SE 14-331: Introduction to Computer Networks
Department of Software Engineering
Achi Racov Faculty of Engineering
Kinneret College on the Sea of Galilee

Instructor: Michael J. May

Semester 1 of 5785

1 Course Details

The course lecture meets **8:00am–10:00am** on Wednesdays in (**2** hours of lecture) in Room 803. The course recitation (targil) for the course meets at **3:00pm–5:00pm** on Mondays (**2** hours) in Room 815.

2 Prerequisites

The prerequisites for the course are 10-211: Probability and 14-218: Algorithms.

3 Overview

The course is an introduction to the physical, link, network, and transport layers of the standard computer network model. Significant time will be spent on Ethernet, switching, routing, Wi-Fi, IPv4, IPv6, UDP, and TCP. By the end of the course, students will have a good algorithmic understanding of the OSI seven layer model and various technologies have been used to implement the first four layers. Some time will be spent on network programming in Java or C. Congestion control and queueing algorithms will be covered as well.

The course assumes no prior knowledge of networks or communications protocols.

3.1 Course Goals

At the end of the semester, the student shall be able to:

1. Define and explain the differences between the following concepts: size, packet, bandwidth, round trip time (RTT), sending time. The student shall be able to also perform calculations based on them.
2. Read and understand the packet formats of the following protocols and technologies: Ethernet (classical, fast, and gigabit), RIP, OSPF, Wi-Fi, IPv4, IPv6, TCP, and UDP.
3. Explain the roles of each layer in the OSI seven layer model.
4. Perform basic hand executions of routing protocols, CRC, sliding window, and IPv4 assisting protocols: *eg.* DHCP, ARP, DNS, ICMP.
5. Plan an IPv4 network which uses subnetting, including assigning addresses, subnet numbers, and subnet masks.

6. Use Wireshark to examine and analyze network traces of Ethernet, Wi-Fi, RIP, OSPF, UDP, and TCP traffic.
7. Read and write networking communication programs using sockets in Java.
8. Explain how queuing algorithms (fair queuing, weighted fair queuing) work and perform analyses on their behavior.

The schedule for the course is as shown in the following table. Lecture contents are correlated with the books for the course: Tannenbaum (T) [4], Kurose and Ross (KR) [2], and Dordal (D) [1] by showing the chapter or section number in the respective book for each lecture.

4 Lecture Schedule

#	Subject	T	KR	D
1	Overview, Links, Bandwidth	1.3–1.4, 2.1	1	1
2	Layers and OSI Model, Physical		1.5	1.1
3	Data Link Layer: Framing	3.1–3.3, 3.6	6.1–6.3	6.1
4	Error Correction	3.1–3.3, 3.6	6.1–6.3	7.4
	ARQ Protocols	3.4	3.4	8
	Ethernet Intro		6.4.2	2
5	Ethernet and Fast Ethernet	4.3		2
6	Switching Algorithms	5.1, 5.5	4.2	2.4
	Wi-Fi Intro	4.4	7	4.2
7	IP Basics	5.5	4.3	9
8	Subnetting	5.6	4.3	9.6
	IPv6, RIP	5.2.4	4.3.4, 5.2, 3.3	11, 13.1, 16
9	OSPF	5.7.6	5.3	13.5
	UDP	6.4	3.3	16
10	TCP I	6.5	3.5	17
11	TCP Congestion Control	6.5–6.6	3.6–3.7	19
12	DHCP, ARP, DNS, ICMP	7.1	6.7, 6.4, 2.4, 5.6	10
13	Queuing and Scheduling	5.3	4.2	23

Since this is an advanced course, students **are expected to come to class having read the material listed above in the lecture schedule**. Students who do not come prepared will find themselves at a significant disadvantage.

5 Assignments

There will be 4–6 programming and calculation assignments during the course of the semester. Each assignment can be done in groups of 2 or 3 students.

More details of the assignments will be distributed during the course of the semester.

6 Recitation and Laboratory Assignments

Exercise sessions are a combination of recitation and hands on experimentation sessions. Students may ask questions during the session and the instructor will answer all questions and issues posed.

Some exercise sessions will include a laboratory assignment due at the end of the session. Some will include a laboratory assignment due at the beginning of the following lecture period. Any laboratory assignment will be based on material covered in previous lecture or readings, not new material. They will not be taken into consideration in the final grade.

7 Attendance

Attendance of lectures and targil sessions is expected and required for this course. As per College policy, a student who misses 20% or more of the lectures of targil sessions may not be permitted to take the final exam. Students who miss lectures do so at their own risk and expense and will be expected to make up missed material on their own.

