[OMS CS6675] Syllabus

[Advanced Internet Computing Systems and Application Development]

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Instructor Information

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General Course Information

Description

Advanced Internet-scale systems and applications are geographically distributed, highly available, incrementally scalable, and dynamically configurable.

This course reviews concepts, techniques, and optimizations in advanced Internet systems and application development, combined with in-depth study of fundamental principles underlying Internet computing. The course will explore new challenges and research issues that are critical for developing Internet-scale computing systems and applications.

Main topics to be covered include fundamentals of search engines, (incl. robots and indexing servers), Web servers, application servers, peer to peer overlay networks, content distribution networks, Internet scale social computing systems, Decentralized crypto-currency networks like Bitcoin and Blockchain systems, edge computing, mobile computing, Internet of Things, including sensor networks and applications. One of the important goals of the course is to look beyond the present status of the Internet computing systems and applications, and conjecture new innovations for future Internet technologies and applications. The course will include a significant project component.

Course Learning Outcomes

Upon successful completion of this course, you should be able to gain better understanding about important technical questions that Internet-scale systems and advanced application developers are facing today. Here are some examples: How would you build a web service that can handle billions of frantic requests? What systems

support do we need for developing applications of Internet scale? Can we provide dynamic configuration, replication, and migration of Web services? What new techniques will enable Internet systems and applications to better exploit high-speed networks? How should traditional systems issues, such as fault-tolerance, resource management, performance, and security, be provided in a system of Internet scale? How much data can an internet scale system process? What does big data technology mean to a computer scientist, a data scientist, or a business owner?

Required Course Materials

There is no suitable textbook for this course.

The course materials include lecture notes from the instructor and the required reading list (a collection of papers, one per week).

Grading Policy:

Students will be evaluated by ten homework assignments, a midterm test and a final exam test, and a project.

Grades will be computed using the following weighting scales:

- **Assignments: 40%** [4% for each of the ten assignments]
- **Midterm test: 15%**
- **Final-exam test: 15%**
- **Project: 20%**
- **Participation: 10%**

Description of Graded Components

Written Assignments (40%)
The goal of the homework assignments is to help the students to master the knowledge learned from lectures through reading critiques on a selection of topics covered in the lectures. All homework assignments are individual assignments. They will be made available on Canvas under Assignment Tab in the beginning of the semester.

There are ten written assignments in the course: five Principles assignments and five Methods assignments. Each P assignment asks you to answer four questions, and all four questions are weighted equally. Each M assignment asks for a more thorough plan for performing research and development exercises on an Internet computing system/service/application from a list of given choices. These ten assignments together comprise 40% of your grade with each assignment worth 4% of your grade. All assignments should be written in MS word or google doc or Latex in single spacing, font size 12 pt and font size Arial or Times New Roman font face. All assignment submissions should be in PDF. Each of the ten homework assignments is graded using the scale

of 100 points, and worth 4% of the total course grade.

Midterm Exam (15%) and Final Exam (15%)

Midterm exam (Test-1) and Final exam (Test 2) are graded using the scale of 100 points. The goal of these two exam tests is to consolidate the knowledge and learning experience of students about the materials covered in the course modules.

The midterm exam (Test 1) covers the first half of the course (modules 1~7) and is worth 15% of your overall grade.

The final exam (Test 2) covers the second half of the course (modules 8~13), and is worth 15% of your overall grade.

Each question is multiple-choice, multiple-correct with five choices and between 1 and 4 correct answers. Partial credit is awarded. Both midterm and final exam tests are delivered via Canvas.

Projects (20%)

There is one final project in this class. You can design your final project by choose a specific category of Internet computing technology from the materials covered from the course. Providing comprehensive investigation and redesign of an existing Internet system or application. Alternatively, you may also create a brandy new Internet service/application/system. You will conduct need finding by examining existing artifacts, like public forums, reviews, data logs, possibly combined with some research articles to identify the pros and cons of the existing system design in functional requirements (operational capabilities), non-functional requirements (e.g., security, privacy, trust, usability). You will also perform a heuristic evaluation of the existing application(s), grounded in the course's principles. You will then select one existing approach as the baseline design method. In the case of totally new project task, you will use the intuitive implementation as your baseline design method.

