COMP599: Syllabus
Methodologies and Innovations in Real-World Computing

Winter 2018

Prerequisites: Math (Calculus, Linear Algebra and Matrix Computation, Probability Theory) + Operating Systems (COMP310/ECSE427) + Computer Networking courses (COMP535).

Please Note: These prerequisites are strict, unless you get special approval from the course instructor. Please bring your transcript(s) and detailed CV with detailed project and research experiences.

Class web page: myCourses

Instructor: Dr. Xue (Steve) Liu
Office: Room 326, McConnell Engineering Building

Email: solve the reCAPTCHA on my webpage ☺ (Recommended means for communication. Do not use phone.)

Note: Emails should be sent from your official McGill email address in order to be responded. Emails not from your official McGill email address will NOT be properly filtered hence will not be responded. Emails should be started with the title "COMP599: *** ". For every email communication, please make sure to use "COMP599:" as a single word (with no spaces) as the start of the title and replace *** with your topic/questions. Please note: Due to the LARGE number of emails (together with all the spams) we receive every day, emails not started with this title may be categorized as spams by the spam filter and will not be responded. We will NOT use WebCT email. Thank you for your understanding.

Office hours: Thursdays 3:30-4:00 PM@ Room 326 MC.

Academic Integrity: ***"McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism, and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.mcgill.ca/integrity for more information)."***

This is an advanced undergraduate and graduate level course for students who are interested in learning how real-world systems work and understand their foundations. We will first begin with an introduction on scientific research methodologies. Then we will focus on selected interesting topics in the general areas in computing systems and networking. Broad areas that we will study include: operating systems and protocol design, cloud computing basics, P2P networks, network coding and applications, computational advertising, recommender systems, autonomic computing, how page rank

works, and privacy and security. We will also discuss some high-impact industry products and the research problems behind their successes.

The class consists of instructor lectures, student presentations, class discussions, and class project(s).

Course Syllabus[1]

1. Course outline and effective learning skills (week 1)

2. How to study/research and launch a successful career + how to read, write, present papers (Week 2)

3. Priority, scheduling in operating systems, priority inversion, and what happened on Mars and the solution (Weeks 3-4)

4. Network Coding and its applications, Markov Chain and PageRank (Week 5)

5. **Project topic selection – Phase 0 (Week 6)**

6. Human computation + Web Caching, and Bloom Filter (Week 7)

7. Computational advertising and recommender systems (Week 8)

8. **Project progress presentation — Phase I (week 9)**

9. DHT, P2P networks and applications (Week 9-10)

10. Cloud Computing basics (GFS, MapReduce, BigTable) (Week 10)

11. Social Networks and Applications (Week 11)

12. **Project progress presentations/initial demo – Phase II (week 11)**

13. Feedback control of computing systems, and machine learning's applications in computing systems (Week 12)

14. **Project report due/final demo (week 13)**

15. Optional topics: DeDuplicaiton, Routing and Secure Routing, Firewall and Skype, Software Defined Networking, Security and Privacy (Week 13)

[1] Subject to change based on the course progress and student presentation sign ups

Textbooks: Due to the nature of this course, many topics are not available in any textbook yet. Hence there is no required textbook. Instead, we will use many publications, technical notes or materials available from the Internet.

Reference Textbooks:

Larry Paterson and Bruce Davie, *Computer Networks: A Systems Approach, Morgan Kauffma (Latest Edition)*

James Kurose and Keith Ross, *Computer Networking: A Top-Down Approach Featuring the Internet,* Addison-Wesley. *(Latest Edition)*

Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, *Operating System Concepts,* John Wiley & Sons, Inc. *(Latest Edition)*

Giorgio C. Buttazzo, *Hard Real-Time Computing Systems: Predictable Scheduling Algorithms and Applications,* Springer, *(Latest Edition)*

Dimitri P. Bertsekas , John N. Tsitsiklis, Introduction to Probability, 2nd Edition, Athena Scientific

Course evaluation:
Class participations/presentations: 40%
Project, project progress presentations, and final report: 60%
(First presentation 5%, 2nd presentation 15%, final report and deliverables: 40%)
Total 100%

Final project: Two intermediate (milestone) presentations are needed for your final project. These presentations/demos are expected to receive proper feedbacks on your project. Also, these milestone presentations/demos could help you pace the project for timely completion. Every final project must have a final report (and other associated materials, such as software programs) submitted for final grading.

Late project policy: There will be a strict deadline for the final project (the week before the final exams – subject to change). Please pay close attention to the announcements during the course. It is your responsibility to make sure that the final project report (and its associated materials, if any) is properly submitted via myCourses.