CARLETON UNIVERSITY
Department of Systems and Computer Engineering

SYSC 4505 **Automatic Control Systems I** **Fall 2008**

Course Outline

Instructor:

Professor I. Lambadaris, Room 4442 ME, ioannis@sce.carleton.ca

Course Objectives:

The objective of the course is to teach the student the fundamental concepts of control system design and analysis. The course reviews linear systems theory and presents how linear systems theory is used to both specify performance requirements and how to design the control system. A number of electromechanical examples are used to illustrate control system analysis and design.

Prerequisites:

MATH 2004 and (SYSC 2500 or 3500 or 3600). Students should have prior exposure to elementary transforms and differential equations.

Textbook:

K. Ogata, "*Modern Control Engineering*, *Fourth Edition*" Prentice Hall 2002, ISBN: 0-13-060907-2.

References:

- B. Kuo, Automatic Control Systems, Prentice Hall
- W. Palm, Control Systems Engineering, Wiley
- Hostetter et al, Design of Feedback Control Systems, Holt Rinehart and Winston

Labs:

Labs are three hours on alternate weeks.

Grading Scheme:

- In-class quiz 15% (During lecture, October 9, 2008)
- Midterm 25% (During lecture, October 30, 2008)
- Assignments 10%
- Labs 10%
- Final Exam 40% (Scheduled during examination period)

Students with Disabilities:

Students with disabilities requiring academic accommodations in this course are encouraged to contact the Paul Menton Centre for Students with Disabilities to complete the necessary forms. After registering with the PMC, make an appointment to meet with me in order to discuss your needs at least **two weeks prior to the first in-class test.** This will allow for sufficient time to process your request.

Plagiarism:

Plagiarism (copying and handing in for credit someone else's work) is a serious instructional offense that will not be tolerated. Please refer to the section on instructional offenses in the Undergraduate Calendar for additional information.

Final Exam: *Is for the evaluation purposes only and will not be returned to the student.*

Course Outline:

Weeks 1-2 – Review of Laplace transforms, transfer functions, dynamics of linear systems and frequency response.

Week 3 – Steady state errors, system types, stability and Routh-Hurwitz criteria.

Week 4 – The effect of feedback on system dynamics. Construction of root loci. Real axis segments, asymptotic angles, centroids of asymptotes.

Week 5 – Construction of root loci continued. Root locus design examples.

Weeks 6-7 – Time domain controller design. The PD and PID controllers.

Weeks 8-9 – Frequency response analysis. Nyquist polar plots, The Nichols chart, gain margin and phase margin.

Weeks 10-11 – Compensation design. Phase lead compensation and phase lag compensation for time domain and frequency domain specifications. Design of a lead-lag compensation.

Weeks 12-13 – State space techniques, matrix formulation and full state feedback, as time permits.

Carleton University
Department of Systems and Computer Engineering

Engineering SYSC 4505
Automatic Control Systems I

Laboratory Manual

And

Simulation Exercises

Instructor: Professor H.M. Schwartz
Room 4432ME

Fall 2006