CMSC 23300/33300
Networks and Distributed Systems

Department of Computer Science
University of Chicago

Spring 2011 Quarter

Dates: March 28 – June 11, 2011
Lectures: TuTh 1:30-2:50 in Ryerson 251
Website: `http://www.classes.cs.uchicago.edu/archive/2011/spring/23300-1/`

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Course description

This course focuses on the principles and techniques used in the development of networked and distributed software. Topics include programming with sockets; concurrent programming; data link layer (Ethernet, packet switching, etc.); internet and routing protocols (IP, IPv6, ARP, etc.); end-to-end protocols (UDP, TCP); and other commonly used network protocols and techniques.

The learning goals of this course are for students to...

1. Be able to use sockets to develop client/server applications.
2. Be able to design and develop network protocols.
3. Be able to develop software collaboratively through the use of version control tools, code reviews, and project management.
4. Be amused by RFC 1149.

CMSC 15400 and a working knowledge of the C programming language are strict prerequisites of this course. Students who have not taken CMSC 15400 must speak with the instructor to ascertain that they meet the prerequisites for this course.

Course organization

The development of three programming projects accounts for the majority of the grade in this course. Students will develop these projects in pairs. To successfully complete these projects, students must understand fundamental concepts in networking. The class meets two times a week for lectures that provide this conceptual scaffolding, but will also cover material that is not directly applied in the projects. There will be a midterm and a final exam. The course calendar, including the contents of each lecture and project deadlines, is shown in Table 1.

Projects

Throughout the quarter, students will develop three projects:

1. **Electronic Exchanges**: Implementing a distributed system involving multiple servers and clients, using sockets and pthreads.
2. **STCP**: Implementing a reliable protocol on top of an unreliable one.
3. **Routing**: Implementing an Internet router using Stanford's Virtual Network System.

Each project is independent from the others. Students will develop the projects in groups of two. Groups must be formed by Friday, April 1. Groups can be changed from one project to another, but you must inform the instructor that you intend to do so. If your partner drops out of the course or you feel he/she is not contributing to the group's effort, you should make the instructor aware of this.

Graduating students must complete their third project by Monday, May 30.

Homeworks

Graduate students will also have to complete a fortnightly homework that will typically revolve around a scholarly paper in the field of computer networks. Undergraduate students are welcome to read the assigned readings and participate in discussions on these papers, but cannot do the homeworks for extra credit.

Exams

There will be a midterm on Tuesday, May 3. This midterm will take place in class, and will only occupy the first 50 minutes of the lecture. The final exam is tentatively scheduled for June 9 (during Finals Week). Graduating students will take their final exam no later than Thursday, May 26. The exact date and time will be determined in consultation with the graduating students.

For the most part, these exams will not quiz students on the contents presented in lectures or, at least, not directly. Instead, most of the questions and problems will be related to the projects. Students who have developed the projects on their own (which requires understanding the contents presented in class) should be able to answer these questions with relative ease. There will also be a few questions that are not related to the projects, but will be in line with the learning goals outlined above.

Books

The text for this course is *Computer Networks: A Systems Approach*, 4th edition, L. Peterson and B. Davie, Morgan Kaufmann 2007. Available for purchase from the Seminary Co-op Bookstore.

Grading

For undergraduates, the final grade will be based on the projects (60%, each project worth 20%), midterm (15%), and final exam (25%).

For graduate students, the final grade will be based on the projects (45%, each project worth 15%), homeworks (15%), midterm (15%), and final exam (25%).

Types of grades

Students may take this course for a quality grade (a "letter" grade) or a pass/fail grade. Students will declare on the final exam whether, depending on their final grade, they want to receive a letter grade, a pass/fail grade or withdraw from the course (a *W* grade). For example, students can declare "If my final grade is a C+ or lower, I will take a *P* (Pass) instead of a letter grade and, if my grade is an *F*, I wish to take a *W*". By default, all students are assumed to be taking the course for a quality grade.

