

Syllabus

ECE 1150 Computer Networks

Instructor: Dr. Mai Abdelhakim

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Course Description

This course covers essence and foundation of communication networks. It includes theoretical understanding of technology as well as problem solving skills. Fundamentals related to wireless communications and networks design are covered. The protocol layers are emphasized, including physical layer, data link, network, transport protocols, application layer and network support services (DNS, DHCP). The course will enable you to explain advantages and limitations of networks with different topologies, perform analysis of communications systems and evaluate their performance.

Course Learning Objectives

Understand fundamentals of telecommunications and networks

- Describe and evaluate switching (circuit and packet switching) technologies
- Describe functions and analyze the performance of connections, as well as processes of the physical layer and data link layer of the TCP/IP stack
- Demonstrate how different multiplexing and multiple access systems share network resources.
- Examine functions of IP layer in the protocol stack, including addressing and routing techniques
- Describe application layer functions (e.g. HTTP) and network support services (DNS, DHCP).
Analyze Internet packets using Wireshark.

References

1. Computer Networks, A. S. Tanenbaum and D. J. Wetherall, 5th Ed. ISBN: 9780133485936, (available online through library.pitt.edu)

https://pitt.primo.exlibrisgroup.com/permalink/01PITT_INST/t5l303/alma9998562872906236
(<https://nam05.safelinks.protection.outlook.com/?>

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1. Queuing Theory and Telecommunications: Networks and Applications, Giovanni Giambene, 2014, 2nd ed. (available online through library.pitt.edu)
2. Computer Networking - A Top-Down Approach, Jim Kurose and Keith W. Ross, Addison-Wesley
3. Business data communications and IT infrastructures, 2nd Edition
by Agrawal & Sharma, Prospect Press,
4. Wireless Communications Network & Systems, C. Beard and W. Stallings,

Course Expectations & Requirements

ECE 0302 – Data Structures and Algorithms, ECE 0402 – Signals, Systems, and Probability

- Comfort with basic algebraic manipulations.
- Comfort with basic probability and statistics.
- Knowledge of trigonometric functions.
- Ability to perform computations using logarithms

Grading:

This course will consist of regular homework assignments, quizzes, midterm, and a final examination. The course will be graded as follows

- Assignments (homework, reading, term-report (~10%)) & Participation: 40%
- Quizzes: 15%
- Midterm: 20%
- Final: 25%

Any change to the above grading scheme will be reflected on this page.

- For some hands-on exercises we will use Matlab, and Wireshark packet analyzer (<https://www.wireshark.org/> [_https://www.wireshark.org/_](https://www.wireshark.org/))

- You can use Pitt machines through [Pitt virtual labs](https://www.technology.pitt.edu/services/virtual-lab/) [_https://www.technology.pitt.edu/services/virtual-lab/_](https://www.technology.pitt.edu/services/virtual-lab/), to access software such as Matlab



Virtual Lab

What is Virtual Lab?
Virtual Lab is a great resource for students looking to access and use the same classroom/computer lab software and resources from anywhere, using almost any computer or mobile device, at any time of day.

Why Virtual Lab?

- Access to SSOE software resources without the need to download and install on personal devices
- Secure connection to cloud-based storage (Microsoft OneDrive) to ensure your work can be easily saved and accessed
- Connect to resources without the need to use PittNet VPN

What software is available?

- MATLAB
- SolidWorks
- LabView
- Ansys
- Autodesk
- And much, much more...

University of Pittsburgh

For more information: [technology.pitt.edu/services/virtual-lab](https://www.technology.pitt.edu/services/virtual-lab)

- **Pitt IT help desk** (<https://www.technology.pitt.edu/247-it-help-desk>) is very useful for challenges with technology.