Based on the findings, you will complete a written document of your own prototype design, including the measurement of a working version of your own prototype (e.g., can be a revised version of the existing open source). Finally, you will provide a plan of how you would evaluate your prototype both qualitatively and empirically. The project is graded using the scale of 100 points and is worth 20% of your final grade. The project should be written in MS word or google doc or latex in single spacing, font size of 12 pt, font face of Arial or Times New Roman. For more information, consults the project assignment or overview page on Canvas.

Note that all course project related material must be non-proprietary, i.e., the instructor and the GTAs will not sign any non-disclosure agreement just to evaluate a project.

Participation (10%)
In this course, students will earn participation grade in several ways. The goal is to encourage

each student in the class to interact with your peers, to participate in one another's assignment reviews and project check-in reviews, and to see the variety of approaches taken by your classmates in the assignments and projects. Examples of earning participation credits include completing peer reviews, participating in discussions on Ed Discussion. All types of participation are graded on not only quantity, but also quality. For example, peer reviews and Ed Discussion contributions only receive credit if they are substantive. Additional incentives are built in to encourage the completion of peer reviews quickly. The project is graded using the scale of 100 points and is worth 10% of your final grade.

Letter Grade Policy.

The total grade is the sum in percentages of HWs, Project, Midterm exam (Test 1), Final exam (Test 2), and Participations you have earned, and we will convert the total percentage in the scale of 100 points to the following letter grade:

- [90-100] corresponds to letter grade A
- [80~90) corresponds to letter grade B
- [70~80) corresponds to letter grade C
- [60~70) corresponds to letter grade D
- [0~ 60) corresponds to letter grade F

Course Policies

Attendance Policy

For OMS CS course, there is no mandatory attendance recording each week throughout the semester. However, each student is required to participate the class by performing the following tasks according to your own weekly schedule:

1. Listen video lessons for each course module,
2. Complete the reading of assigned paper in our reading list of the semester each week,
3. Perform each of the ten homework assignments, which are designed to consolidate your learning of the course modules,
4. Complete your class wiki-page entry to facilitate the communication among classmates in this semester,
5. Complete the course surveys required, and
6. Participate in and contribute to the course Ed-discussion forum, for example, you are encouraged to ask good questions, to provide answers based on your own experiences and knowledge, and to share your learning experiences on course related subjects.

Academic Integrity

Students are expected to maintain the highest standards of academic integrity. All work submitted must be original and properly cited. Plagiarism, cheating, or any form of academic dishonesty will result in immediate consequences as outlined in the university's academic integrity policy.

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review Georgia Tech's Honor Code and the student Code of Conduct.

Any student suspected of cheating or plagiarism on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Core IMPACTS

Core IMPACTS is the University System of Georgia's General Education curriculum. If you are teaching a course that counts towards Core IMPACTS, you should include a syllabus statement about the Core area and associated career competencies. This resource developed by the Center for Excellence in Teaching and Learning and Online Education at Georgia State University includes template syllabus statements for each of the Core IMPACTS areas that you may adapt for your course.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Student-Faculty Expectations Agreement (Acceptable student conduct Statement)

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulate some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Campus Resources for Students

Undergraduate Student Academic Success Resources:

- Academic Support: Academic Success and Advising (a unit in the Office of Undergraduate Education & Student Success) provides free support for your courses. Students can attend scheduled supplemental review (PLUS) sessions, stop by Drop-In Tutoring, or schedule a one-on-one appointment through Knack. To explore what options work best for you, please visit us online at success.gatech.edu/tutoring, email us at tutoring@gatech.edu, or come see us at Clough Undergraduate Learning Commons, Suite 283.

Graduate Student Academic and Professional Success Resources:

A list of resources for graduate students is given on the Office of Graduate and Postdoctoral Education website. Specific information for current graduate students includes

- Academic Resources such as the Communications Center, Language Institute, Library, Catalog, Registrar, resources for conducting research, Advocacy and Conflict Resolution resources, and how to manage unexpected situations that may impact your academic performance;
- Student Resources such as Campus Services, Child Care/Family programs, Health & Wellness, Career Services, and the Student Resource Guide; and
- *Professional Development such as the programming from the Career Center and other professional development resources and events"*

Student Well-Being:

At Georgia Tech, we are concerned about your overall physical, social, and mental well-being. A comprehensive list of wellness related resources has been compiled and maintained by the Office of the Vice President for Student Engagement and Well-being (student-resource-guide (gatech.edu)