

**CSC 315A Computer Networks and Data Communications**

**4 cr.**

**Instructor:** TBA  
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**Office:** location  
**Office Hours:** days and times

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Section	Time	Room	Final Exam
nn	days and times	location	Date and time

**Catalog description:**

This course provides an introduction to the basic principles of data communications and computer networks. Modulation techniques, multiplexing, transmission media, error control techniques, message formatting, switching and packet-switching techniques, various communication protocols, and networking and internetworking techniques are discussed. Four lecture hours per week, plus programming work outside of class.

**Prerequisite:** CSC 260.

**Goals:**

The purposes of this course are to:

- CG01: provide an introduction to the basic requirements of and the techniques used in data communications networks;
- CG02: develop students' understanding of the basic principles of the technology and architecture of data and computer communications.

**Objectives:**

Upon successful completion of this course the student will have:

- CO01: mastered terminology and basic concepts of general characteristics of LAN and WAN systems;
- CO02: established a unified and fundamental view of the broad field of data communications networks;
- CO03: gained hands-on experience in developing software for a client-server environment;
- CO04: chosen a topic in an area of data communications that represents current and/or future trends, read and synopsized three journal/magazine articles relating to the topic, and given a formal presentation of a completed term paper.

**Program Outcome vs. Course Objectives matrix**

Program Objective (condensed form)	CO01	CO02	CO03	CO04
<b>PO-A:</b> apply knowledge of computing and math	✓	✓	✓	✓
<b>PO-B:</b> analyze a problem and define its computing requirements	✓	✓	✓	✓
<b>PO-C:</b> design, implement and evaluate applications			✓	
<b>PO-D:</b> function effectively in teams to accomplish a common goal				
<b>PO-E:</b> professional, ethical, and social responsibilities				
<b>PO-F:</b> communicate effectively with a range of audiences				✓
<b>PO-G:</b> local and global impact of computing on people and society		✓		
<b>PO-H:</b> need for continuing professional development			✓	✓
<b>PO-I:</b> use current techniques, skills, and tools		✓	✓	

Program Objective (condensed form)	CO01	CO02	CO03	CO04
<b>PO-J:</b> apply theory and principles to model and design systems				
<b>PO-K:</b> apply design and development principles in constructing software				
note - full statements of the Program Outcomes (program objectives) for the Computer Science Major can be found in the document <i>Computer Science Major Program Educational Objectives and Program Outcomes</i> on the Assessment page of the Computer Science Major (cs.salemstate.edu)				

**Topics:**

- Data transmission
  - transmission media NC1(1), NC2(2)
  - history of data communications
  - frequency
  - spectrum
  - bandwidth
  - signal strength
  - analog and digital data transmission
  - transmission impairments
  - signal-to-noise ratio
  - twisted pair
  - coaxial cable
  - optical fiber
  - satellites
  - microwave
  - infrared
  - low earth orbit satellites
  - low earth orbit satellite arrays
- Local asynchronous communications (RS232) NC2(1)
  - The Need For Asynchronous Communication
  - Standards For Communication
  - Baud Rate, Framing, And Errors
  - Full Duplex Asynchronous Communication
  - Limitations Of Real Hardware
  - Hardware Bandwidth And The Transmission Of Bits
  - The Effect Of Noise On Communication
- Long-Distance Communication (Carrier, Modulation, And Modems) NC2(2.5)
  - Sending Signals Across Long Distances
  - Modem Hardware Used For Modulation And Demodulation
  - Leased Analog Data Circuits
  - Optical, Radio Frequency, And Dialup Modems
  - Carrier Frequencies And Multiplexing
  - Baseband And Broadband Technologies
  - Wave Division Multiplexing
  - Spread Spectrum
  - Time Division Multiplexing
- Packet Transmission NC2(1)
- Packets, Frames, And Error Detection NC2(6.5)
  - The Concept Of Packets
  - Packets And Time-Division Multiplexing
  - Packets And Hardware Frames
  - Byte Stuffing
  - Transmission Errors
  - Parity Bits And Parity Checking
  - Probability, Mathematics, And Error Detection
  - Detecting Errors With Checksums
  - Detecting Errors With Cyclic Redundancy Checks

