SDI 3203: Network Fundamentals

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Office: H Wing, Room 1H30
Class Room: TBD
Class Hours: TR 6:30 PM - 7:50 PM
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Course Description

(3 Credits) An introduction to the design and analysis of computer communication networks. Topics include application layer protocols, Internet protocols, network interfaces, local and wide area networks, wireless networks, bridging and routing, and current hot topics. We will use a problem-driven approach to discuss the computer network from bottom to top.

Course Prerequisites/Corequisites

Familiar with Data Structure. Programming proficiency in some high-level language, e.g., Java, Python, or C++, is preferred.

Course Objectives/Learning Outcomes

As a result of successfully completing this course, students will

1. Become familiar with layered communication architectures (OSI and TCP/IP).
2. Understand the client/server model and key application layer protocols.
3. Learn socket programming and how to implement client/server programs.
4. Understand the concepts of reliable data transfer and how TCP implements these concepts.
5. Know the principles of congestion control and trade-offs in fairness and efficiency.
6. Learn the principles of routing and the semantics and syntax of IP.
7. Understand the basics of error detection, including parity, checksums, and CRC.

8. Know the key protocols for multimedia networking, including IntServ and DiffServ for IP.
9. Familiarize the student with current topics such as security, network management, sensor networks, and/or other topics.

Course Materials

Required Textbook:

- Computer Networking: A Top-Down Approach, Kurose & Ross, 8th edition

Recommend Reference Textbook:

1 Computer Networking: Principles, Protocols, and Practice – Olivier Bonaventure

  - Unique Strength: Open-access approach with a strong blend of theoretical foundations and hands-on tutorials, making it exceptionally accessible and practical for students who want a clear conceptual framework plus immediate exercises.

2 Computer Networks (5th Edition) – Andrew S. Tanenbaum & David J. Wetherall

  - Unique Strength: Renowned for its clear, concept-first explanations and educational structure, this classic text excels at helping readers deeply understand the reasoning and design principles behind networking.

3 Data and Computer Communications (10th Edition) – William Stallings

  - Unique Strength: Comprehensive, up-to-date coverage of data communications and network architectures, offering detailed insight into both legacy and emerging technologies for a thorough reference.

4 Cisco CCNA Official Cert Guide (Wendell Odom)

  - Unique Strength: Targeted, exam-oriented material with real-world Cisco device configurations and labs, making it the go-to resource for students pursuing CCNA certification or wanting hands-on networking practice.

5 TCP/IP Illustrated, Volume 1: The Protocols – W. Richard Stevens

  - Unique Strength: In-depth, packet-level analysis of the TCP/IP suite, providing readers with unmatched clarity on how protocols operate in practice through real-world tracing and detailed illustrations.

Course Contents/Topics

- Overview of Computer Networks: What is a network? What is the Internet? A tour of networking introduces architecture, layers, packets, routing, and data transmission. Brief Internet history. Internet high-level architecture.
- Basic Network Programming: Basic operating system utilties: ping, traceroute, dig, lsof, and many others. RFCs. Example applications in Python, JavaScript (Node.js), and Java.

- Physical and Link Layers: Physical media, wired and wireless, Ethernet details (addressing, frame format, twisted pair, hubs, switches).
- Network Layer: Routers, Gateways. IP addresses, subnets, and ARP. IP: format, routing, fragmentation), ICMP.
- Transport Layer: Network service types, ports, and sockets; UDP format and operation. TCP format, window, connection setup, etc. Socket APIs in various high-level languages.
- Application-Level Protocols: Common examples such as DNS, SMTP, POP, FTP, and HTTP, covering formats and specifications of each. Mailing gateways, mailing lists, URIs.
- Wireless and mobile networks.
- Security. Overview of threats, cryptography, authentication, and firewalls. Discussion of project.
- Hot topics such as SDN and IoT.

Grading Overview and Grading Scale

The standard grade scale will be used for converting percentage grades to letter grades as follows:

- A: 90% and above
- B: 80% - 89.99%
- C: 70% - 79.99%
- D: 60% - 69.99%
- F: Below 60%

The instructor reserves the right to lower this grade scale if deemed appropriate.