> Note: *Students taking this course to meet general education requirements must take the course for a letter grade.*

Table 1: CMSC 23300/33300 Spring 2011 Calendar

Week	Date		Lecture	Book	Project Due	Grad HW Due
1	Tu	29 March	Introduction	1		
	Th	31 March	Sockets, Concurrent Programming	—		
2	M	4 April			Project 1a	
	Tu	5 April	Sockets, Concurrent Programming	—		
	Th	7 April	Link Layer	2, 3		
	F	8 April				HW 1
3	Tu	12 April	Link Layer	2, 3		
	W	13 April			Project 1b	
	Th	14 April	IP	4		
4	Tu	19 April	IP	4		
	Th	21 April	TCP/UDP	5		
	F	22 April				HW 2
5	M	25 April			Project 1c	
	Tu	26 April	TCP/UDP	5		
	Th	28 April	TCP/UDP	9.1.3		
6	Tu	3 May	Midterm.	9		
	W	4 May			Project 2a	
	Th	5 May	Application Layer Protocols			
	F	6 May				HW 3
7	Tu	10 May	Routing Protocols, Congestion Control	6		
	W	11 May			Project 2b	
	Thu	12 May	Routing Protocols, Congestion Control	6		
8	Tu	17 May	Security	8		
	Th	19 May	Security	8		
	F	20 May				HW 4
9	Tu	24 May	Other Topics (TBD)			
	Th	26 May	Other Topics (TBD)			
10	Tu	31 May	No class (Instructor out of town)			
	W	1 June			Project 3	

Late submissions

For the projects, the instructors will collect the latest revision each group commits to their SVN repository before the deadline. Any work committed after the deadline is ignored and not collected. Each group is allowed four 24-hour extensions during the quarter. More than one extension can be applied to a single submission. i.e., a single 24-hour extension on four submissions, or a 96-hour extension on a single submission. No extensions will be allowed for the graduate homeworks.

If extraordinary circumstances (illness, family emergency, etc.) prevent a student from meeting a deadline, the student must inform the instructor before the deadline.

Policy on academic honesty

The University of Chicago has a formal policy on academic honesty that you are expected to adhere to:

`http://studentmanual.uchicago.edu/academic/index.shtml#honesty`

In brief, academic dishonesty (handing in someone else's work as your own, taking existing code and not citing its origin, etc.) will *not* be tolerated in this course. Depending on the severity of the offense, you risk getting a hefty point penalty or being dismissed altogether from the course. All cases will be referred to the Dean of Students office, which may impose further penalties, including suspension and expulsion.

Even so, collaboration between students is certainly allowed (and encouraged) *as long as you don't hand someone else's work as your own.* If you have discussed parts of an assignment with someone else, then make sure to say so. If you consulted other sources, please make sure you cite these sources.

If you have any questions regarding what would or would not be considered academic dishonesty in this course, please don't hesitate to ask the instructor.

Asking questions

This course has an *open door policy* for asking questions. Instead of setting fixed office hours, you are welcome to consult with the instructor at any time. Nonetheless, you should try to give the instructor, whenever possible, some advance warning of your visit (by e-mail) to make sure that he will be in the office at that time.

The preferred form of support for this course is though the *course mailing list*, which can be used to ask questions and share useful information with your classmates. You can subscribe to the mailing list in the following web page:

`http://mailman.cs.uchicago.edu/mailman/listinfo/cmsc23300`

All questions over e-mail must be sent to the mailing list, and not directly to the instructor or TA, as this allows your classmates to join in the discussion and benefit from the replies to your question. This rule will be applied strictly: if you send a message directly to the instructor or the TA, you will only get a reply telling you to send your question to the mailing list. The only

exception to this rule is if your question requires revealing part of your solution; in that case, please send an e-mail to the following address:

`cmsc23300-instructors@cs.uchicago.edu`

This address reaches both the instructor and the TA.

Acknowledgements

This syllabus is based on previous CMSC 23300/33300 syllabi developed by Prof. Anne Rogers and Prof. Ian Foster from the University of Chicago.