

[CS4675] Syllabus

[Advanced Internet Computing Systems and Application Development]

[Summer 2026]

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 cover 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. 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.

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).

Special note for summer session: This course is designed for regular session of 16 weeks. Summer session is a total of 12 weeks. Due to the shortage of 4 weeks, the course project will be removed as a mandatory component in the summer semester. We also adjust the grading policy to reflect this change for the summer semester.

Grading Policy:

Students will be evaluated by five homework assignments, a technology review (take-home final exam paper), and participation.

Grades will be computed using the following weighting scales:

- **Assignments: 60%** [12% for each of the ten assignments]
- **Technology Review: 35%**
- **Participation: 5%**

Description of Graded Components

Written Assignments (60%)

There are a total of 5 homework assignments and on average one assignment every 2 weeks. Each assignment requires a student to choose from two types of assignments: reading critique or programming.

For each reading critique assignment, a student should read 2 papers in the same subject area of big data systems and analytics, and write one reading critique for each of the two papers you read. It is recommended that you choose the two papers that are relevant to the lecture topics covered by lectures in the respective two weeks. Each paper critique should be 2 to 5 pages using time Newman font 11 or Arial font 10, single column. Each paper critique should not exceed 5 pages. Each of your two reading critiques should consist of the following sections: (i) overview using your own words, (ii) strong points of the paper, (iii) weak points and limitations of the paper if any, and (iv) your suggestions for improvement (optional).

For each programming assignment, a student should choose one assignment from the list of the programming problems given for each of the two weeks. Most of the programming assignments

are designed to help you gain better understanding on certain aspects of big data systems and analytics. Each programming assignment requires the following deliverable: (i) source code, (ii) executable and screen shots of your code execution, (iii) input data structure and 5 examples, (iv) output data structure and 5 examples. and (v) workflow figure on how your code module takes input and product output.

Each of the five homework assignments is graded using the scale of 100 points and is worth 5% of your final grade.

Technology Review/Final Exam (35%)

The final exam is to write a technology review, and it is an open book and take-home exam for the course. Topics should come from weekly lectures, class discussions, guest presentations, as well as homework assignments and topics related to your group project. You are required write a technology review of 15~20 pages with 1-5 pages references in single column single spacing, including figures, using font times Newman size 12 or arial size 11. This technology review paper is due on the final exam day set by GIT in the final exam schedule each semester.

The technology review should cover (1) Why this specific technology is of interest to you and your readers. (2) The state of the art research and development to the best of your knowledge. (3) The set of technological aspects that you consider most valuable and important to introduce to your readers, especially some of those are not well known, which you believe are important knowledge about the technology. Here you need to identify your readers are peers or non-CS major or your grandparents or K-12 students. (4) The outlook of the technology in your own words or analysis, including what need to be improved, what new applications can benefit from it, etc. You can create a discussion section dedicated to describing your thought and your prediction of the technology in terms of its impact in the next 10-20 years after surveying this specific technology area. (5) A list of references with citation in your review text.

The technology review topics can be selected based on the weekly lecture theme covered in the course as well as topics in homework assignments. The technology review topic can also be combined with the theme of your course project. You are encouraged to choose a topic that is not too general, such as Cloud Computing or Search Engine Technology. The final exam is graded using the scale of 100 points and is worth 35% of your final grade.

Participation (5%)

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 contribute to Ed-discussion. All types of participation are graded on quality in addition to quantity. For example, peer reviews and Ed Discussion contributions only receive extra participation credit if they are substantive. Additional incentives are built in to encourage the completion of peer reviews quickly. The participation is graded using the scale of 100 points and is worth 5% of your final grade.

Letter Grade Policy

The total grade is the sum in percentages of HWs, Final exam (Technology Review) and Participation grade you have earned. Below is the conversion rules for mapping the total percentage in the scale of 100 points to the 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
- [0~60) corresponds to letter grade F

Course Policies

Attendance Policy

For CS course online, 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.

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

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 \(gatech.edu\)](#))