There will be 6 homework assignments, one term project, a midterm exam and a final exam, and quizzes per class meeting. The quizzes also serve as the attendance check. The final grade based on each component, and the weight assigned to each component are listed as below:

Component	Percentage
Homework Assignments	30%
Term Programming Project	15%
Quizzes (every class meeting)	10%
Midterm exam	20%
Final exam	25%

Expections

I recognize that you are balancing other courses, and many of you may also be working while completing your degree. Therefore, you can expect me:

- To start and end class on time.
- To assign homework that adequately covers the material and meets the learning objectives of the course while adhering to the time expectations for a 3-credit course.

I expect and welcome your questions about the course. Therefore, you can expect me:

- To reply to e-mails within 24 hours on weekdays and 48 hours on weekends.
- To keep regularly scheduled student support hours and to notify you of any changes in my availability.

I believe that you should be provided ample opportunity to demonstrate your growth and learning within the course. You can expect me:

- To provide you with low-risk opportunities to demonstrate, and receive feedback, on your learning through quizzes. By low-risk, I mean that these are not intended to weigh heavily in your final grade. They are designed and intended for me to help you progress in your learning and for you to self-assess and identify areas in which you want to improve.
- To give exams that accurately reflect the material covered in class and assigned in homework so that you are provided opportunity to demonstrate what you have learned. These exams will be appropriately challenging, but my hope is that our low-risk assignments will provide you with support and practice to be successful.

Because your active participation not only benefits your learning but also helps others in the class with their learning as well, I expect you:

- To come to class on time so we can maximize our time together and I can begin and end class on time.
- To be attentive and engaged in class so that you can share your understanding of the material and ask questions when you need clarity. I recognize that not everyone will feel comfortable engaging in the same way. I will value different ways of participating by providing you the opportunity to share your thoughts through written or verbal reflection, as well as through anonymous surveys.
- To spend an adequate amount of time on the homework each week, making an effort to solve and understand each problem, so that we can discuss collectively questions and successes with a shared understanding.
- To engage with both the abstract and computational sides of the material.
- To seek help so that you are provided the resources you need in order to actively engage in class.

Course Policies

Academic Integrity/Academic Dishonesty

- Individual Project, Graded Individual Homework, Exams, and Bonus Credit Poll Questions are individual work; they must be done by you only – no collaboration with anyone is allowed. Graded Group Homework is group work; it must be done by you and your assigned group members only – no collaboration with other groups or anyone else is allowed. The use of generative AI tools is not allowed in all homework assignments, group project components, exams, and bonus credit poll questions unless explicitly stated otherwise in the requirements of a specific homework assignment or a specific project component. These tools include ChatGPT, Bard, Bing Chat, and other AI writing and coding assistants. Violations of these rules will be considered academic misconduct and will result in action as specified in the Academic Integrity Code at OU: http://www.ou.edu/integrity. Consult also the following web page for a Student's Guide to Academic Integrity at OU: http://www.ou.edu/integrity/students.
- The ACM code of ethics is **http://www.acm.org/about/code-of-ethics** and the ACM definition of plagiarism is **http://www.acm.org/publications/policies/plagiarism_policy**. Read these documents. Be sure that you fully understand the contents of these documents. Do not hesitate to ask questions on anything you do not understand.

Attendance Policy

- **First of all, you need to follow all attendance policies at the university, college, and department levels.**
- You are expected to be in class, on time, and distraction-free. As this class meets twice a week and as it is lecture and lab any student who misses more than two classes is in danger of failing the course. Please see the instructor immediately if you have missed at least two class meetings.
- This is a lecture-based class. Certain class sections will be lecture, lab, or a combination of lecture and lab. Attendance is vital to success in class, and punctuality is vital to success in your professional career. The instructor will be taking attendance for every class meeting. If you anticipate missing a class due to an event, please email the instructor prior to the start of class. If you are sick, we want you to get better and not infect your fellow classmates; please email the instructor.

Late Submission and Make-up Policy

- You are expected to submit assignments on the due dates. Late submissions will lose 5% of the total grade of each assignment for each day they are late. Submissions after 3 days will not be accepted, unless arrangements are made with the instructor in advance or with proof of medical or other emergency.
- If you must submit work late, you need to talk to me at least one week before the due date in question. Otherwise, late work lasting more than 2 days cannot be accepted except in cases of verifiable emergencies.

