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Description automatically generated**CE 352: Computer Networks**

**Course Syllabus**

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##### **Welcome!**

##### Welcome by Welcome - Welcometo Computer Networks! This course will teach you about computer networks and the Internet protocol stack, including the application, transport, network, data link, and physical layers. The course is grounded in planning, working together, assessment, and learning by doing. Classes will be experience-based, and we will learn from each other through readings from the textbook, assignments, practices, and discussions.

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##### **How will we keep in touch?**

> [Salem Al Agtash, Ph.D.](https://www.scu.edu/engineering/faculty/al-agtash-salem/)

> Email: alagtash@gju.edu.jo

A group of dice with letters on them

Description automatically generated > Office Hours: Sunday, Tuesday: 10:00 – 11:30 AM  
 Monday, Wednesday: 10:00 – 11:00 AM

> Office: Building M # 202

> Course Material and Website: <https://canvas.instructure.com/courses/10364217> (you will receive

an invitation via email, accept and register using your school email)

> Class meetings - ST: 8:30 – 11:00 am (Section 3)  
 ST: 11:30 am – 1:00 pm (Section 1)  
 MW: 8:30 – 11:00 am (Section 2)

##### I am available to meet with you during my office hours. Please feel free to email me directly or via Canvas. I will make every attempt to reply to emails within (48) hours. If you don’t hear from me within this timeframe, please email me again! I’m human, and sometimes I miss messages.

##### I will actively participate in your course and communicate with you via the canvas class announcements. If you haven’t already done so, set up message forwarding to an email address you check regularly in your Canvas Account>Settings. [See How to Manage My Canvas Notification Settings.](https://community.canvaslms.com/t5/Student-Guide/How-do-I-manage-my-Canvas-notification-settings-as-a-student/ta-p/434)

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##### **Course Description and Learning Outcomes**

##### A close-up of a drink Description automatically generatedThis course is an introduction to computer networks. Topics include - Data Communication: circuit and packet switching, latency and bandwidth, and throughput/delay analysis. Application Layer: client/server model, socket programming, Web, e-mail, FTP. Transport Layer: TCP and UDP, flow control, congestion control, sliding window techniques. Network Layer: IP and routing. Data Link Layer: shared channels, media access control protocols, error detection, and correction. Mobile computing and wireless networks. Network security. It will prepare you to:

##### 1> Describe the Internet and the building blocks of computer networks and their respective OSI and TCP/IP models, LAN, WAN, Broadband, and Wireless.

##### 2> Describe services in the application layer, including network tools, DNS, email, and the web, as well as client-server and peer-to-peer applications.

##### 3> Write system calls and socket programming tools in Unix/Linux and C to build transport layer TCP/IP and UDP/IP reliable data transfer services with flow and congestion control.

##### 4> Explain the network layer in the context of both per-router and SDN settings and select and use appropriate techniques for IP addressing, subnetting, SNMP, ICMP, DHCP, NAT, and interior and exterior routing in the network layer, including LS, DV, RIP, OSPF and BGP protocols.

##### 5> Describe techniques for error control, flow control, ARP and MAC addressing, Ethernet and VLAN, and multiple access control protocols: channel partitioning (TDMA, FDMA, CDMA), random access (Aloha, CSMA, CSMA/CD, CSMA/CA), and taking turns (polling, token passing).

##### 6> Explain wireless networks (SNR, BER, 802.11 LAN architecture, channels, and multiple access protocol), cellular networks (2G, 3G, 4G, LTE), mobile IP, and GSM

##### 7> Explore computer network security, including cryptography (DES/AES, RSA, MD5/SHA2), end-point authentication (public key infrastructure, digital signatures), and securing the Internet (Application layer security, Transport layer security (TCP/SSL), Network layer security (IPsec and VPN, and wireless A close up of a flower Description automatically generatednetwork security.

##### 8> Describe sustainability and how the Internet impacts social, economic, and environmental systems.

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**What will you need for this class?**

##### > Required Textbook: J. Kurose and K. Ross, *Computer Networking – A Top-Down Approach Featuring the Internet*, Pearson Addison-Wesley, 8th Edition, 2021.

##### **A book coming out of a computer with Milwaukee Art Museum in the background Description automatically generated**> The textbook website: <http://gaia.cs.umass.edu/kurose_ross/index.html>, includes a wide range of resources such as online lectures, review questions, ppt presentations, and interactive end-of-chapter problems

##### > Technology: Desktop or Laptop running Mac or Linux. Using Windows is not encouraged for this class, but you can still online Linux. Explore: <https://github.com/education/students>

##### > We will be using Canvas for this course. It is mobile-friendly and can be used on your phone or tablet through the Canvas [Mobile App](https://community.canvaslms.com/docs/DOC-4048) or a mobile browser!

