid offenses (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course professor, academic advisor, or the undergraduate associate dean. For information on categories of offenses and types of penalties, students should refer to Policy 71, Student Discipline, http://www.adm.uwaterloo.ca/infosec/Policies/policy71.htm. For typical penalties check Guidelines for the Assessment of Penalties, http://www.adm.uwaterloo.ca/infosec/guidelines/penaltyguidelines.htm.

Appeals: A decision made or penalty imposed under Policy 70, Student Petitions and Grievances (other than a petition) or Policy 71, Student Discipline may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72, Student Appeals, http://www.adm.uwaterloo.ca/infosec/Policies/policy72.htm.

Note for students with disabilities: The Office for Persons with Disabilities (OPD), located in Needles Hall, Room 1132, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the OPD at the beginning of each academic term.