UNIVERSITY AT ALBANY
State University of New York

College of Engineering and Applied Sciences
Department of Computer Science

ICSI/IECE 416 and ICSI516 Sections 9391/9392 and 9832

Computer Communication Networks

(Fall 2020)

Class Meeting Time: T, Th 9-10:20AM

Location: Online via Zoom at
https://albany.zoom.us/j/95672830345?pwd=Mm5CVWNScUNMNWNDNTgvR21ORG5kQT09

INSTRUCTOR

Instructor's name	Mariya Zheleva
Instructor's title	Assistant Professor
Office location	UAB 418
Office hours	T/Th 10:30-11:30AM and by appointment[1]
E-mail address	

TEACHING ASSISTANTS / PEER EDUCATORS (AND LAB/DISCUSSION SCHEDULE, if any)

TA's / Peer educators	Musa Aghayev
TA's office location	
TA's office hours (if any)	
TA's email addresses	

REQUIRED TEXTBOOK

Text/Reference Book(s):

Title: ***Computer Networking: A Top-Down Approach Featuring the Internet, 7th edition***

Authors: Ross/Kurose

Published by: Pearson Education ISBN: *978-0133594140*

Title: Selected chapters from ***Distributed systems, 5th edition*** (chapters will be made available on Blackboard)

Authors: Coulouris

Published by: Pearson Education. ISBN: *978-0132143011*

Other reading material: ***Assigned papers***

[1] Office hours will be held via Zoom at https://albany.zoom.us/j/94020409741?pwd=VTd0c29FMU4vMjRVZjY3WVdCUnVJdz09

COURSE DESCRIPTION

This course covers fundamentals in computer communication networks and the principles of distributed systems that leverage these networks. The course will focus on key Internet application architectures, principles and protocols, covering reliable data transfer and transport protocols; routing and forwarding; data link layer communications and principles of shared media access. Students will also be introduced to various physical layer techniques like error correction and bandwidth efficiency; content delivery networks; and software-defined networks. The students will apply their understanding of networking fundamentals while working on hands-on programming assignments, packet trace analysis and Internet measurements.

PREREQUISITES COREQUISITES: I CSI/I CEN 333, and A MAT 367 or A MAT 370.

STUDENT LEARNING OUTCOMES (SLOs)

At the completion of this course the students will:

- Understand key design principles of computer communication networks and distributed systems.
- Understand how these principles are implemented and function in today's Internet.
- Bridge distributed applications' requirements and networks' operation to justify the use of certain principles (e.g. packet-switched, pipelined protocols, ect.) and not others in today's Internet.
- Understand the need and principles behind the modularity of complex distributed networked systems such as the Internet by studying the TCP/IP stack and its operation.
- Obtain hands-on experience in network applications and protocols through practical projects.
- Be able to design, execute and analyze the results of real-world Internet performance measurements.
- Understand performance requirements of distributed applications and performance guarantees of today's Internet.
- Communicate effectively about a system design, implementation and performance evaluation.

The topics that will be covered in this course are provided at the end of the syllabus.

COURSE WEBSITE AND BLACKBOARD

- **Course website:** http://www.cs.albany.edu/~mariya/courses/csi416-516-F20/
- **Blackboard:** Blackboard will be used to disseminate announcements, maintain grades, provide course materials, the most current syllabus, and assignment documents. However, this is not an online course and class attendance and participation is essential and required.

ASSESSMENT AND POLICIES

The accomplishment of course objectives will be assessed by applying the studied concepts and tools in a combination of team and individual assignments that includes research and design, and a written component.

I do not accept late assignments. All assignments are due by 11:59PM on the due date (unless otherwise specified). Any re-grading requests will be considered up to 5 business days after posting the grades for the corresponding assignment. No re-grading after the 5-day period has passed.

Projects: Students are required to work on two class project that will form 40% of their final grade (50% for graduate students). The project descriptions will be posted on the website.

Class participation: Students must read the assigned materials ahead of class and participate in the in-class discussions using Socrative. This item will comprise 5% of the final grade for undergraduate students and 10% of the final grade for graduate students. In addition to textbook readings, graduate students will be required to read research papers and participate in an online discussion, which will be graded towards their 10% class participation.

