

Syllabus

CSE 4153/6153 and ECE 4833/6833

Data Communication Networks

Term: Fall 2024

Class Time and Location: Monday and Wednesday,
3:30pm - 4:45pm in RULA 2080

Instructor: Maxwell Young (email: my325@msstate.edu)

Instructor Office hours: In person in Butler Hall, Rm. 312,
Wednesday 2pm - 3pm and Friday 11:30am - 12:30pm

TA: Tirian Judy (email: tkj105@msstate.edu)

TA Office Hours: Monday 10 to noon, and Tuesday 9:30am to 1:30pm
Butler 101-E; glass partition on the immediate right when entering 101 from main hallway.

Outside of office hours: Appointments for meeting outside office hours must be made only if you cannot attend my regular office hours. You must provide me with at least a full 24 hours in advance.

Please send all email from an MSU email account

Course Description and Main Goals: This course serves to provide an in-depth understanding of computer networks. We will examine the various layers inherent to computer networking and understand the duties and responsibilities of each layer. Additionally, we will examine networking protocols and understand their design. The Internet will serve as an example of the concepts we cover in class by illustrating the theory and operation of each layer. The general goals of this course are for students to understand:

- computer networks and computer networking models
- the theory underlying how computer networks operate
- the complexities and various issues that networking protocols must address to ensure correct service
- security implications and requirements of network protocols

Student Prerequisites: Students must have strong programming skills with either C++ or Java; your grade will likely suffer if you do not meet this requirement. I will provide more support for C++, since this is the language students have prior to this course (via prerequisites); you may use Java, but there will be far less support.

Students should be able to use the Linux environment to edit, compile and test their programming assignments. Internet socket programming (sometimes just referred to as “socket programming”) is part of what we learn in this course; we will review fundamental material in class, do examples, and references will be provided, but **this is in large part the student’s responsibility to learn by setting aside time to practice.**

Textbooks: The required textbook is *Computer Networking: A Top-Down Approach, 8th Edition*, authored by Kurose and Ross (KR). ISBN-10: 0133594149, ISBN-13: 978-0133594140.

A supplemental (**not required**) textbook is *Computer Networks, 5th Edition*, authored by Tanenbaum and Wetherall (TW). ISBN-10: 0-13-212695-8, ISBN-13: 978-0-13-212695-3.

Grading Scale: Grades will be assigned according to the following percentages:

[90, 100] A	[80, 90) B	[70, 80) C	[60, 70) D
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and less than 60 results in failing the course.

Deadlines are Firm. Every semester a few students will tell me they submitted something a few minutes after the deadline (either the original or late deadlines); this will still be counted as having missed the deadline. It is your responsibility to ensure you have a reliable internet connection.

Attendance: There is no grade for attendance, but I put this here to be explicit, since there are always a handful of students who ask about this. I strongly encourage you to attend lectures.

Exams: These will be **held in class**. There will be one (1) midterm exam and one (1) final exam. The final exam will be comprehensive, but it will emphasize the material after the midterm exam.

In the past, I've dealt with students who have booked a flight home during the final exam period, and then complained to me when they find they will miss the exam. You know when the final-exam period comes to an end, and this is avoidable. Do not request special exam accommodations for this reason, I will not grant it.

Quizzes: There will be a short **online** quiz at the end of most **Wednesday** classes. You must be able to access Canvas via an internet-connected device during class to do the quiz. A quiz that is not completed in class time will receive a score of 0. **I will drop the lowest 3 quiz scores when tallying this portion of the grade for each student.** For any distance students, the quiz will be available until midnight of Friday of that week; this should offer sufficient flexibility to complete it.

Homework Assignments (HWs): There will be four (4) assignments. These will test concepts from the lectures and serve as preparation for the exams. Solutions must be written in a word editor of your choice (such as Word or Latex) and submitted via Canvas in pdf format.

Late HWs will be accepted for up to **2 days** (48 hours starting from the deadline) past the original due date (and, yes, weekends count). 10% total will be deducted from the achieved grade. After a 48-hour period, **the grade will then be a zero.**

Students are to work **individually** on these assignments. High-level discussion is allowed, but students are expected to obey the code-of-conduct for MSU. For further information, see the *Collaboration Policy* at the end of this document.

Programming Assignments (PAs): There will be three (3) programming assignments.

Your code must compile without errors and execute on the student computing environment; this is typically the Pluto server. If you do not have an account, instructions for how to obtain an account will be provided in class and posted online in Canvas.

Late Policy: You have 3 days (72 hours) from the original deadline to submit a solution. Regardless of how many days you are late, you will lose 10% of the achieved grade. Weekends count as days. It is your responsibility to make sure that your solution — submitted late or not — is correct.

