DEPARTMENT OF MATHEMATICAL AND COMPUTATIONAL SCIENCES
UNIVERSITY OF TORONTO MISSISSAUGA

CSC409H5F LEC0101
Scalable Computing
Course Outline - Fall 2019

Class Location & Time	Thu, 01:00 PM - 03:00 PM DH 2020
Instructor	Arnold Rosenbloom
Office Location	DH3088
Office Hours	TBA
E-mail Address	arnold.rosenbloom@utoronto.ca
Course Web Site	www.cs.toronto.edu/~arnold/409/19f

Course Description

We investigate computation in the large -- utilizing many CPUs with large amounts of memory, large storage and massive connectivity -- to solve computationally complex problems involving big data, serving large collections of users, in high availability, global settings. Our investigation covers both theoretical techniques and current, applied tools used to scale applications on the desktop and in the cloud. Topics include caching, load balancing, parallel computing and models of computation, redundancy, failover strategies, use of GPUs, and noSQL databases. [24L, 12P]

Prerequisite: CSC309H5, CSC369H5, CSC373H5 (SCI)
Distribution Requirement: SCI

Students who lack a pre/co-requisite can be removed at any time unless they have received an explicit waiver from the department. The waiver form can be downloaded from here.

Textbooks and Other Materials

No required text.

Assessment and Deadlines

Type	Description	Due Date	Weight
Assignment	Assignment 1	2019-10-06	25%
Assignment	Assignment 2	2019-11-03	25%
Assignment	Assignment 3	2019-12-04	25%
Lab		On-going	5%
Final Exam		TBA	20%
		Total	100%

Penalties for Lateness

20% deduction for up to 48 hours late. Not accepted after that.

Procedures and Rules

Missed Term Work

To request special consideration, bring supporting documentation to the instructor in person during office hours at least one week in advance.

In case of illness, bring a U of T medical certificate to the instructor within one week of the missed work. The certificate must specify the exact period during which you were unable to carry out your academic work.

Missed Final Exam

Students who cannot write a final examination due to illness or other serious causes must file anonline petition **within 72 hours of the missed examination**. Original supporting documentation must also be submitted to the Office of the Registrar **within 72 hours of the missed exam**. Late petitions will **NOT** be considered. If illness is cited as the reason for a deferred exam request, a U of T Verification of Student Illness or Injury Form must show that you were **examined and diagnosed at the time of illness and on the date of the exam, or by the day after at the latest**. Students must also record their absence on ACORN on the day of the missed exam or by the day after at the latest. Upon approval of a deferred exam request, a non-refundable fee of $70 is required for each examination approved.

Academic Integrity

Honesty and fairness are fundamental to the University of Toronto's mission. Plagiarism is a form of academic fraud and is treated very seriously. The work that you submit must be your own and cannot contain anyone elses work or ideas without proper attribution. You are expected to read the handout How not to plagiarize (http://www.writing.utoronto.ca/advice/using-sources/how-not-to-plagiarize) and to be familiar with the Code of behaviour on academic matters, which is linked from the UTM calendar under the link Codes and policies.

Final Exam Information

Duration:	3 hours
Aids Permitted:	Lab based exam

Additional Information

Topics covered tentatively include:

General Architectural Principles: Scalability, Performance, Latency, Availability, Fault Tolerance, Replication and Partitioning

Optimizing Performance on isolated systems, CPU, RAM, Caching, persistent storage.

Sample Architectures: r/place

Distributed Systems Theory: The CAP Theorem, The impossibility of consensus, algorithms for consensus. Tools like etcd.

Scalable Storage: Casandra/Mongodb, Redis

Proxy/Load Balancing: nginx

Scaling Compute: Apache Spark, Containers, Amazon Lambda

Last Date to drop course from Academic Record and GPA is November 7, 2019.