



CS 656 Internet and Higher Layer Protocols Syllabus

Semester

Course Modality:

This is an online course, which will be conducted fully online, asynchronously via Canvas. For more information on using Canvas and other supported learning tools, visit the IST Service Desk Knowledgebase.

Instructor Information

Instructor	Email	Office Hours	
Samaneh Berenjian	<u>sb936@njit.edu</u>	Office hours : Wednsedays: 03:30 pm - 04:30 pm; Zoom: <u>https://njit-</u> edu.zoom.us/i/8310165968	
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*I will respond to all emails/Inbox messages within 1 business day, Mon-Fri 9am-6pm. Messages received after 5pm Fri will be processed after 9am Mon.

General Information

Course Description

The course introduces the protocols and standards of the TCP/IP suite that govern the functioning of the Internet. The material covered in class is a top-down approach on introduction, discussion, and analysis of protocols from the data-link layer to the application layer. Alternative protocols to the TCP/IP suite and new protocols adopted by this suite are discussed. Numerical examples related to network planning and protocol functioning are analyzed. 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.

Prerequisites/Co-requisites

The program or certificate prerequisite, CS 505 and co-req CS 506 are assumed. Students whose undergraduate major was not CS or EE, please see the instructor first. This course requires knowledge of at least one procedure-oriented language such as Pascal, C or Java. Also see the Appendix below.

Course Learning Outcomes

By the end of the course, students will be able to:

- 1. Identify network protocols and layers such as application, link-layer, TCP, UDP, IP, HTTP and their derivatives.
- 2. State and differentiate the components of network protocols and layers including addressing, checksums, flags and exception handling mechanisms.
- 3. Demonstrate how various Internet protocols work, give a network configuration.
- 4. Design and develop computer programs and experiments that emulate the behavior of network protocols and layers such as but not limited to HTTP, TCP, UDP, IP.
- 5. Analyze and compare the features of several Internet protocols and network architectures.
- 6. Identify problems and challenges with various network protocols and propose solutions to solve these problems.
- 7. Identify the main ideas along with the strengths and the weaknesses of research articles in computer networks, mobile/wireless networks and cloud networks, and clearly present these articles.
- 8. Communicate effectively about topics related to Internet and Higher Layer Protocols through weekly group project assignments.

Required Materials

- Text: Computer Networking, 8 Ed, by Kurose and Ross, ISBN 9780136681557
- Wireshark labs
- NJIT Highlander AFS ID.

Additional Resources

PowerPoint Slides

Grading Policy

NJIT Grading Legend

Final Grade Calculation

Final grades for all assignments will be based on the following percentages:

Assignments	60%
Midterm Exam 20%	
Final Exam	20%
Final Score	100%

Your LETTER GRADE will be computed on a curve which will be based on the relative performance of all students and groups in the class.

Course Work

Assignments: (60% of grade) There will be 7 assignments, each coincident with a learning module. These assignments are group assignments and have a strong emphasis on collaboration. The assignments include a combination of programming projects, quiz questions and computer experiments. Your deliverable/s for the assignments will include a combination of computer experiments, interactive video discussions and written reports. Each assignment is worth about 8-10% of course score.

Midterm Exam: (20% of grade) The midterm will include material from Modules 1 through 3. The midterm will comprise short questions, multiple-choice questions and numerical questions based on the material in the learning modules.

Final Exam: (20% of grade) The final will include material from Modules 1 through 7. The final will comprise short questions, multiple-choice questions and numerical questions based on the material in the learning modules.

Feedback

You will receive written feedback, typically as an attachment to the assignment in Canvas, on the performance of your project/experiment and on the quality of your reports.

Letter to Number Grade Conversions

A	90-100
B+	85-89
В	80-84
C+	75-79
С	70-74
F	0-64

Exam Information and Policies

NJIT policy requires that all midterm and final exams must be proctored, regardless of delivery mode, in order to increase academic integrity. Note that this does not apply to essay or authentic based assessments. Effective beginning Fall semester 2019, students registered for a fully online course section (e.g., online or Hyflex mode) must be given the option to take their exam in a completely online format, with appropriate proctoring.

Any course that uses online proctoring for exams may require you to do an environmental scan. You are responsible for selecting a location where you are comfortable with yourself and your room being video and audio recorded. You may be asked to use your camera to scan all four walls of the room you are in, as well as the workspace, desk, and area around the computer. Ideally, your exam environment should be well-lit and free from distractions and interruptions.

This course has a midterm exam and a final exam. The midterm exam is administered midsemester and covers all the material discussed up to and including the week of the midterm. The final exam covers the material discussed through the whole semester. In this course you will be required to use the following proctoring method to ensure academic integrity for exams:

ProctorU Live+

ProctorU **Live+** is a live proctoring service that works by connecting you to a proctor who will watch (and listen to) you **live**, via webcam, while you take your exam online.

In using ProctorU Live+, students need:

- Guardian Browser
- High-speed internet connection
- Webcam (internal or external)
- Microphone and Audio (internal or external)
- NJIT ID or Photo-Issued ID
- Reflective surface such as a small mirror
- To perform an environment check
- Windows or Apple Operating System
- **Important Note:** Students will be required to have an active Windows license on their computer. ProctorU Live supports the following version of Windows:
 - Minimum OS: Windows 10 (Windows 10 S mode is not supported). Guardian Browser requires 64-bit Windows 10 or MacOS 10.13 (Oldest still maintained version)
 - Recommended OS: Windows 10 (10 S mode is not supported) or MacOS 10.15

Recommendations for students in using ProctorU Live+:

- 1. Read the Full, Step-by-step instructions on the ProctorU Live+ Process.
- 2. You must first create a ProctorU account and confirm your email address.
- 3. If you do not receive an "invitation" to take a specific exam, you can sign up for an appointment by logging in and searching for the exam by your instructor/course name.
 - a. While ProctorU Live+ is available 24/7, you will need to schedule your proctoring sessions at least 72 hours in advance of the exam to avoid any on-demand scheduling fees. Students are currently responsible for any fees as a result of late scheduling.
- 4. <u>Test your equipment</u> prior to your proctoring session. It is recommended you click on the button that says "Connect to a Live Person" to **fully** test out your equipment.
 - a. **Important Notice for OSX Users**: You will need to <u>enable screen sharing in</u> <u>your browser</u> **prior** to taking the exam.