- Combining Building Blocks
- Burst Errors
- Frame Format And Error Detection Mechanisms
- LAN Technologies And Network Topology **NC2(6)**
  - Direct Point-to-Point Communication
  - Shared Communication Channels
  - Significance Of LANs And Locality Of Reference
  - LAN Topologies
  - Example Bus Network: Ethernet
  - Carrier Sense On Multi-Access Networks (CSMA)
  - Collision Detection And Backoff With CSMA/CD
- Hardware Addressing And Frame Type Identification **NC2(2)**
  - Specifying A Recipient
  - How LAN Hardware Uses Addresses To Filter Packets
  - Format Of A Physical Address
  - Broadcasting
  - Multicasting
  - Multicast Addressing
  - Identifying Packet Contents
  - Frame Headers And Frame Format
- LAN Wiring, Physical Topology, And Interface Hardware
  - Speeds Of LANs And Computers
  - Network Interface Hardware
  - The Connection Between A NIC And A Network
  - Original Thick Ethernet Wiring
  - Connection Multiplexing
- Extending LANs: Fiber Modems, Repeaters, Bridges, and Switches **NC2(1)**
- Long-Distance Digital Connection Technologies: repeater/bridge/router/gateway **NC2(0.5)**
- WAN Technologies And Routing **NC2(0.5)**
- Connection-Oriented Networking And ATM
- Network Characteristics: Ownership, Service Paradigm, And Performance **NC6(1)**
- Protocols And Layering **NC2(1)**
- Internetworking **NC1(1), NC2(6)**
  - Internetworking: Concepts, Architecture, and Protocols
  - IP: Internet Protocol Addresses
  - Binding Protocol Addresses (ARP)
  - IP Encapsulation, Fragmentation, And Reassembly
  - The Future IP (IPv6)
  - An Error Reporting Mechanism (ICMP)
  - TCP: Reliable Transport Service
  - Internet Routing
- Network Applications **NC3(2), NC4(5)**
  - Client-Server Interaction
  - The Socket Interface
  - Example Of A Client And A Server
  - Naming With The Domain Name System
  - Electronic Mail Representation And Transfer
  - File Transfer And Remote File Access
  - World Wide Web Pages And Browsing
  - Dynamic Web Document Technologies (CGI, ASP, JSP, PHP, ColdFusion)
  - Technology For Active Web Documents (Java, JavaScript)
  - RPC and Middleware
  - Network Security

The course grade will be determined using the following approximate weights: 30% final examination, 25% midterm examination, 15% written homework, 20% programming assignments, 10% term paper and oral presentation

### Course Objective / Assessment Mechanism matrix

	Homework Assignments	Programming Projects	Programming Exercises	Term Paper	Hour Examination	Final Examination
CO01	✓	✓	✓	✓	✓	✓
CO02	✓	✓	✓	✓	✓	✓
CO03			✓		✓	✓
CO04				✓		

#### Bibliography:

- Comer, Douglas E. **Computer Networks and Internets. Fifth Edition.** Prentice Hall, 2009.
- Fitzgerald, Jerry and Dennis, Alan. **Business Data Communications and Networking. Tenth Edition.** Wiley, 2009.
- Forouzan, Behrouz. **TCP/IP Protocol Suite. Fourth Edition.** McGraw Hill, 2009.
- Forouzan, Behrouz; Mosharraf, Firouz. **Computer Networks: A Top Down Approach, First Edition,** Mcgraw-Hill, 2011.
- Halsall, Fred. **Data Communications, Computer Networks, and Open Systems. Fourth Edition.** Addison-Wesley, 1996.
- Kurose, James F.; Ross, Keith W. **Computer Networking – A top-down Approach Featuring the Internet. Fifth Edition.** Addison-Wesley, 2009.
- Stallings, William. **Data and Computer Communications. Ninth Edition.** Prentice Hall, 2011.
- Tanenbaum, Andrew S. **Computer Networks. Fourth Edition.** Prentice Hall, 2003.

#### Academic Integrity Statement:

“Salem State University assumes that all students come to the University with serious educational intent and expects them to be mature, responsible individuals who will exhibit high standards of honesty and personal conduct in their academic life. All forms of academic dishonesty are considered to be serious offences against the University community. The University will apply sanctions when student conduct interferes with the University primary responsibility of ensuring its educational objectives.” Consult the University catalog for further details on Academic Integrity Regulations and, in particular, the University definition of academic dishonesty.

The Academic Integrity Policy and Regulations can be found in the University Catalog and on the University website ([http://catalog.salemstate.edu/content.php?catoid=13&navoid=1295#Academic\\_Integrity](http://catalog.salemstate.edu/content.php?catoid=13&navoid=1295#Academic_Integrity)). The formal regulations are extensive and detailed - familiarize yourself with them if you have not previously done so. A concise summary of and direct quote from the regulations: "Materials (written or otherwise) submitted to fulfill academic requirements must represent a student's own efforts". *Submission of other's work as one's own without proper attribution is in direct violation of the University's Policy and will be dealt with according to the University's formal Procedures. Copying without attribution is considered cheating in an academic environment - simply put, **do not do it!***

#### University-Declared Critical Emergency Statement:

In the event of a university-declared emergency, Salem State University reserves the right to alter this course plan. Students should refer to [www.salemstate.edu](http://www.salemstate.edu) for further information and updates. The course attendance policy stays in effect until there is a university-declared critical emergency.

In the event of an emergency, please refer to the alternative educational plans for this course, which will be distributed via standing class communication protocols. Students should review the plans and act accordingly. Any required material that may be necessary will have been previously distributed to students electronically or will be made available as needed via email and/or Internet access.

#### Equal Access Statement:

"Salem State University is committed to providing equal access to the educational experience for all students in compliance with Section 504 of The Rehabilitation Act and The Americans with Disabilities Act and to providing all reasonable academic accommodations, aids and adjustments. **Any student who has a documented disability requiring an accommodation, aid or adjustment should speak with the instructor immediately.** Students with Disabilities who have not previously done so should provide documentation to and schedule an appointment with the Office for Students with Disabilities and obtain appropriate services."

**Note:** This syllabus represents the intended structure of the course for the semester. If changes are necessary, students will be notified in writing and via email.