Syllabus
CSC317 Computer Networks
Professor Sikder Huq / Professor Leon Tabak
Block 6
February 11, 2019 to March 06, 2019

1 Our meeting times and places

- My office is in Law 206C.

- You may call me in my office at (319) 895 4294.

- You may send me electronic mail at l.tabak@ieee.org.

- I will be in my office and available to meet with you Monday through Friday from 3:00 p.m. until 3:30 p.m.

- We will all meet together in the laboratory in the mornings and in the classroom in the afternoons.

	Where	When
Laboratory	Law Hall 113	9 a.m. to 11 a.m.
Classroom	Law Hall 121	1 p.m. to 3 p.m.

2 Textbooks

You may use an older edition of the textbook. The page numbers that I have listed in this syllabus are the numbers of pages in the sixth edition.

- Computer Networking: A Top-Down Approach (Seventh Edition), James F. Kurose and Keith W. Ross, Pearson, New York, 2013, ISBN 978–0–13–285620–1

3 Etiquette for the Classroom

Please show respect to your classmates, to me, and to the seriousness of our enterprise by exercising the following courtesies:

- Please give your attention to whomever is speaking. You cannot view unrelated pages on the Web and be part of our class' discussion at the same time.

- You learn from your classmates. Be generous in offering help to classmates in the laboratory. Take interest in your classmates' work. Encourage them. Compliment them for work that is well done. Give them a good audience when they stand at the front of the room to present their work. Show these courtesies to all of your classmates.

- Please do not interrupt the class by late entries or early departures. If you anticipate a need to be absent from all or part of one of our meetings, please notify me in advance of your anticipated absence.

- You may listen to music while working in the laboratory so long as you are still able to hear your name when called and you do not disturb neighbors.

- Please refrain from bringing food or drink into the classroom or laboratory. We can make reasonable exceptions for eating that is not noisy and foods that do not have strong smells.

  Acceptable beverages and foods include water, tea, and granola bars. Bringing breakfast to class is not courteous.

  Please clean up crumbs and spills. Please dispose of empty containers and leftovers.

- Please dress as you might for an employer in the software engineering industry. Please keep your shoes on. Wearing hoods, hats, or sunglasses (except when there is a medical reason for shielding the eyes) that hide your face is not courteous.

- Imagine that you are seeking employment. How will you present yourself to your prospective employer?

  Imagine that you are now employed in a software engineering firm. How will you speak to your teammates, the head of your team, and your company's clients?

  Imagine that your grandmother has purchased the company for which you work. She has joined you in the company's conference room to hear and see you walk through the code that you have written for the company (her company).

  Are there some words that you will keep out of your vocabulary during this hour?

4   Policies

Cornell College is committed to providing equal educational opportunities to all students. If you have a documented learning disability and will need any

accommodation in this course, you *must* request the accommodation(s) from the instructor of the course and no later than the third day of the term. Additional information about the policies and procedures for accommodation of learning disabilities is available on Cornell College's Web site.

Please also familiarize yourself with the college's statement on academic honesty and its policies for dropping courses.

5   Goals

We will give special attention to three of Cornell College's Educational Priorities and Outcomes:

- Knowledge—you will gain familiarity with protocols for data commmunication, you will learn how layers of abstraction make the design of complex systems easier, and you will learn how to use a variety of tools for diagnosing problems on networks and building applications that use networks.

- Reasoning—-you will learn how to trace the passage of a message from sender to receiver.

- Citizenship—in this project-oriented course you will learn how to collaborate with classmates. You will learn with one another and from one another.

6   Course Objectives

Upon successful completion of this course, students are expected to:

- Become familiar with the organization of networking protocols within the layer architecture (OSI, TCP/IP)

- Understand the client/server model and key application layer protocols such as HTTP.

- Learn sockets programming.

- Understand the concepts of reliable data transfer and how TCP implements these concepts.

- Know the principles of congestion control and trade-offs in fairness and efficiency.

- Learn the principles of routing and Internets IP protocol.

- Understand the basics of error detection including parity, checksums, and CRC.

- Understand the key concepts of wireless networks, and especially mobility support.

7 Grades

Written work will be due on each day of the term except for the first day and the last day. Printed copies and electronic copies of your papers will be due at 9 a.m.

Experience presenting work to peers will be a central part of the course. Practice asking your teammates questions during their presentations, critiquing their decisions, and suggesting improvements to their code will also be an important part of your education during this term. We will schedule one day in each week of the term for you to present your work.