Grading Policies

- Your work must be your own
- Copying work, cheating, or plagiarism will not be tolerated. Result in **failing** (zero grade) the corresponding assignment/exam or the entire course
- No credits for vague answers
- It is your responsibility to make sure that you uploaded the correct files for your submissions of assignments (download solution after submission to check). Once graded, no files can be modified
- Late completion of any of the required coursework is generally not accepted. However, I acknowledge that some may be facing different challenges during this exceptional time in the world. If you need an extension for a legitimate reason, please ask the instructor before the due date of the corresponding assignment. Permission should be requested and granted prior to the due date. Once solutions are out, no submission can be accepted.
- It is crucial to communicate with the instructor as early as possible if you need an extension or any help of any kind. We are here for you!

Course Outline:

Please note that the schedule below is tentative and may change as the class progresses.

Date	Topics	Readings (Tanenbaum)
Week 1 (Aug 30, Sep 1)	Introduction, applications, the Big picture	Ch 1
Week 2 (Sept 6, 8)	Networks basics, Performance measures	Ch. 1
Week 3 (Sep 13, 15)	Performance measures Layering and high-level view of networking, The TCP/IP Protocol	Ch. 1
Week 4 (Sep 20,22)	Telecommunications basics, physical Layer	Ch. 2
Week 5 (Sep 27, 29)	Physical Layer, wired and wireless communications basics	Ch. 2
Week 6 (Oct 4, 6)	Physical Layer, wired and wireless communications basics	Ch. 2
Week 7 (Oct 11, 13)	PhY layer processing, Multiplexing & WAN networks,	Ch 3
Week 8 (Oct 18, 20)	Midterm Data Link Layer	Ch. 3,4
Week 9 (Oct 25, 27)	Data Link Layer	Ch 3,4

Week 10	Error detection, LANs,	Ch. 3,4
(Nov 1, 3)		
Week 11		
(Nov 8, 10)	LANs cont.,	Ch. 3,4
Week 12	Network layer ,	
(Nov 15, 17)	Subnetting, NAT, IPv6, route aggregation	Ch 5
Week 13		
(Nov 22, 24)	Thanksgiving Recess – No classes	
Week 14	Routing and transport layer	
(Nov 29, Dec 1)		Ch.6, 7
Week 15	Application layer	
(Dec 6, 8)	TBD	TBD
Week 16	Monday Dec 12, at 12:00PM	

Useful resources

- [Student Strategies for Success in the Remote Environment](https://teaching.pitt.edu/wp-content/uploads/2020/04/IC-Student-Strategies-for-Success-in-the-Remote-Environment.pdf) [_\(https://teaching.pitt.edu/wp-content/uploads/2020/04/IC-Student-Strategies-for-Success-in-the-Remote-Environment.pdf\)_](https://teaching.pitt.edu/wp-content/uploads/2020/04/IC-Student-Strategies-for-Success-in-the-Remote-Environment.pdf): Please refer to this useful resource from the university center for teaching and learning
- In this exceptional time, we may need additional support. There is a support network of specialists in place available for us, including:

- University Counseling Center: 412-648-7930
- Care And Resource Support (CARS) Team: 412-624-5756
- Resolve Crisis Services: 1-888-796-8226

Academic Integrity.

Students in this course will be expected to comply with the [University of Pittsburgh's Policy on Academic Integrity](https://www.provost.pitt.edu/info/ai1.html) [_ \(https://www.provost.pitt.edu/info/ai1.html\)](https://www.provost.pitt.edu/info/ai1.html). Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity. This may include, but is not limited to, the confiscation of the examination of any individual suspected of violating University Policy. Furthermore, no student may bring any unauthorized materials to an exam, including dictionaries and programmable calculators.

To learn more about Academic Integrity, visit the [Academic Integrity Guide](http://pitt.libguides.com/academicintegrity/) [\(http://pitt.libguides.com/academicintegrity/\)](http://pitt.libguides.com/academicintegrity/) for an overview of the topic. For hands- on practice, complete the [Understanding and Avoiding Plagiarism tutorial](http://pitt.libguides.com/academicintegrity/plagiarism/) [\(http://pitt.libguides.com/academicintegrity/plagiarism/\)](http://pitt.libguides.com/academicintegrity/plagiarism/).