- Make-up exams or assignments will only be allowed for students who have a substantiated excuse approved by the instructor **before the due date**. Leaving a phone message or sending an e-mail without confirmation is not acceptable.
- Please do not record lectures in any way. Thanks!
- Out of courtesy to other students and to me, please make sure that you turn off or place your cell phone in silent mode.

University Policies

Mental Health Support Services:

Support is available for any student experiencing mental health issues that are impacting their academic success. Students can either been seen at the University Counseling Center (UCC) located on the second floor of Goddard Health Center or receive 24/7/365 crisis support from a licensed mental health provider through TELUS Health. To schedule an appointment or receive more information about mental health resources at OU please call the UCC at 405-325-2911 or visit University Counseling Center. The UCC is located at 620 Elm Ave., Room 201, Norman, OK 73019.

Title IX Resources and Reporting Requirement

The University of Oklahoma faculty are committed to creating a safe learning environment for all members of our community, free from gender and sex-based discrimination, including sexual harassment, domestic and dating violence, sexual assault, and stalking, in accordance with Title IX. There are resources available to those impacted, including: speaking with someone confidentially about your options, medical attention, counseling, reporting, academic support, and safety plans. If you have (or someone you know has) experienced any form of sex or gender-based discrimination or violence and wish to speak with someone confidentially, please contact OU Advocates (available 24/7 at 405-615-0013) or University Counseling Center (M-F 8 a.m. to 5 p.m. at 405-325-2911)

Because the University of Oklahoma is committed to the safety of you and other students, and because of our Title IX obligations, I, as well as other faculty, Graduate Assistants, and Teaching Assistants, are mandatory reporters. This means that we are obligated to report gender-based violence that has been disclosed to us to the Institutional Equity Office. This means that we are obligated to report gender-based violence that has been disclosed to us to the Institutional Equity Office. This includes disclosures that occur in: class discussion, writing assignments, discussion boards, emails and during Student/Office Hours. You may also choose to report directly to the Institutional Equity Office. After a report is filed, the Title IX Coordinator will reach out to provide resources, support, and information and the reported information will remain private. For more information regarding the University's Title IX Grievance procedures, reporting, or support measures, please visit Institutional Equity Office at 405-325-3546.

Reasonable Accommodation Policy

The University of Oklahoma (OU) is committed to the goal of achieving equal educational opportunity and full educational participation for students with disabilities. If you have already established reasonable accommodations with the Accessibility and Disability Resource Center (ADRC), please submit your semester accommodation request through the ADRC as soon as possible and contact me privately, so that we have adequate time to arrange your approved academic accommodations.

If you have not yet established services through ADRC, but have a documented disability and require accommodations, please complete ADRC's pre-registration form to begin the registration process. ADRC facilitates the interactive process that establishes reasonable accommodations for students at OU. For more information on ADRC registration procedures, please review their Register with the ADRC web page. You may also contact them at (405)325-3852 or adrc@ou.edu, or visit www.ou.edu/adrc for more information.

Note: disabilities may include, but are not limited to, mental health, chronic health, physical, vision, hearing, learning and attention disabilities, pregnancy-related. ADRC can also support students experiencing temporary medical conditions.

Religious Observance

It is the policy of the University to excuse the absences of students that result from religious observances and to reschedule examinations and additional required classwork that may fall on religious holidays, without penalty. [See Faculty Handbook 3.15.2]

Adjustments for Pregnancy/Childbirth Related Issues

Should you need modifications or adjustments to your course requirements because of documented pregnancy-related or childbirth-related issues, please contact the Accessibility and Disability Resource Center at 405/325-3852 and/or the Institutional Equity Office at 405/325-3546 as soon as possible. Also, see the Institutional Equity Office FAQ on Pregnant and Parenting Students' Rights for answers to commonly asked questions.

Final Exam Preparation Period

Pre-finals week will be defined as the seven calendar days before the first day of finals. Faculty may cover new course material throughout this week. For specific provisions of the policy please refer to OU's Final Exam Preparation Period policy.