Exams: This class will include two in-class exams. Exam 1 is on October 8th and Exam 2 is on November 24th. These exams account for 50% of the overall grade (40% for graduate students). They will cover all textbook material and assigned papers and will be closed notes, closed textbooks.

Make-up Exams: Make-up exams will be given only for valid and verifiable excruciating circumstances (e.g. a major medical situation). If you are going to miss an exam, you must contact your instructor ahead of time and arrange to take a make-up exam at an alternate date/time.

Extra credit for undergraduate students. Undergraduate students who attempt to solve parts of the exams and projects that are designated as "advanced" (i.e. for graduate students) will receive extra credit. The extra credit will be the equivalent to the number of points for problems that were completed correctly.

Grading. A final grade will be determined as a weighted average of these scores using the following weights:

Grading item		Weight	
		416	516
Class participation		5%	10%
Projects	Project 1	25%	30%
	Project 2	20%	20%
Exams	Exam 1	25%	20%
	Exam 2	25%	20%

Students must complete all requirements in order to pass the course. A grade of incomplete will be given only when circumstances beyond the student's control cause a substantial amount of course work to be unfinished by the end of the semester. Whenever possible, the student is expected to make extra efforts to prevent this situation from occurring. The instructor will be the sole judge of whether an incomplete is warranted. Final grades are computed based on the above formulas and are NOT negotiable. Per department policy, "…students may not submit additional work or be re-examined for the purpose of improving their grades once the course has been completed and final grades assigned."

Policy on I grade: A grade of *I* will only be given for genuine extenuating circumstances that are beyond your control ***after the midterm point***. Both of the following conditions must be met:

1. Your work must be in good standing as of the passing of the midterm point (i.e. October 8, 2020); that is, you must have an average score of at least 50% on Project 1. Furthermore, your grade from Exam 1 must also be equivalent to at least a C. Therefore, if you miss Exam 1 or have not turned in Project 1, you are not eligible for an *I* grade.

2. Written documentation must be supplied about the extenuating circumstance either by you or the University administration.

Under no circumstances will the condition for completing an *I* grade be that the entire course be retaken later without a new registration.

Attendance and Class participation: I expect you to attend every class. If you miss a couple of classes, this will affect your grade. I also expect active participation in in-class discussion; if you attend class but do not participate, you will not receive the full class participation credit. To prepare for these discussions, you must read the assigned reading before coming to class. I will use a tool called Socrative to facilitate class discussion, get feedback on your learning and track attendance. If you miss a class, it is your responsibility to find out the material covered in the class. It will not be possible for your instructor to conduct makeup classes.

Responsible Computing: Students are required to read the University at Albany Policy for the Responsible Use of Information Technology (https://www.albany.edu/its/its_policies.htm). Students will be expected to apply the policies discussed in this document to all computing and electronic communications in the course.

Students with disabilities: Reasonable accommodations will be provided for students with documented physical, sensory, systemic, cognitive, learning and psychiatric disabilities. If you believe you have a disability requiring accommodation in this class, please notify the Director of the Disability Resource Center (Campus Center 130, 442-5490). That office will provide the course instructor with verification of your disability, and will recommend appropriate accommodations. For further information refer to the University's Disclosure Statement regarding Reasonable Accommodation found at the bottom of the document at the following website: http://www.albany.edu/disability/docs/RAP.doc. This website can be reached by following the link under "Reasonable Accommodation Policy" at the following webpage http://www.albany.edu/disability/faculty-staff.shtml.

Academic Honesty and Overall Regulations: Every student has the responsibility to become familiar with the standards of academic integrity at the University. Faculty members must specify in their syllabi information about academic integrity and may refer students to this policy for more information. Nonetheless, student claims of ignorance, unintentional error, or personal or academic pressures cannot be excuses for violation of academic integrity. Students are responsible for familiarizing themselves with the standards and behaving accordingly, and UAlbany faculty are responsible for teaching, modeling and upholding them. Anything less undermines the worth and value of our intellectual work, and the reputation and credibility of the University at Albany degree. Plagiarism and other acts of academic dishonesty will be punished. Read the Standards of Academic Integrity and policies in the University Bulletin (https://www.albany.edu/undergraduate_bulletin/regulations.html).

