

[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 will review 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 also 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. Web robots and indexing servers), Distributed Computing Platforms (Hadoop/Spark) and AI-powered big data computing platform, 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: 25%** [5% for each of the ten assignments]
- **Midterm test: 15%**
- **Final-exam (open book): 20%**
- **Project: 45%**
- **Participation: 10%**

Additional Performance Bonus: up to 10% only for top performance to your final grade, including but not limited to attendance, Q&A, Wiki for class social and project, Ed-discussion contributions.

Description of Graded Components

Written Assignments (25%)

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 five written assignments in the course, and each assignment consists of two options: reading critique or programming. Each reading assignment requires a student to read two papers and write a critique about each of the two papers. Each programming assignment will cover

topics of programming tasks relevant to the lectures covered in previous weeks up to the recent two weeks. Each student can choose one of the two options for each homework assignment. You are given 2 weeks to complete the assignment.

All five assignments are individual assignments, requiring independent work. 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 5% of the total course grade.

Final Exam (20%)

Final exam is open book and each student is asked to write a Technology review of a topic of his or her own choice. Topics should be chosen from weekly lecture and class discussions and guest presentations as well as HWs. You are required to write a technology review of 15-20 pages, including figures and references. This technology review paper is due on the final exam day.

The technology review needs to have an abstract that summarizes your review, an introduction on why you choose the specific technology to do the review, and it should end with an outlook of the technology you choose to review and the list of references. All references listed at the end should be cited within the context (pages) of your technology review.

Projects (45%)

The course project should be significant (non-trivial) and related in some way to the Internet Application Development. Students may work in groups with group size of 2-4 students per project. You are encouraged to come up with your own project ideas. Students are encouraged to discuss ideas with the instructor to identify suitable project topic with innovative ideas/designs/optimizations.

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 proposal presentation and workshop presentation and contributing to Ed-discussions. 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.

Additional Performance based Bonus.

This category of performance points is designed to give credits to those students who contribute to active participations and positive interactions throughout the semester, including but not limited to: the Q&A in classroom and off class, helpful comments to the class learning experiences on Ed discussion, during office hours, performance in presentation and QA during project workshop days and demo meeting with the Instructor, the positive participation in pre-course survey, mid course survey and the end of course survey, as well as outstanding performance for in-class attendance.

Negative scores might be given to those students who did poorly according to the expectation for learning and compared to the peer students in the same class of the semester.

Letter Grade Policy.

All itemized grades are scored using the scale of 100 points. The total grade is the sum in 100 points scale of HWs, Project, Final Exam, Attendance, In-Class-QA. Then convert 100% to the following letter grade:

- [85-100] corresponds to letter grade A
- [75~85) corresponds to letter grade B
- [65~75) corresponds to letter grade C
- [60-65) corresponds to letter grade D
- below 60 corresponds to letter grade F

Course Policies

Attendance Policy

This is an in-campus course and according to GIT requirement, a GTA will ask students to sign off the attendance sheets in every lecture starting the week 2 of the semester until the last lecture in the week 16.

Students with special circumstances can be excused of absence. Example scenarios include:

- health emergency with doctor's note,
- family emergency with the note from the dean of students,
- off-campus job interviews with the proof of interview schedule
- majors' career fair with the proof of the schedule

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.

Extra Credit Opportunities

This course will provide students opportunities for extra credit of up to 10%, which will be awarded to those students who excel in one or more tasks in the course, ranging from homework, project, final exam, in-class question and answer (Q&A) section, off-class Q&A discussion, and class participation (incl. attendance, Ed-discussion). The extra credit that a student earns will be applied his or her final numerical grade before converting it to the letter grade.

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 \(gatech.edu\)](https://student-resource-guide.gatech.edu))