	Activity	Points
	Participation and daily work	20
	Graded exercise 1 (Monday, 18 February 2019)	20
	Graded exercise 2 (Tuesday, 26 February 2019)	20
	Graded exercise 3 (Wednesday, 06 March 2019)	20
+	Lab/programming assignments	20
		100

Note that the dates mentioned above are tentative.

The final grade will be assigned according to the following percentages: 90 A, 85 A-, 82 B+, 78 B, 75 B-,70 C+, 65 C, 60 C-, 55 D+, 50 D, 45 D-, <45 F.

The grades of the exams might be curved to calibrate for the difficulty of the exams relative to course objectives; your curved grade will always be equal to or higher than your raw points. The instructor reserves the right to adjust the weights and percentages if it is appropriate and will notify students if these adjustments occur.

8 Lab/Programming Assignments

We plan to do some or all of the following projects in the laboratory.

- Discrete event simulation of networking protocols

- Client-server communication using multi-threading and socket programming

- Implementation of a Web cache

- Implementation of a messenger application

- Implementation of a TCP port scanner

- Implementation of a Web server

9   Calendar

	Mon	Tue	Wed	Thu	Fri
Week 0	11	12	013	14	15
Week 1	18	19	20	21	22
Week 2	25	26	27	28	01
Week 3	04	05	06	07	08

10   Schedule

10.1   Week 0

10.1.1   Monday, 11 February 2019

Read: Read Sections 1.1–1.4 (pages 1–47).

Discuss: Protocols, network edge and network core, physical media, circuit switching vs. packet switching, and multipexing, delays and throughput.

Write: Solve problems P2, P4, and P5 on page 71 of *Computer Networking: A Top-Down Approach* .

10.1.2   Tuesday, 12 February 2019

Read: Read Sections 1.5–1.8 (pages 47–82).

Discuss: The value of layers of abstractions, how malicious people can compromise networking services, the origins of networking technology, and the evolution of the Internet.

Write: Solve problems P29 and P31 on pages 76–77 of *Computer Networking: A Top-Down Approach*

10.1.3 Wednesday, 013 February 2019

Read: Read Sections 2.1–2.2 (pages 83–116).

Discuss: Peer-to-peer and client-server architectures, exchange of messages between processes, sockets, IP addresses and port numbers, requirements that distinguish network applications (including willingness to tolerate loss of data, slow throughout, long delays, and eavesdroppers), TCP and UDP transport protocols, and HTTP.

Write: Solve problems P4 and P5 on pages 171 and 172 in *Computer Networking: A Top-Down Approach* .

10.1.4 Thursday, 14 February 2019

Read: Read Sections 2.37–2.5 (pages 116–144).

Discuss: Protocols for the transfer of files, electronic mail, and finding the IP address that corresponds to a given hostname.

Write: Solve problems P18 and P19 on page 176 in *Computer Networking: A Top-Down Approach* .

10.1.5 Friday, 15 February 2019

Read: Read Sections 2.6–2.8 (pages 144–183).

Discuss: Peer-to-peer architures, models of the performance of client-server and peer-to-peer systems, BitTorrent as an example of a peer-to-peer system, use of distributed hash tables for databases on peer-to-peer systems, and TCP and UDP socket programming.

Write: Graded exercise 0.

10.2 Week 1

10.2.1 Monday, 18 February 2019

Read: Read Sections 3.1–3.3 (pages 185–204).

Discuss: Communication between processes vs. communication between hosts, connection-oriented and connectionless transport, multiplexing and demultiplexing, and checksums.

Write: Solve problems P5 and P8 on page 289 in *Computer Networking: A Top-Down Approach* .

10.2.2 Tuesday, 19 February 2019

Read: Read Sections 3.4–3.5 (pages 204–258).

Discuss: Modeling reliable transport with finite state machines, automatic repeat request (ARQ) protocols, stop and wait protocols, alternating bit protocols, pipelining, ACKS and NACKS, sequence numbers, Go-Back-N (GBN) and Selective Repeat protocols, and flow control.

Write: Solve problems P23 and P24 on page 293 in *Computer Networking: A Top-Down Approach* .

10.2.3   Wednesday, 20 February 2019

Read: Read Sections 3.6–3.8 (pages 259–303).

Discuss: How networks become congested, end-to-end and network assisted congestion control, Available Bit Rate (ABR) in Asynchronous Transfer Mode (ATM), TCP congestion control, and fairness.

Write: Solve problem P51 on page 299 in *Computer Networking: A Top-Down Approach* .

10.2.4   Thursday, 21 February 2019

Read: Read Sections 4.1–4.3 (pages 305–331).

