

Syllabus

OMS CS6675

Advanced Internet Computing Systems and Application Development

Instructor: Professor [Ling Liu](#)

Course Description

Advanced Internet-scale systems and applications are geographically distributed, highly available, incrementally scalable, and dynamically configurable. Typical questions that systems and advanced application developers are facing today include: 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 naming, persistence, 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? to a data scientist? to a business owner or a scientist?

This course reviews concepts, techniques, and systems issues in advanced Internet application development, and explores new challenges and research issues that are critical for developing Internet scale systems and applications. Main topics to be covered include fundamentals of search engines (incl. robots and indexing servers), Web servers, application servers, web-based online transaction systems, content distribution networks, Internet scale crowd computing and social network systems, Blockchain systems, edge computing, mobile computing, Internet of Things, Cyber-physical systems and digital twins. 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.

Grading

Students will be evaluated by assignments, tests and project.

Grades will be computed using the tentative weighting scheme below:

- **Assignments:** 40%
- **Tests:** 30%
- **Project:** 20%
- **Participation:** 10%

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 Principles assignment asks you to answer four questions, each of which is weighted equally. Each Methods assignment asks for a more thorough plan for performing research on an Internet computing systems or application development of given choices. These ten total assignments together comprise 40% of your grade; thus, each assignment is worth 4% of your grade. All assignments should be written in MS word or google doc using single spacing with 12pt font size and arial or times new roman font face and submitted in PDF on Canvas.

Tests (30%)

The goal of the tests is to consolidate the knowledge and learning experience of students about the course lecture materials. There are two proctored tests in this course. Test 1 covers the first half of the course modules and Test 2 covers the second half of the course modules. Each question is multiple-choice, multiple-correct with five choices (between 1 and 4 correct answers). Partial credit is awarded. The tests are delivered via Canvas.

Projects (20%)

There is one final project in this class. You are asked to design your final project by choosing a specific category of Internet computing technologies from the materials covered in the course. Providing comprehensive investigation 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 and usability), and non-functional requirements (e.g., security, privacy, trust, reliability). You may also perform a heuristic or an empirical evaluation of some existing applications. This need finding exercise will motivate you to either propose a new design of an existing Internet system or application or service, or to create a brand-new service model or infrastructure or algorithm with target applications or user communities. You will then complete a written document of your own prototype design or 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 should be written in MS word or Google doc using single spacing with 12pt font size and arial or times new roman font face and submitted in PDF on Canvas.

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 usability studies, and to see the variety of approaches taken by your classmates in the assignments. Examples of earning participation credits include completing peer reviews, participating in discussions on Piazza, participating in one another's surveys and interviews. All types of participation are graded on not only quantity, but also quality. For example, peer reviews and Piazza contributions only receive credit if they are substantive, and participation in peers' studies receives differing amounts of credit based on the effort involved. Additional incentives are built in to encourage the completion of peer reviews quickly.

Useful References and Text Books

There is no text book required for this course. The course material comes primarily from course notes and a list of required readings, one paper per week, accessible from the course website on Canvas.

The list of required readings contains a short list of classical or representative papers on advanced Internet computing systems and application development, and is provided to help consolidate your learning from the course modules.

We also provide a list of recommended readings and some open access books as useful references organized based on the subjects covered by each week's course module.