Emergency Protocol

During an emergency, there are official university procedures that will maximize your safety.

Severe Weather: If you receive an OU Alert to seek refuge or hear a tornado siren that signals severe weather.

1. Look for severe weather refuge location maps located inside most OU buildings near the entrances.
2. Seek refuge inside a building. Do not leave one building to seek shelter in another building that you deem safer. If outside, get into the nearest building.
3. Go to the building's severe weather refuge location. If you do not know where that is, go to the lowest level possible and seek refuge in an innermost room. Avoid outside doors and windows.
4. Get in, Get Down, Cover Up
5. Wait for official notice to resume normal activities.

Additional Weather Safety Information is available through the Department of Campus Safety.

The University of Oklahoma Active Threat Guidance

The University of Oklahoma embraces a Run, Hide, Fight strategy for active threats on campus. This strategy is well known, widely accepted, and proven to save lives. To receive emergency campus alerts, be sure to update your contact information and preferences in the account settings section at one.ou.edu.

RUN: Running away from the threat is usually the best option. If it is safe to run, run as far away from the threat as possible. Call 911 when you are in a safe location and let them know from which OU campus you're calling from and location of active threat.

HIDE: If running is not practical, the next best option is to hide. Lock and barricade all doors; turn of all lights; turn down your phone's volume; search for improvised weapons; hide behind solid objects and walls; and hide yourself completely and stay quiet. Remain in place until law enforcement arrives. Be patient and remain hidden.

FIGHT: If you are unable to run or hide, the last best option is to fight. Have one or more improvised weapons with you and be prepared to attack. Attack them when they are least expecting it and hit them where it hurts most: the face (specifically eyes, nose, and ears), the throat, the diaphragm (solar plexus), and the groin.

Please save OUPD's contact information in your phone.

NORMAN campus: For non-emergencies call (405) 325-1717. For emergencies call (405) 325-1911 or dial 911.

TULSA campus: For non-emergencies call (918) 660-3900. For emergencies call (918) 660-3333 or dial 911.

Fire Alarm/General Emergency:

If you receive an OU Alert that there is danger inside or near the building, or the fire alarm inside the building activates:

1. LEAVE the building. Do not use the elevators.
2. KNOW at least two building exits
3. ASSIST those that may need help
4. PROCEED to the emergency assembly area
5. ONCE safely outside, NOTIFY first responders of anyone that may still be inside building due to mobility issues.
6. WAIT for official notice before attempting to re-enter the building.

OU Fire Safety on Campus

Tentative Schedule, Subject to Change

Semester Week	Topics	Assignments
Week 1 (Jan 13 - Jan 19)	Introduction and Overview	quiz
Week 2 (Jan 20 - Jan 26)	Physical Layer and Link Layer	quiz
Week 3 (Jan 27 - Feb 2)	Link Layer (continued)	quiz & Assignment 1
week 4 (Feb 3 - Feb 9)	Network Layer and Routing: Part 1	quiz
week 5 (Feb 10 - Feb 16)	Network Layer and Routing: Part 2	quiz & Assignment 2
week 6 (Feb 17 - Feb 23)	Transport Layer: Part 1	quiz
Week 7 (Feb 24 - Mar 2)	Midterm & Sockets programming	quiz & Term Project
week 8 (Mar 3 - Mar 9)	Transport Layer: Part 2	quiz & Assignment 3
Week 9 (Mar 10 - Mar 16)	Application Layer	quiz
Week 10 (Mar 17 - Mar 23)	Spring break, no class	
Week 11 (Mar 24 - Mar 30)	Application Layer (Continue)	quiz & Assignment 4
Week 12 (Mar 31 - Apr 6)	Wireless and mobile networks	quiz
Week 13 (Apr 7 - Apr 13)	Network Management and Security in Networks	quiz & Assignment 5
Week 14 (Apr 14 - Apr 20)	Hot topics – IoT, NFV and SDN	quiz
Week 15 (Apr 21 - Apr 27)	Course wrap-up and Review for final exam	Assignment 6
Week 16 (Apr 28 - May 4)	Final Exam Preparation Period(Final Exam Q&A)	
Week 17 (May 1 - May 7)	Final Exam	