

**Instructor:** Prof. Anura Jayasumana, Electrical and Computer Engineering  
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Office Hours: Open (see Canvas for availability)

**Objectives:** Introduce communication networking principles, architectures and technologies that make the current complex global information infrastructure possible. This infrastructure consists of diverse devices, systems and users interconnected via multiple networking technologies. Internet is a dynamically evolving system held together by a set of protocols, in contrast to many other complex systems (e.g., microprocessors, automobiles and skyscrapers) that are designed by a close-knit group of designers. Where information resides has become less important compared to ubiquitous and quick availability of information. The quality of service experienced by a user or an application depends on the underlying network hardware (e.g., links, routers), protocols (e.g., TCP/IP) and characteristics (e.g., network traffic, access times and interference), while the quality of service expected by a user depends on the application and the device. Internet of Things (IoT) and of Everything together with emerging 5G technologies will dramatically change our interaction with the physical and virtual landscapes. This course will provide the fundamental expertise in networking necessary for understanding and developing modern networked systems and applications.

**Outcomes:** Students will gain knowledge of different communication technologies used in the global information infrastructure. They will know how the Internet works and how it is able to evolve and grow in size, speed and complexity. They will be able to develop network protocols and distributed Internet based applications using basic network programming concepts.

**Prerequisites:** ECE251, ECE303, and programming skills (ex. CS160 or CS155, CS156, CS157)

**Topics:**

1. Circuit Switching, Packet Switching, and Layered Architectures (TCP/IP, ISO-OSI)
2. Physical Layer – Link Technologies, Encoding
3. Logical Link Control (LLC) –Framing, Error Detection & Correction, Flow Control
4. Medium Access Control (MAC) - Fixed, Random and Demand Assignment; Sonet/SDH, Wired & Wireless Networks; IEEE 802.X Standards
5. Cellular Communication Networks
6. Internet Protocol (IP) – Addressing, Service Model, Routing
7. Transport Protocols – TCP/UDP
8. Network Programming - Socket Systems Calls, Client-Server
9. Internet of Things
10. Future Trends in Networking

**Texts and Reading Material:**

The recommended text for the course is “*Data Communication and Networking*,” B. A. Forouzan (McGraw Hill). Fifth edition is preferred but fourth edition is also acceptable. Two other excellent texts are *Computer Networking*, Kurose & Ross (7<sup>th</sup> to 5<sup>th</sup> ed.), and *Computer Networks*, Peterson & Davie, (Morgan Kaufman, 5<sup>th</sup> or 4<sup>th</sup> ed.). Links to a few free books are available off the course webpage. Additional reading material will be made available as necessary via e-reserve at the library.

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| <b>Grading:</b> | Homework & Quizzes | 15% |
|                 | Minute Papers      | 10% |
|                 | Presentation       | 15% |
|                 | Exam 1             | 15% |
|                 | Exam 2             | 15% |
|                 | Lab Assignments    | 30% |

+/- Grading will be used.

Homework & Quizzes: You are expected to turn in solutions to all the homework problems. However, only a subset of problems in each assignment will be graded; the subset may vary by assignment and by student. The on-line quizzes will require familiarity with recent lectures.

Minute paper: A minute paper is a short write-up about each lecture: What are the most significant things you learned in the lecture? Why is it significant? What question is uppermost in your mind at the end of the lecture? Be creative!! A typical minute paper would be ~150 to 250 words. As each minute paper is based on a lecture, you must not submit one for a lecture that you did not attend. The minute paper must be submitted prior to the next lecture. Follow the link from the course web page to submit minute papers. Up to 20% of the minute papers may be skipped without a penalty.

Presentation: A presentation is expected covering a pre-approved topic or a project. Grade for the presentation will be based on the technical content, quality of slides, quality of presentation, and the understanding of the topic as conveyed by the presentation.

Exams: You will be allowed to bring a single 2-sided page of notes to the exams.

Labs: The lab assignments are an important part of this course. You must pass each lab assignment with a score of 60% or better to pass the course. Discussions with colleagues are encouraged on different approaches to solving the assignments and to overcome difficulties. However, the program must be your own work, and no collaborative efforts are acceptable in developing the program, except in case of group assignments, for which any collaboration must be limited to the group. *Under no circumstances should you copy a program or a segment of a program from another source. Providing code for use by someone else or using someone else's code in any form is academic fraud. It is your responsibility to ensure that the code you write for the assignments is not accessible to others.* The lab will run on an open-hour basis. E-mail a well commented source code for the program and demonstrate the lab by the due date. The TA will help you conceptually with the labs, but is not responsible for debugging your program.

**Inclusivity:** ECE456 classroom is a place where you will be treated with respect. We welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability – and other visible and nonvisible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class.

**Academic Integrity:** This course will adhere to the CSU Academic Integrity Policy in the General Catalog (<http://catalog.colostate.edu/general-catalog/policies/students-responsibilities/#academic-integrity>) and the Student Conduct Code (<https://resolutioncenter.colostate.edu/conduct-code/>). At a minimum, violations will result in a grading penalty in this course and a report to the Office of Conflict Resolution and Student Conduct Services.

**No web browsing, checking email, texting, etc., during the lecture please!!**