Discuss: Forwarding and routing in the network layer, routers vs. packet switches, menu of network layer services, the Internet's best-effort service, virtual circuit vs. datagram networks, output port queueing, packet schedulers, and active queue management (AQM).

Write: Solve problems P2, P3, and P6 on pages 417 and 418 in *Computer Networking: A Top-Down Approach* .

10.2.5   Friday, 22 February 2019

Read: Read Section 4.4 (pages 331–363).

Discuss: Construction of IPv4 datagrams, IPv4 adddresses, subnets and submasks, Classless Interdomain Routing (CIDR), Dynamic Host Configuration Protocol (DHCP), Network Address Translation (NAT), Internet Control Message Protocol (ICMP), IPv6, tunneling, and IP security.

Write: Solve problem P27 on page 423 in *Computer Networking: A Top-Down Approach* .

Graded exercise 1.

Return to calendar.

10.3 Week 2

10.3.1 Monday, 25 February 2019

Read: Read sections 4.5–4.6 (pages 363–399).

Discuss: Least cost paths, global vs. decentralized routing algorithms, static vs. dynamic routing algorithms, load-sensitive vs. load-insensitive routing algorithms, link state (LS) algorithm, distance vector (DV) algorithm, intra-autonomous system routing vs. inter-autonomous system routing, Routing Information Protocol (RIP), Open Shortest Path First (OSPF), Border Gateway Protocol (BGP).

Write: Solve problems P34, P35, and P36 on page 424 in *Computer Networking: A Top-Down Approach* .

Return to calendar.

10.3.2 Tuesday, 26 February 2019

Read: Read Sections 4.7–4.8 (pages 399–432).

Discuss: Broadcast vs. multicast routing, simplicity and drawbacks of N-way-unicast, uncontrolled vs. controlled flooding, spanning trees, and Distance-Vector Multicast Routing Protocol (DVMRP) and Protocol-Independent Multicast (PIM) routing protocol.

Write: Solve problems P49 and P51 on page 427 in *Computer Networking: A Top-Down Approach* .

10.3.3   Wednesday, 27 February 2019

Read: Read Sections 5.1–5.3 (pages 433–461).

Discuss: Nodes and links, menu of services at the link layer, network adapters, algorithms for detecting and correcting errors, multiple access protocols (channel partitioning, random access, and taking turns), code division multiple access (CDMA), ALOHA, and Carrier Sense Multiple Access (CSMA) protocols.

Write: Solve problems P1, P3, and P5 on page 503 in *Computer Networking: A Top-Down Approach* .

10.3.4   Thursday, 28 February 2019

Read: Read Sections 5.4–5.5 (pages 461–490).

Discuss: Physical addresses (also known as LAN or MAC addresses), Address Resolution Protocol (ARP), Ethernet, hubs, Ethernet frames, evolution of Ethernet, switches vs. routers, virtual local area networks, and multiprotocol label switching (MPLS) in the link layer.

Write: Solve problems P23, P24, and P25 on page 508 in *Computer Networking: A Top-Down Approach* .

10.3.5   Friday, 01 March 2019

Read: Read Sections 5.6–5.8 (pages 490–512).

Discuss: Design of data centers, the many steps and protocols used to respond to a respond to a request for a Web page.

Write: Solve problems P31 and P32 on page 509 in *Computer Networking: A Top-Down Approach* .

Graded exercise 2.

Return to calendar.

10.4   Week 3

10.4.1   Monday, 04 March 2019

Read: Read Sections 6.1–6.3 (pages 513–546).

Discuss: Wireless networks, base stations, cell towers, and access points, multipath propagation, path loss, signal-to-noise ratio, code division multiple access (CDMA) protocols, and IEEE 802.11 wireless LAN.

Write: Solve problems P1, P2, and P5 on page 580 in *Computer Networking: A Top-Down Approach* .

Return to calendar.

10.4.2   Tuesday, 05 March 2019

Read: Read Sections 8.1–8.2 (pages 671–688).

Discuss: Meaning of secure communication, symmetric key vs. public key encryption, monoalphabetic vs. polyalphabetic ciphers, block ciphers, and the RSA algorithm.

Write: Solve problems P3, P4, and P5 on page 746 in *Computer Networking: A Top-Down Approach* .

Return to calendar.

10.4.3   Wednesday, 06 March 2019

Read: There is no reading assignment today.

Discuss: There is no discussion scheduled for today.

Write: Graded exercise 3.

Return to calendar.

10.4.4   Thursday, 07 March 2019

Block Break   We will not meet today.

There is no work due today.

Return to calendar.

10.4.5   Friday, 08 March 2019

Block Break   We will not meet today.

There is no work due today.

Return to calendar.