

Fall 2020

## CS 656-851: Internet and Higher Layer Protocols

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# Syllabus

## Course Information

**Course Number:** CS656

**Course Title:** Internet and Higher-Layer Protocols

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## Faculty Contact Information

**Instructor:** Dr. Jie Tian

**Email:** jt66@njit.edu

**Office Hours:** Office hours will be held through WebEx. The detailed time will be posted in the “Instructor Announcement” discussion forum in the first week of the class.

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## Course Description

This course studies the architecture and protocols of modern computer networks. Topics to be covered include: addressing, performance measurement metrics, application-layer protocols, transport-layer protocols, networking-layer protocols, link-layer protocols, and wireless and mobile networking. Upon successful completion of the course, students will have gained a deep understanding of the fundamental concepts and principles of designing and implementing modern computer networks.

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## Textbook and Materials

Kurose, J. & Ross, K. *Computer Networking: A Top-Down Approach*. Pearson, 7th edition, 2016, ISBN: 978-0133594140 (You can also use the 6th edition; ISBN: 978-0132856201)

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# Prerequisite

Decent programming skills are required. **The class has a semester-long programming project and the professor will not debug this assignment for you.** CS356 or equivalent courses are suggested.

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# Course Outcomes

- Deep understanding of modern computer network architecture and protocols.
  - Broad knowledge on start-of-the-art network concepts.
  - Hands-on experience in designing and coding network-related mobile application.
  - Improved presentation skills.
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# Grading Scale

Grade	Percentile	Percentage
A	4.0	< = 25%
B+	3.5	< = 25%
B	3.0	< = 25%
C+	2.5	< = 15%
C	2.0	< = 10%
F	N/A	~

**Reminder: At the discretion of the instructor, the grading may be done on a curve.**

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# Grading Categories

Categories	Percentage
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Quiz	8%
Research / Presentation Assignment	20%
Programming Assignment	20%
Mid-Term Exam	20%
Final Exam	32%

The overall score must be higher than 60 to pass the class.

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## Quiz Dates

Quiz	Date
Module 03: Quiz 01	<i>September 19</i>
Module 05: Quiz 02	<i>October 3</i>
Module 10: Quiz 03	<i>November 7</i>
Module 13: Quiz 04	<i>November 28</i>

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## Group Assignments

Both programming assignment and research assignment are done in a group and in the same group. Continue reading on Team Formation and those expectations.

### Objectives of teamwork

The objective of teamwork is two-fold: (1) Communication is an art. Through teamwork, you are expected to learn and improve how to collaborate and communicate with other people. (2) Teammates are expected to learn from each other. Each individual has his/her own gift. Learn from your peers. Also, one person cannot do everything, and you are expected to learn how to leverage others' resources and help.

Especially for an online course, teamwork is very important and more than necessary because you do not go to the classroom for lectures together. Without required

teamwork, you may not even know your classmates at the end of the semester. Learning from each other and making friends at graduate school is very helpful to future career development.

## Team formation requirements/suggestions

- [Requirement] A group is composed of four members. Considering that the number of enrolled students may not be a multiple of four, two groups can have five members or three members.
- [Rule] You need to build a team by the end of the first week.
- [Rule] After week two, you cannot change groups anymore except for some extreme situation, e.g., all your partners drop the class. That your partner does not work or that you do not like them is not a legitimate reason to change partners. So BE CAREFUL when forming a team.
- [Rule] Once you have decided on which group you belong to, put your name beside your other group members on the spreadsheet in the Grouping for your Section. The group member who signs up first under a blank group on the spreadsheet decides the group number. For example, if John Smith sees that group 2 is blank on the spreadsheet; then he can start group 2, and all other group members who are in a group with John are now in group 2. Also, immediately respond to the thread that corresponds to your group number. For example, if John Smith signs up for group 2 on the spreadsheet, he should respond to the group 2 thread saying something like, "John Smith joining the group!"
- [Administration] Use the thread below that corresponds to your group to facilitate conversation on your group assignments. Once all groups are finalized we will restrict the settings so that this thread can only be seen by your other group members. Once restricted, posts in your private group thread will only be visible to you, your other group members, and the teaching staff. Not other groups.
- [Administration] Once you form a group, you can start bidding the project topics that your group plans to work on.
- [Suggestion] The best strategy to form a team is to incorporate different skills, so that (1) group members can learn from each other; (2) the group possesses the whole skill set necessary to accomplish the project including programming, information searching, presentation, and many more.
- [Suggestion] Be careful when forming a team. Reach out to all your other classmates, if possible, and find out the right partners to work with.