7.1 Decorum

Students who attend lecture are expected to give their full attention to the material. Reading newspapers, talking on cellular phones, text messaging, or other distracting behavior will not be tolerated.

Students must arrive to lectures **on time, within the first 5 minutes of class.** After ten minutes into class, the door will be locked and no student will be allowed entry. The door will be opened at the next break in the lecture (approximately every 50 minutes). Students who need to leave during lecture for some urgent matter must leave quietly and may return at the next break.

As per college policy, the instructor reserves the right to expel from the classroom any student who is disturbing the lecture or others.

8 Submissions

8.1 How to Submit Work

Each assignment will be given a specific submission target - either Moodle (written assignments) or GitHub (programming assignments). Materials not submitted via the correct system will not be graded.

Materials sent via email will be ignored without consideration of their merits. Technical issues with the Moodle software should be directed immediately to the information technology support staff in Kinneret College who will address them in a timely manner.

When an assignment is turned in by a group, **every member** of the group must submit a copy of the submission. Students who do not submit a copy **will not** be given a grade for the submission, even if their names appear on others' submissions.

8.2 Assignment Late Submission Policy

Students are expected to be on time with their assignment submissions. Each assignment must be turned in by the date it is due.

Each student will be given 36 slip hours to use for late submissions. The slip hours can be used on a single assignment or divided up among several. Slip hours are rounded up per assignment (*i.e.* 70 minutes late = 2 slip hours, 3 minutes late = 1 slip hour). Once the slip hours are finished, a student's late submissions will no longer be accepted.

36 hours after the due date of any assignment, no submissions will be accepted.

Students who are called up to Miluim duty will have their assignment deadlines extended in accordance with college policy.

9 Cheating

Cheating of any sort will not be tolerated. Student collaboration is encouraged, but within limits as set forth in the college's rules on academic integrity. Any students caught cheating will be immediately referred to the office of the Deacon and may receive a failing grade for the course.

Cheating includes:

- Copying information, content, or verbatim text to answer questions, solutions, or aid in programming projects from other students, internet sites, books (other than the ones listed in the bibliography), other unaffiliated individuals.
- Submitting work that is identical or substantially identical to work submitted by other teams, whether from the current academic year or from previous academic years.
- Working in groups when working in groups is not permitted or working in groups larger than the maximum size permitted by the instructor.
- Submitting someone else's work in your name.
- Copying source code **without attribution** from other students, **web sites**, online repositories, text books, open source programs, or other unaffiliated individuals.
- Other forms of academic misconduct as described on the site: `https://catalog.upenn.edu/pennbook/code-of-academic-integrity/` or as reasonably assessed by the instructor, program head, or dean.

10 Exams

There will be a single exam at the end of the semester. The exam will be worth 60% of the final grade.

11 Grading

The instructor will not address questions about specific individual grades during the lecture or review sessions. Students may contact the instructor *in person* during office hours or after the lecture/review sessions at the instructor's convenience.

Final grades will be calculated by combining grades from assignments and exams. The grades are weighted as follows:

40%	Assignments (required)
60%	Final Exam

12 Books

The following books are used in the class. They are shown below in the bibliography as well: Tanenbaum [4], Kurose and Ross [2], Peterson and Davie [3], and Dordal [1]. As a rule, the lecture notes follow the Peterson and Davie book's presentation.

The library has copies of two of the books listed. The Dordal [1] book is available free of charge in a PDF edition at `https://intronetworks.cs.luc.edu/current2/ComputerNetworks.pdf`. The Peterson and Davie book is also available free of charge in an online edition at `https://book.systemsapproach.org/`.

13 Contact Information

Instructor: Michael J. May
Web site: `https://www2.kinneret.ac.il/mjmay`

References

[1] Peter L. Dordal. *An Introduction to Computer Networks*. Online, Shabbona, IL, USA, 2.0.11 edition, Jul 2023. https://intronetworks.cs.luc.edu/current2/ComputerNetworks.pdf.

[2] James F. Kurose and Keith W. Ross. *Computer Networking: A Top-Down Approach*. Addison-Wesley, 8/E edition, 2020.

[3] Larry L. Peterson and Bruce S. Davie. *Computer Networks: A Systems Approach*. Elsevier, 6.2-dev edition, 2020. https://github.com/SystemsApproach/book.

[4] Andrew S. Tanenbaum, Nick Feamster, and David J. Wetherall. *Computer Networks*. Pearson, 6th edition, 2021.