CARLETON UNIVERSITY

Department of Systems and Computer Engineering

SYSC 4102 **Performance Engineering** **Winter 2012**

Course Handout

Instructor:

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Course Description and Objectives:

Performance in this course deals with time and capacity characteristics of computer-based systems. When systems are designed for functionality only, the time to complete a response may be so long that the system is useless; similarly its capacity to serve numbers of users may be so restricted that the system is uneconomic to run. Both of these problems occur often in practice. Performance engineering is a body of concepts and techniques for evaluating systems and system designs, using measurements and models.

The course will cover all the basic approaches to performance engineering, including measurement techniques, setting up test environments, interpreting and comparing results, models that explain capacity constraints and delays (bottleneck models, queueing models), an introduction to hard-real-time delay constraints and schedulability evaluation for embedded systems, parallelism as in Grid systems, and the effect of logical resources such as process threads.

This course will prepare the student to address performance problems in Grid systems, embedded controllers, enterprise distributed systems, and web service systems. It will introduce the conceptual framework and the nature of problems and solutions, so that the student can go into the field.

Prerequisites:

STAT 3502 and (SYSC 3001 or SYSC 4001)

Textbook:

Quantitative System Performance Computer System Analysis Using Queueing Network Models by Edward D. Lazowska, John Zahorjan, G. Scott Graham, Kenneth C. Sevcik (free download available from: http://www.cs.washington.edu/homes/lazowska/qsp/)

References:

- Performance by Design: Computer Capacity Planning By Example by Daniel A. Menasce, Lawrence W. Dowdy, and Virgilio A.F. Almeida. Prentice Hall. ISBN-10: 0130906735.
- Designing Concurrent, Distributed, and Real-Time Applications with UML by Hassan Gomaa, Addison-Wesley Professional. ISBN-10: 0201657937.

Course Outline:

1. Performance concepts and requirements.

2. Performance measurement. Workloads.

3. Performance models. Cures for performance problems.

4. Memory hierarchy effects. Queueing analysis.

5. Queueing Analysis cont.

6. Software resources.

7. Layered resource effects.

8. Measurement and tools.

9. Schedulability analysis for hard realtime systems.

10. Hard realtime systems cont.

11. Patterns for improving performance.

12. Case study.

13. Review.

Grading Scheme:

Assignments (Five assignments to be done individually, taking about ten hours each)	20%
Midterm	20%
Final exam	60%

Assignment due dates are important and late completion will be penalized.

Important Notes:

1. Students must pass the final exam in order to pass the course.
2. The final exam is for evaluation purposes only and will not be returned to the student.
3. 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 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 require accommodation for your formally scheduled exam(s) in this course, please submit your request for accommodation to PMC by their deadline.
4. Plagiarism (copying and handing in for credit someone else's work) is a serious instructional offence that will not be tolerated. Please refer to the section on instructional offences in the Undergraduate Calendar for additional information.
5. 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.