Carleton University

Department of Systems and Computer Engineering

SYSC 3600 D: Systems and Simulation
Winter 2012
Course Information

Instructor: Prof. Richard M. Dansereau
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Office Hours: To be posted on course webpage

Course Description and Objective:

This course provides an introduction to the techniques of system modeling, analysis and simulation. One will learn how to predict the behaviour of dynamic systems to various inputs. Knowledge gained from previous courses on mechanical and electrical systems and differential equations is integrated to provide an understanding of the dynamic behaviour of engineering systems. The topics to be covered include: modeling of dynamic systems, the properties of dynamic systems, the use of Laplace transforms, transfer functions and block diagrams, convolution and time and frequency response.

Prerequisites: MATH 1005, and (ECOR 1101 or PHYS 1001). Precludes additional credit for SYSC 2500/3500.

Students who have not satisfied the prerequisites must either (a) withdraw from the course or (b) obtain a prerequisite waiver from http://www.sce.carleton.ca/ughelp. Students not meeting these conditions may be deregistered from the course after the last day for course registration.

Textbook:

- Norman Nise, *SYSC 3600: Systems & Simulation*, Wiley, 2010. ISBN: 978–1–119–94826–1
  custom textbook, b/w, available at bookstore
  or custom eBook, two-colour

Grading:

Assignments:	15%	
Laboratories:	20%	
Midterm Examination (in-class):	15%	(Feb. 17, 2012)
Final Examination:	50%	

To obtain a final grade higher than F, students must obtain a passing grade on the final examination. To be eligible to write the final examination or the deferral of the final examination, all course requirements must have been completed, including completion of all assignments and all labs.

WWW: You must have a Carleton Connect account to access the course webpage at
http://webct.carleton.ca/
Login = Carleton Connect userid
Password = Carleton Connect password
The web page will list your official midterm, laboratory, and assignment grades throughout the semester. It is your responsibility to double check that the grades are recorded correctly for your work.
Check the course web page regularly for announcements and postings.

Health and Safety: Every student should have a copy of our Health and Safety Manual. An electronic version of the manual can be found at `http://www.sce.carleton.ca/courses/health-and-safety.pdf`

Attendance: Students are expected to attend all lectures and lab periods as required. The Faculty of Engineering and Design requires students to have a conflict-free timetable, so requests to accommodate missed exams, assignment due dates, project milestones, etc., because of conflicts with other courses, jobs or vacation plans will not be considered.

Plagiarism: Plagiarism (copying and submitting 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.

Midterm Policy: The midterm is to be written at the scheduled class time. A missed midterm will be recorded as a zero. If the midterm is missed for circumstances beyond your control, you should submit appropriate documentation within 5 business days for consideration.

Final Exam Policy: The final exam is for evaluation purposes only and will not be returned to the student.

Assignments: The assignments will contain primarily analytical problems, with a focus on modeling and analyzing dynamic systems. Students are required to complete all assignments, and submit the assignments by the specified due dates to meet the requirements of this course.

Labs: Labs will be three hours every week as per the registration schedule. In the labs, we will use MATLAB™ and SIMULINK™ for modeling, analysis, and simulation of dynamic systems. Students are required to complete all labs to meet the requirements of this course.

Course Plan (tentative):

- Basic system properties; fundamental continuous-time signals
- Laplace transform and its properties; inverse Laplace transform, partial fraction expansion
- Differential equations; transfer functions
- Modeling electrical networks; operational amplifiers
- Modeling translational mechanical systems, rotational mechanical systems, and electromechanical systems
- Describing systems with differential equations, transfer functions, and analogous systems
- State space representations and canonical forms
- Block diagrams; reduction of multiple subsystems; feedback systems
- System stability; pole-zero diagrams
- Time response of systems; natural, forced, steady-state, and transient responses; impulse, step, and general input responses
- Time response analysis with Laplace transform; convolution; effect of pole and zero placements;
- Dynamics of 1^{st}-order systems; time constant, rise time and settling time
- Dynamics of 2^{nd}-order systems; overdamped, underdamped, and critically damped systems; overshoot and peak evaluation
- Frequency response, Bode plot construction

Academic Accommodation
You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

Pregnancy/parental leave obligation: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website:
`http://www.carleton.ca/equity/accommodation/academic/`

Religious obligation: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website
`http://www.carleton.ca/equity/accommodation/academic/`

Students with disabilities requiring academic accommodations in this course must register with the Paul Menton Centre for Students with Disabilities (PMC) for a formal evaluation of disability-related needs. Documented disabilities could include but are not limited to mobility/physical impairments, specific Learning Disabilities (LD), psychiatric/psychological disabilities, sensory disabilities, Attention Deficit Hyperactivity Disorder (ADHD), and chronic medical conditions. Registered PMC students are required to contact the PMC, 613-520-6608, every term to ensure that I receive your Letter of Accommodation, no later than two weeks before the first assignment is due or the first in-class test/midterm requiring accommodations. If you only require accommodations for your formally scheduled exam(s) in this course, please submit your request for accommodations to PMC by the deadlines published on the PMC website:
`http://www.carleton.ca/pmc/students/dates-and-deadlines/`