Disability Resources and Services (DRS)

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and Disability Resources and Services (DRS), 140 William Pitt Union, (412) 648-7890, drsrecep@pitt.edu [\(mailto:drsrecep@pitt.edu?subject=Request%20for%20Accommodation\)](mailto:drsrecep@pitt.edu?subject=Request%20for%20Accommodation), (412) 228-5347 for P3 ASL users, as early as possible in the term. DRS will verify your disability and determine reasonable accommodations for this course. <https://www.diversity.pitt.edu/disability-access/disability-resources-and-services> [\(https://www.diversity.pitt.edu/disability-access/disability-resources-and-services\)](https://www.diversity.pitt.edu/disability-access/disability-resources-and-services)

Statement on Students Recording Lectures

"To ensure the free and open discussion of ideas, students may not record classroom lectures, discussion and/or activities without the advance written permission of the instructor, and any such recording properly approved in advance can be used solely for the student's own private use."

Student Opinion of Teaching Surveys

Students in this class will be asked to complete a Student Opinion of Teaching Survey. Surveys will be sent via Pitt email and appear on your Canvas during the last three weeks of class meeting days.

Your responses are anonymous. Please take time to thoughtfully respond, your feedback is important to me. Read more about Student Opinion of Teaching Surveys.

Religious observance

The observance of religious holidays (activities observed by a religious group of which a student is a member) and cultural practices are an important reflection of diversity. As your instructor, I am committed to providing equivalent educational opportunities to students of all belief systems. At the beginning of the semester, you should review the course requirements to identify foreseeable conflicts with assignments, exams, or other required attendance. If possible, please contact me within the first two weeks of the semester to allow time for us to discuss and make fair and reasonable adjustments to the schedule and/or tasks.

Diversity and Inclusion

The University of Pittsburgh does not tolerate any form of discrimination, harassment, or retaliation based on disability, race, color, religion, national origin, ancestry, genetic information, marital status, familial status, sex, age, sexual orientation, veteran status, or gender identity or other factors as stated in the University's Title IX policy. The University is committed to taking prompt action to end a hostile environment that interferes with the University's mission. For more information about policies, procedures, and practices, see: <https://www.diversity.pitt.edu/> [\(https://www.diversity.pitt.edu/\)](https://www.diversity.pitt.edu/).

I ask that everyone in the class strive to help ensure that other members of this class can learn in a supportive and respectful environment. If there are instances of these issues listed above, please contact the Title IX Coordinator by calling 412-648-7860 or emailing titleixcoordinator@pitt.edu [.\(mailto:titleixcoordinator@pitt.edu\)](mailto:titleixcoordinator@pitt.edu). Reports can also be filed online:

<https://www.diversity.pitt.edu/civil-rights-title-ix/make-report/report-form>

[.\(https://www.diversity.pitt.edu/civil-rights-title-ix/make-report/report-form\)](https://www.diversity.pitt.edu/civil-rights-title-ix/make-report/report-form). You may also choose to report this to a faculty/staff member; they are required to communicate this to the University's Office of Diversity and Inclusion. If you wish to maintain complete confidentiality, you may also contact the University Counseling Center (412-648-7930).

Abet criteria

This course is designed to meet ABET accreditation requirements and contribute to student attainment of the following ABET outcomes:

1. an ability to identify, formulate, and solve **complex engineering problems** by applying principles of engineering, science, and mathematics

Complex engineering problems include one or more of the following characteristics: involving wide-ranging or conflicting technical issues, having no obvious solution, addressing problems not encompassed by current standards and codes, involving diverse groups of stakeholders, including many component parts or sub-problems, involving multiple disciplines, or having significant consequences in a range of contexts.

1. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
8. ability to apply probability and statistics in communications and networks protocols and applications