ChE522/624
Advanced Process Dynamics and Control – Winter 2015

Class times: Tuesdays from 12:30 to 2:30pm and Thursdays from 12:30 to 1:30pm, E6-4022.
Instructor: Luis Ricardez-Sandoval
Room: E6-3014
E-mail: laricard@uwaterloo.ca
Office hours: Thursdays from 1:30 to 2:30pm, E6-3014
Course folder: UWLearn course site.

CALENDAR DESCRIPTION
State space methods; Sampled-data systems; Discrete systems; Transform methods; Multivariable control; Computer control; Closed-loop analysis; Design of controllers; Control of complex chemical systems.

DETAILED DESCRIPTION
At the conclusion of this course the students should be able to solve systems of ODE's using linear algebra techniques, formulate state feedback controllers and assess the observability and controllability of the states. For the purpose of computer control implementation and analysis, students will learn the z-transform, analyzed closed loop stability of discrete systems and design discrete controllers based on z-transform-based transfer functions.

REFERENCES

- Process Dynamics and Control by Seborg, Edgar and Mellichamp, Ed. Wiley, 3rd edition.
- Chemical Process Control by G. Stephanopoulos, Ed. Prentice Hall.
- Linear Systems by T. Kailath, Ed. Prentice Hall, 1980.
- Advanced Engineering Mathematics, E. Kreyszig, Ed. Wiley.
- Multivariable feedback control, S. Skogestad and I. Ian Postlethwaite, 2nd Ed.

Course topics:

- State space models for control.
- State feedback controllers.
- Observability and controllability.
- Introduction to discrete control.
- Introduction to z-transform.
- Introduction to multivariable control.

GRADING
Assignments (4-6): not graded but given every 1-2 weeks and solutions posted a week later.
Mid-term (2½ h): 40%, dates, time and location TBA
Final (2½ h): 60%, date, time and location TBA.

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.