CS455 Computer Communications and Networking

Department of Computer Science

George Mason University

(This syllabus may be updated throughout the semester)

Location	Horizon 2016
Class Time:	MW 12.00-1.15 PM
Instructor:	Sapna Gambhir
E-mail:	sgambhi@gmu.edu
GTA Details:	TBD
Office Hours	TBD
Office Location:	R356, Research Hall

DESCRIPTION

- This course introduces concepts and design principles of modern computer and telecommunication networks. It uses the Internet TCP/IP protocol suite to discuss how today's computer networks operate and how they have evolved over many years to meet the requirements of today's networking applications. The focus will be on both - fundamental networking and communication techniques, and protocols used in today's complex Internet architecture.

- Topics include DNS and HTTP protocols at the application layer, TCP and UDP at transport layer, routing algorithms and forwarding with BGP and OSPF at network layer, and multiple access technologies along with Ethernet and WiFi LANs. Concepts of network security and related protocols like the Transport Layer Security (TLS) suite and DNS' Security Extensions (DNSSEC) will also be introduced.

- In- person classes are going to be held as scheduled. If anything changes, alternate method will be updated on Blackboard.

PREREQUISITES
- Grade C or better in CS 310, CS 367 and STAT 344
- Ability to program in C or Python

BOOKS
- Required textbook:
    - James Kurose and Keith Ross, "Computer Networking: A Top-Down Approach", 8th Edition, Pearson, 2021
- Other recommended textbooks for references
    - Computer Networks, 5th Edition, Andrew S. Tanenbaum, David J. Wetherall, Pearson, 2011

COURSE OBJETCIVES- Gain a basic understanding of how computer and communication networks operate - Understand various tradeoffs and performance metrics that drive the design of today's networks, especially the Internet - Learn the basics of network programming, and relevant tools and protocols

COURSE OUTCOMES
The CS department has identified these outcomes as ones that must be met throughout the semester.
- Understand the architectural principles of computer networking and overall structure of the Internet.
- Show a clear understanding of layered Internet protocol framework, its design principles and functionality.

- Explain various network performance metrics (throughput, latency, loss, etc.) and their impact on applications.
- Describe the essential principles of reliable data delivery, flow control, and congestion control, and their implementation at transport layer.
- Understand distributed routing protocols, and data and control plane operations of network layer in Internet.
- Understand wired and wireless data link layer protocols for communication over a shared medium.
- Demonstrate a basic understanding of network security, vulnerabilities at various layers, and associated protocols.
- Implement network protocols using network stack programming libraries and use tools such as Wireshark to analyze real-world networks.

TOPICS

- Introduction to computer networks and Internet protocol suite
- Internet architecture - edge, core and layered service model
- Application layer principles and protocols (DNS, HTTP, SNMP, etc.)
- Transport layer services, TCP, reliable delivery, congestion control, and UDP
- Network layer data plane principles, forwarding and routing, addressing, IPv6, and DHCP
- Network layer control plane overview, routing algorithms, security enhancements, OSPF and BGP
- Link layer services, error detection and correction, and multiple access protocols
- Introduction to network security, vulnerabilities and protocols
- Introduction to wireless and mobile networks with 802.11 wireless LANs

CLASS MATERIALS

All class materials are available through the course homepage on Blackboard, accessible from your Blackboard accounts.

ASSIGNMENTS/PROJECTS

- All assignments and home works are submitted to Blackboard (http://mymason.gmu.edu) by the given deadlines and late penalty information (if any). Grades are also posted on Blackboard for all assignments and homework.
- The students are responsible for keeping back-ups of their work while they are working on an assignment. If a student makes multiple submissions, only the last submission will be graded.
- Projects will have a late submission penalty (details will be mentioned in the project specifications) and will not be accepted 2 days after the due date.
- Any type of accommodations will not be applicable on group/team work. For group assignments, each member of the group must make a separate submission. If your code does not compile, you will get no credit.
- It is critical that the students double check the files they are submitting, as submitting a wrong, corrupted, or empty file is very likely to result in a score of 0 for that assignment.