Neither the TA nor I will compile your code using another environment/IDE, nor will we fix your errors. It is solely your responsibility to submit code that compiles and satisfies the specifications spelled out in each PA.

You are strongly advised to start these programming assignments early rather than leave them to the last minute (or even the last few days).

Unless specified otherwise, students are to work individually on these assignments. High-level discussion is allowed, but students are expected to obey the code-of-conduct for MSU. Again, for further information, see the *Collaboration Policy* at the end of this document.

Graduate Students: If you are a graduate student, you will be required to complete all programming assignments individually. This is a challenging part of the course, and I encourage you to start working on this assignment as soon as it is released.

Important Dates: The following dates are provided for quizzes, assignments, and exams. This schedule is subject to change if deemed necessary. The last column tells you which items I anticipate will be included in the two progress grade reports (Oct. 2 and Oct. 25) provided during the semester. I think that the last day to withdraw is **Oct. 14** — students should double check this themselves!

Task	Percentage	Date Assigned	Date Due	Included in Progress Grade
Quizzes	10	Most Wednesdays	Most Wednesdays	Throughout
HW1	3	Aug. 21	Sep. 4	1
PA1	5	Aug. 26	Sep. 16	1 (hopefully)
HW2	3	Sep. 11	Sep. 30	2
PA2	10	Sep. 18	Oct. 21	2
Midterm Exam	23	Oct. 7	Oct. 7	2
HW3	3	Oct. 14	Nov. 1	N/A
PA3	5	Oct. 23	Nov. 13	N/A
HW4	3	Nov. 6	Nov. 25	N/A
Final Exam	35	TBA	TBA	N/A

Class Outline: The area of computer networks is vast, so our coverage will be selective with a focus on core principles. In each class, I will lecture for roughly 60 minutes. However, I am hoping for student engagement when it comes to discussing topics, and asking/answering questions. I will also include a 5-minute break in the middle as this seems to help people absorb new material. There will also be quizzes at the end of each class, which take up some time.

Students are responsible for doing the assigned reading. Lectures will complement and supplement this reading; **lectures are not a replacement for the textbook.**

Lecture slides will be made available on the Canvas website ahead of time.

Students are expected to attend class. I will be giving a quiz at the end of many classes which tests the material we covered recently. This is aimed at making sure students are keeping up with at least the basic material.

The following is a *tentative* schedule for the term in terms of material covered. The date given is for the Monday of that week.

The relevant sections of our textbook (KR) are noted for the 8th edition; if you have the 7th edition, that's fine too, the relevant sections are almost identical. The relevant sections from the supplementary text (TW) are also provided, but this is not required; I'm including this just in case some students find it helpful.

On holidays specified by the academic calendar, I will NOT be giving lecture, nor will I be holding office hours. This applies even in the case where I neglect to list a holiday below.

Aug. 19 (*Week 1*) – Cover the syllabus. Introduction to networks. Definition of layers, services, interfaces, protocols, common themes. Sublayers, security and QoS. OSI and TCP/IP models.
Reading: KR 1.1 - 1.5, TW 1 - 1.8

Aug. 26 (*Week 2*) – Continue with introductory materials. Primer on socket programming. Begin application layer.
Reading: KR 1.1 - 1.5, 2.7 TW 1.1 – 1.8

Sep. 2 (*Week 3*) – **No class on Sep 2 due to Labor Day Holiday.** Overview of application layer, design & protocol components. Components of a good protocol (and a good session layer protocol).
Reading: KR 2.2 - 2.4, TW 7.1 – 7.3

Sep. 9 (*Week 4*) – Continue with application layer. Discuss P2P networks (distributed hash tables, Chord).
Reading: Slides and posted materials on Canvas, KR 2.5, TW 7.5

Sep. 16 (*Week 5*) – Sliding window protocols. Begin transport layer.
Reading: KR Chapter 3, TW 3.4, 6.1

Sep. 23 (*Week 6*) – UDP, TCP, and congestion control.
Reading: KR Chapter 3, TW 6.2 – 6.5

Sep. 30 (*Week 7*) – Wrap up transport layer. Start on network layer.
Reading: KR Chapter 3 and 4.1 - 4.3, TW 6.1 – 6.5, 5.1

Oct. 7 (*Week 8*) – **Midterm exam (in class) during the Monday class.** Network Layer: virtual circuits, datagrams, routing algorithms, routing tables, tunneling, subnets, congestion control. Discuss IPv4, ARP, ICMP, RIP, OSPF, IPv6.
Reading: KR 4.1 - 4.3, 5.1 – 5.6, TW 6.1 – 6.5