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##### **What topics will you learn throughout the Semester?**

|  |  |  |
| --- | --- | --- |
| **Week** | **Topics** | **Textbook** |
| **1** | **Computer networks and the Internet** | **Chapter 1** |
|  | 1. The Internet, network edge, packet and circuit switching 2. Delay, loss, throughput | |
| **2** | **The application layer: P2P and Client-Server and the Web** | **Chapter 2** |
|  | 1. Protocol Layers, service models, and security 2. Principles of network applications, the Web   Assignment 1 via Canvas | |
| **3** | **The transport layer: service and protocols**  **The application layer: Web and DNS** | **Chapter 3**  **Chapter 2** |
|  | 1. Socket Programming – TCP/IP and UDP/IP 2. Web caches, cookies, and the DNS   Assignment 2 via Canvas | |
| **4** | **The application layer: eMail, P2P, CDN**  **The transport layer: service and protocols** | **Chapter 2**  **Chapter 3** |
|  | Group Quiz 1 via Canvas   1. eMail, Peer-to-Peer applications, and CDN 2. Transport layer services, multiplexing/ demultiplexing, Reliable data transfer | |
| **5** | **The transport layer: service and protocols** | **Chapter 3** |
|  | 1. Reliable data transfer, noisy channel 2. Connection management and congestion control – TCP   Assignment 3 via Canvas | |
| **6** | **The transport layer: TCP**  **The network layer: Data plane** | **Chapter 3**  **Chapter 4** |
|  | Group Quiz 2 via Canvas   1. TCP Congestion Control 2. Network layer – data plane   Assignment 4 via Canvas | |
| **7** | **The network layer: Control plane** | **Chapter 5** |
|  | Group Quiz 3 via Canvas   1. IP addresses, NAT, DHCP, and OpenFlow 2. IP network protocols   Assignment 5 via Canvas | |
| **8** | **The network layer: LS routing protocols** | **Chapter 5** |
|  | Midterm Exam   1. Routing protocols: LS | |
| **9** | **The network layer: DV, Intra, and Extra routing protocols** | **Chapter 5** |
|  | 1. Routing protocols: DV 2. Intra and Extra AS routing: OSPF and BGP   Assignment 6 via Canvas | |
| **10** | **The network layer: SNP, ICMP, and SDN**  **The datalink layer: MAC, ARP, and Ethernet** | **Chapter 5**  **Chapter 6** |
|  | Group Quiz 4 via Canvas   1. SNMP, ICMP, and SDN 2. Link layer addressing (MAC), ARP, and the Ethernet   Assignment 7 via Canvas | |
| **11** | **The datalink layer: VLAN, MPLS, Error detection** | **Chapter 6** |
|  | 1. VLAN, MPLS and Data Center 2. Link layer: Error detection and error correction techniques   Assignment 8 via Canvas | |
| **12** | **The data link layer: Multiple access link and Ethernet**  **Wireless and Mobile Networks** | **Chapter 6**  **Chapter 7** |
|  | 1. Multiple access link protocols 2. Wireless links, 802.11, Wireless LAN | |
| **13** | **Wireless and Mobile Networks**  **Network Security** | **Chapter 7**  **Chapter 8** |
|  | Group Quiz 5 via Canvas   1. Cellular Networks 2. Network Security – Cryptography   Assignment 9 via Canvas | |
| **14** | **Network Security** | **Chapter 8** |
|  | 1. Network Security – Hash, Authentication, and SSL 2. Network Security – Ipsec, WEP, Firewall, and IDS   Assignment 10 via Canvas | |
| **15** | **Review** |  |
|  | Group Quiz 6 via Canvas  Guest Lecture - Building a Long Haul Backbone  Review | |
| **16** | **Finals Week** |  |
|  | Final Exam | |

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##### **What assignments will you do in this class?**

Homework assignments will be posted on Canvas. Readings from the textbook will be assigned before the class begins. For each lecture, you will need to contribute to the discussion posts, questions, and reflections through Canvas. Work on the assignments independently (honor code) unless otherwise instructed. **Quizzes and Exams will be held in the classroom. Taking a quiz or exam outside the classroom is not allowed.** If, in certain situations, you will miss a quiz and/or an exam, please notify me in advance. Make-up quizzes and exams may not be given otherwise. Please do not hesitate to contact me for any grading correction requests.

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##### **Making the Grade**

> [5% of your grade] Class Attendance/ Participation

> [5% of your grade] Canvas Discussions Posts based on readings and lecture contents.

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Description automatically generated> [15% of your grade] Homework Assignments (Weeks 2, 3, 5, 6, 7, 9, 10, 11, 13, 14) via Canvas.

> [10% of your grade] Group Quizzes (Weeks 4, 6, 7, 10, 13, and 15) via Canvas.

