CSCI 39596: Advanced Networks & Cloud (Fall 2020)

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Class hours: Th 5:35 - 8:15 PM, Via Zoom - `https://huntercollege.zoom.us/j/91822382898?pwd=ZTc1aHR4T1hyVUVnOE11OHJmZUl3dz09`

Office hours: Th 3 - 5 PM, Via Zoom (Prior reservation required)

Prerequisites: Basic knowledge in data structures, operating systems, and probability theory is must. Basic knowledge on computer networks is also strongly recommended.

Textbooks:

- "Computer Networking: A Top-Down Approach", *James Kurose and Keith Ross*, Pearson, 7th Edition. (**Required**)
- "Data Networks", *Dimitri Bertsekas*, MIT Press, 2nd Edition.(**Reference only**)
- "Wireless Communication Networks and Systems", *Cory Beard and William Stallings*, Pearson, 1st edition. (**Reference only**)
- "Distributed and Cloud Computing", *Kai Hwang, Jack Dongarra, and Geoffrey Fox*, Elsevier, 1st edition. (**Reference only**)

A reading list with reference book chapters and articles will be compiled during the course.

Course description: This course is designed for computer science students with basic knowledge in algorithms, operating systems, and statistical probability theory. The students are also expected to have basic networking knowledge. The students will learn advanced topics in computer networks, such as, 'state-of-the-art' application and transport protocols, queuing principles, wireless networking, cloud and future networks. Students will also be introduced to network vulnerabilities, threats, and prevention techniques. The course will be lecture heavy. As part of laboratory exercises, students will learn how to design simple network simulations and use distributed testbeds to design and perform experiments. Finally the students will be expected to take part in group projects which will exercise their critical thinking and problem solving skills gathered through this course.

Course outline: Topics covered will include the following, however, the order and emphasis may change.

- Network basics (2 weeks): Basic networking and communication concepts, performance measurements, packet queuing.
- Applications (2 weeks): Application layer protocols, HTTP, DNS, web caching, CDN and video streaming, introduction to CloudLab/GENI testbed.
- Nuts and bolts (4 weeks): Reliable data transmission, TCP, network data plane protocols, network control plane and routing, software-defined networking and OpenFlow.
- Wireless networks (2 weeks): Multiple access in wired vs. wireless networks, CSMA/CA, IEEE 802.11, cellular networks, spectrum sharing.
- Network security (2 weeks): Vulnerabilities, threats, attacks, intrusion detection, firewalls, denial of service.
- Cloud and future networks (2 weeks): Cloud environments and Big Data, ScienceDMZ, softwarized networks, 5G, edge computing, Internet of Things.

Lectures: The lectures will involve both slides and in class discussions. Attending all the lectures will be very important for the students to develop the concepts and skills, and also to be able to perform well in the project, exams, assignments, and quizzes.

Homework: There will be 5 homework assignments assigned throughout the semester. Assignments will be due via Blackboard. It is the students' responsibility to keep track of the due dates. Submission after due date will not be allowed.

Labs: There will be 5 labs (using CloudLab environment) assigned throughout the semester. Lab reports will be due via Blackboard on the dates announced. Submission after due date will not be allowed.

Quizzes: There will be 5 unannounced pop quizzes (via Blackboard) during class hours containing multiple choice questions. There will be no retake of the quizzes. Students will be allowed to collaborate during the quizzes.

Test: There will be one in-class test (tentatively on Nov 19th) with no final exam. For those having verified reasons to be absent during a test, makeup tests may be arranged on an individual basis. Please contact me at least 1 week prior to the scheduled test date, as it will not be possible to schedule a makeup "after the fact".

Project: A final project will be assigned half-way (tentatively on Oct 15th) into the course. Student teams will be given a 'state-of-the-art' problem to build a solution around with each team having no more than 5 students. Apart from the quality of solution elegance, the project performance will also be evaluated based on mid-term review and final presentation/submission. There will not be any extensions under any circumstances.

Assessment:
Pop quizzes (10%)
Homework assignments (25%)
Laboratory exercises (25%)
Test (15%)
Final project (25%)

The final score for the course will be curved to derive your letter grade.

Abuse of Trust: Duplicate homework and laboratory assignments written and performed in collaboration with others are NOT acceptable. Although it is permissible to discuss the homework with others, these discussions should be of a general nature. All work at a detailed level must be done on your own. Students submitting the same or similar solutions to the homework/lab reports or downloaded off the Internet (or obtained from other sources) will be considered as having cheated. Any evidence of cheating, copying or collusion, plagiarism, etc., will be graded as zero for all students involved and an automatic F for the course along with sanctions in accordance with Hunter College procedure. The official college statement is:

Hunter College regards acts of academic dishonesty (e.g., plagiarism, cheating on examinations, obtaining unfair advantage, and falsification of records and official documents) as serious offenses against the values of intellectual honesty. The College is committed to enforcing the CUNY Policy on Academic Integrity and will pursue cases of academic dishonesty according to the Hunter College Academic Integrity Procedures.

In compliance with the American Disability Act of 1990 (ADA) and with Section 504 of the Rehabilitation Act of 1973, Hunter College is committed to ensuring educational parity and accommodations for all students with documented disabilities and/or medical conditions. It is recommended that all students with documented disabilities (Emotional, Medical, Physical and/ or Learning) consult the Office of AccessABILITY located in Room E1124 to secure necessary academic accommodations. For further information and assistance please call (212-772- 4857)/TTY (212-650-3230).

This course partially meets the department's learning goals 1A, 1B, 1D, 3A, and 3C.