Carleton University
Department of Systems and Computer Engineering

SYSC 3303 A ***Real-Time Concurrent Systems*** ***Winter 2012***

Course Outline

Instructor: C. Schramm, Room ME4230, schramm@sce.carleton.ca

Course Objectives
To introduce students to the principles and practice of software development for systems characterized by one or more of the following terms: real-time, concurrent, event-driven, and embedded. Although a specific implementation technology will be used to provide hands-on programming experience, the goal is to present techniques that are applicable to a diverse range of applications, hardware/software components, programming languages and operating systems.

Prerequisite Courses
For Engineering students, the prerequisites are: SYSC 2004 or SYSC 2100, **and** SYSC 2003.
Computer Science students must have successfully completed COMP 2003, **and** COMP 2002 or COMP 2402. Prerequisite waivers will not be granted. Students who have not completed the prerequisites must withdraw from SYSC 3303 by the last date for registration; otherwise, they will be deregistered before the end of term.

Textbook
Recommended: *Real-Time Systems and Programming Languages: Ada, Real-Time Java and C/Real-Time POSIX*, Fourth Edition, Alan Burns and Andy Wellings, Addison-Wesley, 2009.

Additional supplementary references will be listed on the course web site.
Additional material that is **not** on the posted slides will be presented in class and will be examined.

Web Site
Course materials will be placed on the SYSC 3303 Web site, so students must have Internet access. The URLfor the site is http://www.sce.carleton.ca/courses/sysc-3303. Students are expected to access this site regularly, and **consult it before emailing questions** to the instructor. Portions of the Web site will be protected by a password, which will be provided to students in class.

Email
As required by University regulation, students are required to consistently read their Connect email. The instructor will be using this email account to communicate important and timely messages. Not reading these emails is not a valid excuse for missing a deadline.

Emails to the instructor must be professional in nature and in writing. All emails must be from the student's Connect account, titled with the course name, and contain the student's name and number. The instructor attempts to answer all emails in a timely and helpful manner but will not reply to emails concerning matters already covered in class, on the course website or discussion groups or class emails.

Attendance
Students are expected to attend all lectures and lab periods. 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.

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Labs
Attendance at lab periods is mandatory. Labs are either used for lab exercises or for group demonstrations of a project milestone.

Assignments
There will be several assignments to be completed individually. Because assignments are designed to be worked on over the course of two-weeks, students who are sick at the time of the submission deadline should have already been working on the assignment. Those who can provide appropriate medical documentation will be able to submit their partial work for marking against a reduced grading scheme; others will receive zero. Consequently, please do not ask for exemptions and/or extensions because of illness. Those with long-term illnesses will be handled on a case-by-case basis.

Project
A major component of the course is a team project that will lead you through the process of building a reasonably complex concurrent system. Each team member must participate in all aspects of the project: design, coding, testing and debugging, etc. You will get your team's mark for the project, multiplied by a factor of between 0% and 150%, based on the instructor's and the TAs' judgement of your contribution to your team. Students who do not pull their weight on their project team and projects submitted by students who refuse to join a team will receive a mark of 0; these students will receive a final grade of FND regardless of how well they do in the other course components.

Exams
One closed-book midterm exam will be held approximately half way through the term. The date for the exam will be announced in class. Students who are unable to write the midterm exam because of illness or other circumstances beyond their control must provide, in cases of illness, a medical certificate dated no later than one working day after the exam, or appropriate documents in other cases. If this information is provided to the instructor no later than five working days after the exam, an alternative examination will be offered; otherwise, the mark for the missed exam will be zero.

***Requests for accommodation based on poor performance on the midterm will not be considered under any circumstances*.**

A closed-book final exam will be held during the University's examination period. With the exception of those students who receive an FND based on their participation in the team project (see the "Projects" section), **and** those who did not write either the midterm exam OR its alternative, all students are eligible to write the final examination. Eligible students, who miss the final exam and received at least 40% on the midterm exam, will receive the grade ABS and may apply to the Registrar's Office for deferral of the final examination. Eligible students who miss the final exam and received less than 40% on the midterm will receive a grade of FND and be ineligible for the deferred final exam.

The final exam is for evaluation purposes only and will not be returned to students.

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Evaluation and Grading Scheme
With the exception of those students who do not have a passing grade in the project (See **Project**), a student's grade is calculated as follows:

Labs:	5%
Assignments:	15%
Midterm Exam:	15%
Project:	25%
Final Exam:	40%

Students with Disabilities
Students with disabilities requiring academic accommodations in this course must register with the Paul Menton Centre for Students with Disabilities for a formal evaluation of disability-related needs. Registered PMC students are required to contact the Centre (613-520-6608) every term to ensure that their instructor receives their Letter of Accommodation, no later than two weeks before the first in-class test/midterm requiring accommodations. If you require accommodation for your formally scheduled exam(s) in this course, please submit your request for accommodation to PMC by March 7th, 2012.

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.

Week by Week Outline: Topics Covered
1. Nature of Real-Time Systems
2. Internet Protocols and InterProcess Communication
3. Concurrency: Process and Thread Models. Java Thread Programming
4. Linux Thread Programming. Concurrency Testing and Debugging Practices
5. Thread Synchronization: Mutex Synchronization
6. Thread Synchronization: Conditional Synchronization
7. Class Concurrency Problems: Bounded Buffers, Readers Writers
8. Real-Time Systems: Requirements
9. Scheduling Schemes for Real-Time Systems: Fixed Priority (Rate and Deadline Monotonic), Cyclic Executive, Dynamic Priority
10. Additional Considerations for the Practitioner
11. Verification and Validation
12. Recent Developments in Real-Time Concurrent Systems

Revised January 3rd, 2012