## About Grading

A project has a grade. All the group members will have the same grade. No request for a higher grade than team members will be granted for any reason.

## About fairness

Note that you may be the one who does most of the work and your teammate does not finish his/her tiny parts. You may feel it is unfair. However, you need to know similar or worse things happen more often in the real workplace. You need to learn how to handle this. First of all, if you are the one who does most of the job, you learn the most from the project and no one can steal gained knowledge and experience from you. You actually have the opportunity to practice while your teammates give that up. Secondly, effective communication with others is not easy. How do you make others do their work? How do you express your feelings diplomatically? You need to learn to handle different situations and different kinds of people.

## About backup plan

The whole group will have the same grade. If your group determines to split the project and each one works on a piece, it is possible that one member does not do his/her job and potentially the grade of those who have finished their parts are affected equally. Therefore, from day one, there should be a backup plan or some monitoring mechanism in case a team member drops the class or just does not finish his/her parts.

## Programming Assignment

- The project is about developing a smartphone application.
- The platform can be Android phone or iOS.
- Different groups will work on different projects or on different platforms. The professor will provide a list of projects and groups will bid on the project/platform.
- All students, including the presenting group, will participate in the Peer Review Questionnaire.

More details about the programming assignment can be found in a separate description.

Note: The professor will NOT teach you how to develop a mobile application, NOR debug it for you. Instead, the professor will post useful online material so you can learn by yourself with your team members. Smartphone app development skills are in great demand in today's job market. As a graduate student with decent programming skills (our course prerequisite), you definitely would be able to do it after spending time. Hands-on experience is important. We need to obtain the most useful network-related hands-on experience.

## Research Assignment

- The research assignment is for you to study by yourself and with your team members some hot networking topics or new networking technologies.
- The professor will provide a list of research assignment topics. Each group will work on a topic. Other groups will learn from this group about the topic. The presenting group needs to answer the questions raised by their classmates.
- All students, including the presenting group, will participate in the Peer Review Questionnaire.

More details about the research assignment can be found in a separate description.

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## Quizzes

There will be four quizzes in total. You have a **48-hour-long window** to take the **25 min-quiz online**. Quiz date **cannot** be rescheduled. **Any request to change the quiz date will not be considered nor replied to**. However, you can choose to drop the grade of one quiz. By default, we will drop the quiz with the lowest score and the final quiz score will be the average of the highest three scores unless you indicate otherwise.

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## Homework Exercises

Homework exercises will be given almost every week and the solutions will be provided at the same time. You need to work on the exercises, check with the solutions, and ensure you know how to solve them.

There is no need to submit your homework exercises. They will not be counted into the final grade.

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## Time Commitment

Date	Topic
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Module 1 September 1 - September 6	Introduction / Protocol Layer and Service Models
Module 2 September 7 - September 13	Network Performance: Delay and Loss/ Addresses
Module 3 September 14 - September 20	Application Layer Architecture/ FTP and E-mail/P2P Applications
Module 4 September 21 - September 27	The Web, HTTP, and DNS
Module 5 September 28 - October 4	Web Searching/ Intro to Transport Layer/ UDP
Module 6 October 5 - October 11	Principles of Reliable Data Transfer/ TCP Reliability
Module 7 October 12 - October 18	TCP Congestion Control
Midterm Exam	
Module 8 October 19 - October 25	Router/ IP
Module 9 October 26 - November 1	Routing Algorithms
Module 10 November 2 - November 8	Introduction to Link Layer/ MAC Protocol
Module 11 November 9 - November 15	Switched Local Network/ Overview of the Five Layers
Module 12 November 16 - November 22	Features of Wireless Links/ WiFi
Module 13 November 23 - November 29	Cellular Network/ Manage Mobility
Module 14 November 30 - December 6	Group Project Overviews
December 11 and 14	Reading Day 1 and 2



### Disclaimer

The module may be modified at the discretion of the instructor or in the event of extenuating circumstances. Students will be notified in class of any changes to the modules.