CAUTION AND A STRONG WORD OF WARNING!!!! Plagiarism and other acts of academic dishonesty will be punished. Students are expected to submit original work. While you may discuss a problem with another student, the work you submit must be your own. Any student who submits copied work or any student that provides work for copying will earn a zero grade for that assignment. If there is more than one copying incident, the student will be graded an E for the class. As per college policy, cheating activity, including cheating in exams, quizzes, projects, etc., WILL be written up in a Violation of Academic Integrity Report (VAIR) reported to the college administration, which includes the Computer Science Chair, the College of Engineering and Applied Sciences Dean, and the Vice Provost of Undergraduate Studies. This will become a part of your permanent record. Multiple incidents will result in being expelled from the college.

- Cheating on exams will result in an E grade for the course. Further, the students involved will be referred to the Dean's office for disciplinary action.
- Cheating on assignments – homework exercises and programming assignments ***are meant to be individual exercises*** (unless otherwise stated); you must do these by yourself. Cheating in a homework or programming assignment will result in a ZERO for that homework or program for all the students involved. Students who cheat in two or more homework/programming assignments will receive an E grade for the course. The names of such students will also be forwarded to the Dean's office for disciplinary action.

TENTATIVE List of TOPICS TO BE COVERED

Below is a tentative schedule of topics for the semester. Note that this schedule may change as the semester progresses. The final schedule and specific assignments will be provided on our course website. Students are expected to have read the listed material before class.

Week	Date	Lecture topic	Reading	Projects
Introduction				
Week 1	25-Aug	Class overview. Internet evolution and architecture.	1.1, 1.2, 1.3, [Clark88]	
	27-Aug	Measuring the performance of computer networks. Protocol layers and service models	1.4, 1.5, [Saltzer+84]	
Application layer				
Week 2	1-Sep	Application architectures. WWW and HTTP.	2.1, 2.2	
	3-Sep	DNS	2.4	
Week 3	8-Sep	Peer-to-peer	2.5	
	10-Sep	Internet video. Content delivery networks.	2.6	Project 1 assigned
Transport layer				
Week 4	15-Sep	Wrap up applications. Socket programming. Project 1.	2.8	
	17-Sep	Intro to the transport layer. Multiplexing and demultiplexing. Connectionless transport (UDP)	3.1, 3.2, 3.3	
Week 5	22-Sep	Principles of reliable transport. Pipelined protocols.	3.4	
	24-Sep	TCP	3.5	
Week 6	29-Sep	Intro to congestion control. Congestion control in TCP	3.6, 3.7, [Jacobson88], [Chiu+89]	
	1-Oct	Wrap up the transport layer	3.7	
Week 7	6-Oct	Exam 1 review	All material so far	Project 1 due
	8-Oct	**Exam 1**	All material so far	
Network layer				
Week 8	13-Oct	Intro to the network layer. Virtual circuits vs. datagram networks.	4.1.	Project 2 assigned

	15-Oct	Router design. Packet scheduling and active queue management.	4.2, [Floyd+93], [Demers+89]	
Week 9	20-Oct	Internet Protocol (IP). IP addressing. NAT. ICMP. IPv6	4.3	
	22-Oct	Routing algorithms.	5.2	
Week 10	27-Oct	Routing in the Internet.	5.3, 5.4	
	29-Oct	Software-defined networking	4.4, 5.5	
Data link layer				
Week 11	3-Nov	Intro to the Data Link Layer. Error detection and correction	6.1, 6.2	
	5-Nov	Multiple access links and protocols.	6.3	
Distributed systems				
Week 12	10-Nov	Overview of distributed systems	2 (Coulouris)	
	12-Nov	Time and logical clocks	14 (Coulouris)	
Week 13	17-Nov	Fault tolerance and consensus	15 (Coulouris)	Project 2 due
	19-Nov	Exam 2 review	All material since after exam 1	
Week 14	24-Nov	**Exam 2**	All material since after exam 1	