> [30% of your grade] Midterm Exam (Weeks 8) based on specific learning topics will be posted.

> [40% of your grade] Midterm Exam (Weeks 16) cumulative and learning topics will be posted.

**🡪 [105%] Total Grade (5 points extra)**

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##### A close up of a flower Description automatically generated**Our Commitments to Each Other**

**A group of people holding hands together

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> Clarity of Instructions to ensure transparency and commitment to meet course outcomes.

> Active Participation: Strive to contribute regularly to collaborative class activities.

> Meet the Deadline: Assignments, quizzes, and exams have due dates to complete them.

> Flexibility and Expectation: Ask if you have concerns about assignments, deadlines, or anything else.

> Continuous Improvements: We make mistakes, so feedback helps to improve quality and relevance.

> Supportive and Safe Environment for all to learn, share, and discuss ideas with each other to grow.

> Disagreements are part of learning and growing. Always be open to new ideas and provide support.

##### EHS attendance policy changes with start of new school year – Edina Zephyrus**Course Policies and Statements**

**Class Attendance**

##### Experience demonstrates that regular attendance enhances academic success. We will work together during class to learn basic concepts and practice commands, tools, and utilities. Attendance means interacting through discussions and working on group assignments.

**Late Policy**

Fairness deduction will be applied to all assignments submitted after the due date. Canvas will automatically deduct 20% of your grade if submitted past the deadline.

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Description automatically generated**Honor Code**

By taking this course, you agree, individually and collectively, that you will neither give nor receive unpermitted aid in examinations or other coursework to be used as a basis for grading. You are also expected to behave ethically and professionally by respecting classmates and the classroom environment.

A collage of a person's face

Description automatically generated**Generative AI**

Generative AI is a great tool that you can use to generate content, such as text, code, images, and even music. In this course, we will extensively use ChatGPT and/or Google Bard as common generative AI tools, mainly to help you clarify concepts, draft blogs, write code, and solve problems. So, the tools will be your tutor to help you understand the course topics, but you will not be allowed to use them in the assessments, exams, and quizzes.

**Academic Integrity**  
Academic integrity is part of your intellectual, ethical, and professional development. I expect you to uphold the principles of this pledge for all work in this class. I will clarify expectations on academic integrity -- including the use of AI tools such as ChatGPT and course-sharing sites for all assignments and exams in this course. If you have questions about what is appropriate on any assignment, please let me know before you hand in work.

**Collaborative Work**

Feel free to discuss the topics covered in this class with other students (in fact, try to organize one or more study groups to do just that), including homework problems and assignments. But all work you submit for grading must be solely your own unless the assignment is formally defined as a group assignment. By submitting work for grading, you affirm that all the work is your own and that you have neither received help from nor given service to any other person.

**Copyright Statement**

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Description automatically generated Materials in this course are protected by the copyright laws. I am the copyright holder of the materials I create, including syllabi, lecture notes, handouts, slides, videos, assignments, and exams. You may make copies of the course material for your use and share them with other students enrolled in this course. You may not publicly distribute the course materials without my written permission.

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##### **Tips for Success**

🡪 Attend all the classes -research finds that attendance is the best predictor of student success!

🡪 Get the textbook and keep up with the readings assigned for each lecture: Keep in mind that you may not understand the material the first time you read it, but you are laying a neural network in your brain for stronger connections to occur in class

🡪 Get a laptop or desktop with Mac OS or Linux or Windows with Linux virtual machine

🡪 Keep up with the coding assignments

🡪 Submit the class assignments and contribute to the discussion posts by the deadlines

🡪 Pay close attention to the assignment due dates and mark them on your calendar

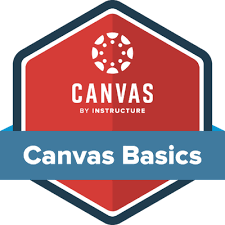
🡪 Keep track of your grade in the class and ask for help when you need it!

🡪 Be resourceful, be patient, and have a sense of humor with technology ☺

🡪 Most importantly, please be assured that I want students to learn and receive the good grades they deserve. So, if you have undue difficulty with your work at any time during the course, talk to me.

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##### **Camino Basics**

> Syllabus: Check to access a web-based version of the syllabus and a timetable of due dates.

> Modules: Check weekly course details, reading lists, lecture notes, discussions, assignments, and quizzes.

> Assignments: Check to access assignment groups: Discussions, Lab, Homework, Quizzes, and Exams

> Quizzes: Check to access homework assignments, quizzes, and exams.

> Discussions: Contribute to reading questions, reflections, and posts.

> Grades: Check your grades to keep track of your performance in the class.

> Announcements: Check periodically for important information. You may update your account to receive email/text notifications anytime a new announcement is posted.

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