Oct. 14 (*Week 9*) – Network Layer: virtual circuits, datagrams, routing algorithms, routing tables, tunneling, subnets, congestion control. Discuss IPv4, ARP, ICMP, RIP, OSPF, IPv6.
Reading: KR 4.1 - 4.3, 5.1 – 5.6, TW 6.1 – 6.5

Oct. 21 (*Week 10*) – Network Layer: virtual circuits, datagrams, routing algorithms, routing tables, tunneling, subnets, congestion control. Discuss IPv4, ARP, ICMP, RIP, OSPF, IPv6.
Reading: KR 4.1 - 4.3, 5.1 – 5.6, 5.1 – 5.6, TW 6.1 – 6.5

Oct. 28 (*Week 11*) – Finish network layer. Introduction to data link layer and MAC sublayer: Multiple access protocols; contention; persistence; performance; collision-free protocols. CSMA/CD and CSMA/CA. Ethernet, MAC. Wireless protocols (Internet: IEEE 802.11), discussion of Bluetooth.
Reading: KR 6.1 – 6.3.3 and 6.4-6.4.3, TW 4.1 – 4.4, 4.8

Nov. 4 (*Week 12*) – More on data link layer. Mobile wireless technologies (GSM, LTE), infrastructure components (e.g., fiber optic network, evolved packet core, PLMN), mobile protocols (SS7, RR, MM, CC), registration procedures.
Reading: KR 7.1, 7.2 (not 7.2.1), 7.3 - 7.3.6, TW 3.1 – 3.2, 4.1 – 4.4, 4.8, 8.1 – 8.7

Nov. 11 (*Week 13*) – Mobile wireless technologies (GSM, LTE), infrastructure components (e.g., fiber optic network, evolved packet core, PLMN), mobile protocols (SS7, RR, MM, CC), registration procedures. Summary of protocol stack.
Reading: KR 7.1, 7.2 (not 7.2.1), 7.3 - 7.3.6, TW 3.1 – 3.2, 4.1 – 4.4, 4.8, 8.1 – 8.7

Nov. 18 (*Week 14*) – Network security; common terms, attacks, security protocols. Link Layer Security. Security analysis of protocols.
Reading: KR 8.1 – 8.7.4, TW 8.1 – 8.7

Nov. 25 (*Week 15*) – **No class on November 27 due to Thanksgiving Holiday.** Finish network security content and security analysis of protocols.
Reading: KR 8.1 – 8.7.4, TW 8.1 – 8.7

Dec. 2 (*Week 16*) – Review class (this is final week of classes).

Students are responsible for writing the final exam. Please see:

<http://www.registrar.msstate.edu/students/schedules/exam-schedule/>

I will announce more details about the final exam later on in the semester; note that it will be held in class. Students are responsible for double checking any information I provide about the date/time of the exam.

Course Policies and Information:

The Mississippi State University Syllabus contains all policies and procedures that are applicable to every course on campus and online. The policies in the University Syllabus describe the official policies of the University and will take precedence over those found elsewhere. It is the student's responsibility to read and be familiar with every policy. The University Syllabus may be accessed at any time on the Provost website under Faculty and Student Resources and at:

<https://www.provost.msstate.edu/faculty-student-resources/university-syllabus>

Additionally, I have the following policies; if any of these additional policies are in conflict with the above policies, then the above policies take precedence

Policy on Assignments: It is your responsibility to keep all graded assignments in case you wish to request regrading. If a request is made, the assignment will be regraded in its entirety.

Request for Extensions: Requests for extensions must be made at least 48 hours in advance and done on an individual basis. However, such requests will typically be denied in the absence of an emergency/compelling situation (medical, family, etc.). Please contact me as soon as possible in these cases; I will abide by the MSU policies specified in the link above.

Collaboration Policy: Unless stated otherwise, students must work individually and any copying of solutions or plagiarizing is expressly forbidden. Students are permitted to use other textbooks and online sources, but you must not plagiarize this material, and you must explicitly acknowledge these sources in your submitted materials clearly at the top of the submission. The penalty for violating this policy will range from a 0 on the corresponding assignment to a grade of F for the course. If you have any questions about what constitutes plagiarism, ***please come see me before making a mistake.***

Email Policy: I am reachable by email and I will respond as soon as I can. However, I typically check my email twice per day, once in the morning and once in the evening, so please keep this in mind if the topic of your email is time sensitive.

Cell Phones: Please keep your phones set on silent when class is in session.

AI Policy: In this course, it is expected that all submitted work is produced by students themselves. Use of a Generative AI tool to complete an assignment constitutes academic dishonesty and will be reported as an Honor Code Violation. Submitted work may be filtered through turnitin.com AI Writing Detection. This review may initiate further discussion about the authenticity of the submission which could result in a more formal review through the Honor Code Council.