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## Policies about Emails and Questions

- All the academic questions should be posted through Canvas on the corresponding discussion forums and the professor/TA will answer there. In this way, students can learn from each other's questions. For such a post, use [Questions to Professor/TA] in the subject. Before posting a question, first check whether a similar question has been posted already and answered. **Such questions emailed to the professor/TA will not be answered.** For example, if you have a question about how congestion control works, post on the forum; asking by email will not be replied to. If you have a question about course administrative details, e.g., the TA's office, check corresponding documents (in this case, the syllabus) first. If no answer, post online.
  - Only if you have some personal issue, contact the professor/TA by email. For example, if all your group members drop the class and you need help.
  - If you have comments and suggestions about how to improve the class, please email the professor/TA, instead of posting on Canvas. For example, you believe that one programming topic is too hard and the professor should change a topic. The professor appreciates the comments and will consider adjusting the course material for the coming semesters, but the requirement clearly stated from the beginning will be strictly followed.
  - Questions posted online will be answered by 11:59 P.M. on the next business day. For example, if you post a question on Friday at 10 P.M., the question will be answered by Monday at 11:59 P.M. If you post a question on Monday at 10 P.M., the question will be answered by Tuesday at 11:59 P.M. The only exception is when the professor is out of town for academic conferences/meetings and has no Canvas access, and the TA cannot answer the question. In this case, the Professor will answer the question within one business day after she comes back.
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## Late Work and Make-Up Exams

A make-up exam request and request to use longer time to finish the exam may be taken only after providing written documentation from the Dean of Students. The Dean of Students will then inform the instructor about their decision.

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## Sharing Information

Students are free to discuss assignments with their colleagues. However, they should not take any written (electronic or otherwise) record away from the discussion. This applies when the assignment is supposed to be an individual effort or whenever two teams discuss common problems they are each encountering (inter-group collaboration). After the discussion, it is advisable to engage in at least half an hour of non-course related activity before starting to work on the assignment. This will assure that students are able to reconstruct by themselves what they learned from the discussion.

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## Student Conduct

The NJIT University code on academic integrity, found at <http://www.njit.edu/academics/integrity.php> (Links to an external site.), will be followed in all courses.

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## Student with Disabilities Codes

NJIT adheres to section 504 of the Rehabilitation Act (ADA) of 1990. Appropriate accommodations are provided at no cost to the student. If you have any questions or would like additional information, please contact Dr. Phyllis Bolling, Center for Counseling and Psychological Services (C-CAPS), Campbell Hall, (entry level), room 205, (973) 596-3420. For further information, visit the [Disability Support Services \(Links to an external site.\)](#) website.

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## Technical Support

For assistance with the following items, please contact NJIT IST Service Desk at: 1-973-596-2900 or <https://ist.njit.edu/servicedesk/> (Links to an external site.)

\*NJIT passwords may be changed using the [Global Password Change mechanism \(Links to an external site.\)](#). You will need to know your current UCID and UCID password. Questions can be referred to 1-973-596-2900.

Periodic changing of passwords and strategies for managing them are best practice for anyone using a computer. All members of the university community are encouraged to review [tips for password management \(Links to an external site.\)](#) and to change passwords regularly.

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## Software and Hardware Requirements

Sometimes, you will be required to use Word processing and presentation software, such as MS Word and PowerPoint found in Microsoft Office. You will also need to be comfortable with various aspects of using the Internet such as:

- Search engines
- Newsgroups
- E-mail
- Ability to download files

To view certain media elements in this course, you will need to have several browser plug-ins such as Shockwave, Flash, and Adobe Acrobat on your computer. Use the links in the course to download and install the appropriate software application.

**Important:** With regards to plug-ins, ensure you are using the most recent version of each plug-in you require. View the [hardware and software requirements \(Links to an external site.\)](#) for this course.

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## Student Services and Support

### Timothy J. Hart

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Digital CRM Coordinator,  
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(C) 862-234-5706  
[hart@njit.edu](mailto:hart@njit.edu)

Virtual Appointment: [Tim Hart's Virtual Office \(Links to an external site.\)](#)

Website: <http://www5.njit.edu/online/programs/> (Links to an external site.)

Linkedin: <https://www.linkedin.com/in/timothyhart> (Links to an external site.)

Webex: <https://njit.webex.com/meet/thart> (Links to an external site.) 640 025 006