You should expect the startup process with the proctor to take about 10-15 minutes. However, this time will **not** affect your exam time. Helpful Resources:

- ProctorU Equipment Requirements
- Live+ (Guardian) Instructions for Test-Takers
- <u>The Student Experience: What to Expect During Your Remote Proctored Exam</u> (Video)
- <u>Test-Taker Resource Center</u>
- Tips for Ensuring a Smooth Experience
- ProctorU Privacy Policies
- ProctorU Accommodations
- Questions or Problems? Contact:
 - <u>ProctorU LiveChat</u> (Immediate Help with an Account)
 - <u>ProctorU Help Center</u> (Immediate Help without an Account, or Non-Urgent Requests)
 - ProctorU Support: 855-772-8678
 - IST Service Desk: 973-596-2900 or Help.njit.edu

Policy for Late Work

No late work. All work must be submitted in Canvas by the specified deadline. Submits after the deadline will not be graded. You are encouraged to submit at least 1 hour before the deadline, subject to your own location/timezone.

Academic Integrity

"Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the <u>NJIT academic code of integrity</u> <u>policy</u>.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of *F*, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at <u>dos@njit.edu</u>"

Netiquette

Throughout this course, you are expected to be courteous and respectful to classmates by being polite, active participants. You should respond to discussion forum assignments in a timely manner so that your classmates have adequate time to respond to your posts. Please respect opinions, even those that differ from your own, and avoid using profanity or offensive language.

Weekly Expectations

This course is organized in modules of about two weeks each. In each module, you will view lecture videos, complete any associated reading and assignments, and develop interactive videos describing your network models. Your assignments will typically be due every other Sunday, specific dates will be provided in the assignment calendar.

This course is about the Internet and appropriately the deliverables are also Internet + video. Each group is expected to prepare a weekly video in which they present their assignment and discuss their progress, challenges and the strategies they used to overcome those challenges. Each group will develop, over the time period of the course, a play list of their work in the course. All group members are expected to participate in all videos. Please see the assignments for specifics about the videos.

Weeks	Module	Торіс	Reading/Assignment	Due Dates
1 & 2	1	Introduction and HTTP	Read Chapter 1	
			Discussion-Group Formation	See assignment
			A1	Sun (week #2)
3 & 4	2	Application Layer Protocols, DNS, IMAP,	Read Chapter 2	
		SMTP	A2	Sun (week #4)
5&6	3	M3, Transport Layer and RDT	Read Chapter 3	
			A3	Sun (week #6)
7		Midterm Exam		TBD (week 7)
8 & 9	4	Network Layer Data Plane	Read Chapter 4	
			A4	Sun (week #9)
10 &11	5	Network Layer Control Plane	Read Chapter 5	
			A5	Sun (week #11)
12 & 13	6	The Link Layer	Read Chapter 6	
			A6	Sun (week #13)
14 & 15	7	Special Topics Wireless and Mobile	Read Chapter 7	
			A7	Sun (week #15)
		Final Exam		TBD-Please consult the registrar's page

Course Schedule

Weeks	Module Topic	Reading/Assignment Due Dates
		and Canvas
		announcement for
		details.

Additional Information and Resources

Accessibility:

This course is offered through an accessible learning management system. For more information, please refer to Canvas's <u>Accessibility Statement</u>. Being that this course makes use of YouTube, you may also refer to <u>Google's Accessibility Statement</u>.

Requesting Accommodations:

The Office of Accessibility Resources and Services works in partnership with administrators, faculty, and staff to provide reasonable accommodations and support services for students with disabilities who have provided their office with medical documentation to receive services.

If you are in need of accommodations due to a disability, please contact the <u>Office of</u> <u>Accessibility Resources and Services</u> to discuss your specific needs.

Resources for NJIT Online Students

NJIT is committed to student excellence. To ensure your success in this course and your program, the university offers a range of academic support centers and services. To learn more, please review these <u>Resources for NJIT Online Students</u>, which include information related to technical support.

Appendix

This class requires Java programming at the wire level. This is probably different from what you may have done before because you cannot use String, StringBuffer etc and you will have to use lower level functions such as

```
InputStream.read(byte[] b, int off, int len)
```

If you want to read ahead and prepare, it is highly recommended you try out this exercise for practice.

1. Modify the EchoServer in the Java Web Site, link below, to convert input to uppercase. Try to do this by direct read/write operations on the Socket InputStream/OutputStream, without using BufferedReader or PrintReader etc.

2. Add a few more jokes to the KnockKnockServer.

Links:

- Java Tutorials Web Site-basic trails and custom networking trail.
- Java tutorials on Youtube such as Intro to <u>Java Programming</u> or <u>Java Tutorial for</u> <u>Beginners</u>
- There are many other tutorials etc on the net.

Supplementary Books

- Sun Website companion book, The Java Tutorial (ISBN 0134034082)
- Teach yourself Java in 21 Days by Laura Lemay etc. (ISBN 9780672329432)
- Head First Java by Kathy Sierra etc. (ISBN 0596009208)
- Java Gently by Judith Bishop, 2Ed or 3Ed.