GRADING POLICY

- Your grade will be calculated using the following percentages:
    - 15% Home Work
        - to be done individually
        - Will drop one with lowest grade

    - 15% Lab Assignment
        - to be done individually

- 20% Projects
    - can be done with a partner (Team of maximum two students)
- 20% Midterm Exam
    - Exam Logistics will be uploaded on Blackboard
- 20% Final exam (cumulative)
    - less than 40% will result in F
- 10% In-class activities and quizzes
    - to be done individually
    - Will drop two with lowest grade

Note: A total grade of less than 50 or a final exam score less than 40 will result in F. I may make some changes in grading. If it is done, it will be announced in the class or on the blackboard.

GRADING SCALE

Grade	Range	Grade	Range	Grade	Range	Grade	Range
A+	>=95%	B+	80%<=B+ <85%	C+	66%<=C+<70%	D	50%<=D<60%
A	90%<=A<95%	B	75%<=B<80%	C	63%<=C<66%	F	< 50%
A-	85%<=A-<90%	B-	70%<=B-<75%	C-	60%<=C-<63%		

NOTE:
- Exact Schedule for Final Exam will be shared on Blackboard and There is no make-up for missed exams. **Makeup exam may be given only if proper documentation is provided explaining why you missed the exam.** Only 80% of the credit (what one earns in the makeup exam) may be counted in making the final grade.
- No make-up for in-class activities or quizzes.

- If you think your work is not correctly graded then you must initiate contact with the grader within <u>three days of receiving the grades</u> (either email or on the Blackboard). Grade contesting beyond this time window will not be allowed.
- The students are supposed to work individually on the homework, assignments and projects, unless told otherwise. We reserve the right to use MOSS to detect plagiarism.
- Use of public code repositories for course projects during the semester or after the semester is over (to avoid future plagiarism).
- If the campus closes or class is canceled due to weather or other concern, students should check Blackboard [or other instruction as appropriate] for updates on how to continue learning and information about any changes to events or assignments.

ACADEMIC INTEGRITY

You are expected to abide by the University's honor code and the CS Department's Honor Code and Academic Integrity Policies during the semester, i.e., collaboration between students in different groups on an assignment is unacceptable. Any violation of the honor code will result in referral to the honor council.

DISABILITY STATEMENT

If you have a learning or physical difference that may affect your academic work, you will need to furnish appropriate documentation to GMU Disability Resource Center. If you qualify for accommodation, the DRC staff will give you a form detailing appropriate accommodations for your instructor. If you have such a condition, talk to me with in the first week of the semester to discuss any accommodation needs.

SEXUAL HARASSMENT AND INTERPERSONAL VIOLENCE

As a faculty member and designated "Responsible Employee," I am required to report all disclosures of sexual assault, interpersonal violence, and stalking to Mason's Title IX Coordinator per university policy 1412. If you wish to speak with someone confidentially, please contact the Student Support and Advocacy Center (703-380-1434) or Counseling and Psychological Services (703-993-2380). You may also seek assistance from Mason's Title IX Coordinator (703-993-8730; titleix@gmu.edu).

INCLUSION

We believe in an equitable and just work and learning environment. We welcome and value individuals and their differences including race, economic status, gender expression and identity, sex, sexual orientation, ethnicity, national origin, first language, religion, age, and disability.

PRIVACY AND EMAIL

- Students must use their GMU email account to receive important University information, including communications related to this class.
- To protect your privacy, I also cannot list your GMU email address on any public forum or provide it to any other students.
- Video recordings of class meetings that are shared only with the instructors and students officially enrolled in a class do not violate FERPA or any other privacy expectation.
- Email me for any personal issues such as medical situations, disability accommodations, etc. Due to the size of the class, please do not e-mail me your concept and Assignment/ Project doubts, use office hours and Piazza for that!