

COMP 535 Computer Networks September 2005

General Information

Instructor: Muthucumaru Maheswaran
Tel: 398-1465
Email: maheswar@cs.mcgill.ca
Office: Room 213B, McConnell Engineering Building
Office hours: MTuW 1:00-2:00pm. Appointments can be made for meetings at other times.
Email: Please use SOCS email for urgent email. For other messages (particularly with large attachments) use WebCT mail.
Class: MW 16:35-17:55 ENGTR 1080
Tutorial: TBA
Prerequisites: CS 310 or ECSE 427 (or any Operating Systems course)
Class web page: <http://www.cs.mcgill.ca/~cs535>. WebCT will be used only for assignments.
TAs: Bala Maniyamaran, Shah Asaduzzaman, and Sheng Lu.
TA office hours: TBA

“McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism, and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.mcgill.ca/integrity for more information).”

Brief Course Description

This is a senior undergraduate/first-year graduate course in computer networks. We will examine computer networks within the context of the Internet. It will build on prior knowledge in operating systems, basic algorithms, and C programming. We will study the fundamental principles, elements, and protocols of computer networks. We will investigate how the different protocols work, why they work that way, and their performance trade-offs. Using this knowledge, we will try to examine the way applications are deployed on the Internet and their performance trade-offs. In particular, we will try to examine some strategies that are commonly used to accelerate application-level performance in the context of the operation of the Internet.

By the end of the course, you should be able to: (i) explain the operation of a range computer networking applications such as email, web, and peer-to-peer file-sharing; (ii) relate the architecture of the Internet to the underlying design principles; (iii) illustrate the operation of common routing protocols, queuing mechanisms, and congestion control mechanisms; (iv) develop elements of a network such as gateways and routers that conform to IETF standards with acceptable levels of simplification and (v) explain the performance of a given set of routing protocols, queuing mechanisms, and congestion control mechanisms on an example network.

Course Syllabus

Items marked with an asterisk () may be omitted depending on available time.*

Module I: Foundation [Ch. 1]

1. Application requirements
2. Network architecture
3. Basic network performance

Module II: Direct Links Networks [Ch. 2]

4. Basic building blocks
5. Encoding and framing
6. Error detection
7. Reliable transmission
8. Ethernet and wireless LANs

Module III: Packet Switching [Ch. 3]

9. Switching and forwarding
10. Bridges and LAN switches
11. Cell switching
12. Implementation and performance

Module IV: Internetworking [Ch. 4]

13. Simple internetworking
14. Routing
15. Global internet
16. Multicast
17. Multiprotocol label switching

Module V: End-to-End Protocols [Ch. 5]

18. Simple demultiplexing (UDP)
19. Reliable byte stream (TCP)
20. Remote procedure call
21. Performance

Module VI: Congestion Control and Resource Allocation [Ch. 6]

- 22. Issues in resource allocation
- 23. Queuing disciplines
- 24. TCP congestion control
- 25. Congestion-avoidance mechanism
- 26. Quality of service

Module VII: Network Security [Ch. 8]*

- 27. Cryptographic algorithms
- 28. Security mechanisms and example systems
- 29. Firewalls

Module VIII: Applications [Ch. 9]

- 30. Domain name service
- 31. Traditional applications
- 32. Multimedia applications
- 33. Overlay networks

Instructional Method

The course will consist of three hours of instructor led classes per week together with a *maximum* of one hour of tutorial per week taken by the TAs. The class time will be devoted to the presentation and development of new concepts and the application of these concepts to examples and problems, while the tutorials will discuss solutions to the programming projects and other assignments.

Course Materials**Textbooks**

Required text: Larry Paterson and Bruce Davie, *Computer Networks: A Systems Approach, 2nd Edition*, Morgan Kaufmann, 2003.

Supplementary or Reference texts:

Douglas Comer and David Stevens, *Internetworking with TCP/IP, Volume II, Design, Implementation, and Internals*, Prentice-Hall, 1999.

James Kurose and Keith Ross, *Computer Networking: A Top-Down Approach Featuring the Internet, 3rd Edition*, Addison-Wesley.

Radia Perlmann, *Interconnections, 2nd Edition*, Addison-Wesley,

2000.

Christian Huitema, *Routing in the Internet, 2nd Edition*, Prentice-Hall, 2000.

Assignments and Evaluation

Activity	Percentage
Laboratory assignments (4)	10%
Final project (1)	30%
Midterm	10%
Final	50%
Optional assignment	10%
Total	110%

Final project: The final project will have intermediate (milestone) submissions. These submissions are optional. However, you are strongly encouraged to make these assignments to receive proper feedback on your final project. Also, these milestone submissions should allow you to pace the project for timely completion.

Lab assignments: Each laboratory assignment is meant to be completed within a 3 hour lab session. You are expected to come prepared for the laboratory session, complete the experiment, and demonstrate it to the TA. The handouts for the labs will be issued well in advance to facilitate early preparations.

Late assignment/project policy: There will be two deadlines for each assignment: proper deadline and cut-off date. After the proper deadline, there will be a penalty of 10% for each day the assignment is late until the cut-off date. After the cut-off date, the assignment cannot be handed in. No individual requests for extensions will be granted unless they are for medical reasons.

The deadlines will be set for 11:55 pm or 11:59pm. Please observe the time and date very carefully. It is your responsibility to make sure that the assignment is properly submitted via the WebCT.

Regrading Policy: If you find your assignments or exams are not marked according to the marking scheme, you are encouraged to consult me or the TAs. When you resubmit your assignment or exam for regarding, we reserve the right to regrade the full exam or assignment without restricting the attention to the disputed portion.