2020

Principles of Networking

North Carolina Agricultural and Technical State University

NORTH CAROLINA AGRICULTURAL AND TECHNICAL STATE UNIVERSITY

COURSE SYLLABUS

College Name: College of Science and Technology
Department Name: Department of Computer Science
Course Name: Principles of Networking

COURSE INFORMATION

- Course Number/Section: CST 605
- Term:
- Semester Credit Hours: 3
- Times and Days:
- Class Location:

INSTRUCTOR CONTACT INFORMATION

- Instructor:
- Office Location:
- Office Phone:
- Email Address:

Faculty must notify students of the approximate time and method they can expect to receive an answer to all communications (e.g., email, phone, course messages). Excluding holidays, the response should be provided within 48 hours.

If there's a graduate teaching assistant assigned to work with this course, please include their names also.

STUDENT HOURS

These are times students may visit the professor without an appointment to request the assistance they need.

NOTE: Students are responsible for reading, understanding, and following the syllabus.

: AM ☐ / PM ☐ – : AM ☐ / PM ☐

Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐

COURSE PREREQUISITES

None

COURSE DESCRIPTION

This course covers fundamental concepts and principles in designing and implementing computer networks, their protocols, and applications. Topics include: layered network architecture, physical layer, data link, network, transport, and application protocols, wireless and mobile networks, multimedia networking, security, and network management.

STUDENT LEARNING OBJECTIVES/OUTCOMES (SLO)

Learning outcomes should be specific, measurable, and focused on the content knowledge the students are expected to master and not what the faculty will teach.

If the course is a General Education Course, the SLO should be listed and labeled as "General Education."

SLO 1: The key principles and concepts of computer networks;
SLO 2: How computer networks are designed and implemented;
SLO 3: How computer networks are operated;
SLO 4: How computer networks are likely to evolve in the future

REQUIRED TEXTBOOKS AND MATERIALS

Any course-level subscriptions and tools linked in Blackboard Learn learning management system (LMS) should be listed here. The Blackboard LMS must have links to their student data privacy statement.

REQUIRED TEXTS:

Kurose, J., & Ross, K. (2017). *Computer networking: A top-down approach*. Pearson Higher Ed.

REQUIRED MATERIALS:

None

SUGGESTED COURSE MATERIALS

SUGGESTED READINGS/TEXTS:

SUGGESTED MATERIALS:

GRADING POLICY

ASSIGNMENTS AND GRADING POLICY

94% and above	A		76% - 74%	C
93% - 90%	A-		73% - 70%	C-
89% - 87%	B+		69% - 67%	D+
86% - 84%	B		66% - 64%	D
83% - 80%	B-		63% - 0%	F

94% and above	A		76% - 74%	C
79% - 77%	C+			

For GRADUATE COURSES: See 2019-2020 Graduate Catalog p.38 for graduate grading scale and Non-Graded Courses

GRADING ALLOCATION

Course grades are based on a weighted grading scale of 100%. The breakdown for the course is as follows: *[Faculty, please adjust according to your course.]*

Category	# of Activities	Percentage Grade Weight
Discussion Board	1	0%
Assignment/ Homework	7	40%
Hands-on Project	2	20%
Exam	2	40%
Total		**100%**

COURSE POLICIES

USE OF BLACKBOARD AS THE LEARNING MANAGEMENT SYSTEM

Blackboard is the primary online instructional and course communications platform. Students can access the course syllabus, assignments, grades, and learner support resources. Students are encouraged to protect their login credentials, complete a Blackboard orientation, and log in daily to the course.

Note: Uploading assignments through Blackboard presents a challenge for Chromebook users in locating the files for submission. If you use a Chromebook, please be sure you also have access to a Mac computer or Windows computer so you can fully participate in your Blackboard class. For more information about student computer recommendations, please visit https://hub.ncat.edu/administration/its/computer-recommendations.php.

MAKE-UP EXAMS

See << Update Academic Year >>*Undergraduate Bulletin:*

https://www.ncat.edu/provost/academic-affairs/bulletins/index.php

For GRADUATE STUDENTS: See 2019-20 Graduate Catalog p. 54

EXTRA CREDIT

LATE WORK

SPECIAL ASSIGNMENTS

For GRADUATE STUDENTS: FAILING TO MEET COURSE REQUIREMENTS (Graduate Catalog p.40)

For GRADUATE STUDENTS: CLASS ATTENDANCE (see 2019-20 Graduate Catalog p. 53-54)

Students are expected to attend class and participate on a regular basis in order to successfully achieve course learning outcomes and meet federal financial aid requirements (34 CFR 668.22). Class attendance in online courses is defined as active participation in academically-related course activities. Active participation may consist of course interactions with the content, classmates, and/or the instructor. Examples of academically-related course activities include, but are not limited to:

- Completing and submitting assignments, quizzes, exams, and other activities within Blackboard or through Blackboard (3rd-party products).
- Participating in course-related synchronous online chats, discussions, or meeting platforms such as Blackboard Collaborate in which participation is tracked.

CLASSROOM CITIZENSHIP

Courtesy, civility, and respect must be the hallmark of your interactions.

COMPLIANCE WITH THE AMERICANS WITH DISABILITIES ACT

North Carolina A&T State University is committed to following the requirements of the Americans with Disabilities Act Amendments Act (ADAAA) and Section 504 of the Rehabilitation Act.
If you need an academic accommodation based on the impact of a disability, you must initiate the request with the Office of Accessibility Resources (OARS) and provide documentation in accordance with the Documentation Guidelines at N.C. A&T. Once documentation is received, it will be reviewed. Once approved, you must attend a comprehensive meeting to receive appropriate and reasonable accommodations. If you are a student registered with OARS, you must complete the Accommodation Request Form to have accommodations sent to faculty.

OARS is located in Murphy Hall, Suite 01 and can be reached at 336-334-7765, or by email at accessibilityresources@ncat.edu. Additional information and forms can be found on the internet at https://www.ncat.edu/provost/academic-affairs/accessibility-resources/index.php.

Please note: Accommodations are not retroactive and begin once the Disability Verification Form is provided to faculty.

TITLE IX

North Carolina A&T State University is committed to providing a safe learning environment for all students—free of all forms of discrimination and harassment. Sexual misconduct and relationship violence in any form are inconsistent with the university's mission and core values, violates university policies, and may also violate federal and state law. Faculty members are considered "Responsible Employees" and are required to report incidents of sexual misconduct and relationship violence to the Title IX Coordinator. If you or someone you know has been impacted by sexual harassment, sexual assault, dating or domestic violence, or stalking, please visit the Title IX website to access information about university support and resources. If you would like to speak with someone confidentially, please contact Counseling Services at 336-334-7727 or the Student Health Center at 336-334-7880.

TECHNICAL SUPPORT

If you experience any problems with your A&T account, you may call Client Technology Services (formerly Aggie Tech Support and Help Desk) at 336-334-7195, or visit https://hub.ncat.edu/administration/its/dept/ats/index.php.

FIELD TRIP POLICIES / OFF-CAMPUS INSTRUCTION AND COURSE ACTIVITIES

If applicable:

Off-campus, out-of-state, foreign instruction, and activities are subject to state law and university policies and procedures regarding travel and risk-related activities. Information regarding these rules and regulations may be found at https://www.ncat.edu/campus-life/student-affairs/index.php.

STUDENT HANDBOOK

https://www.ncat.edu/campus-life/student-affairs/departments/dean-of-students/student-handbook.php

STUDENT TRAVEL PROCEDURES AND STUDENT TRAVEL ACTIVITY WAIVER

https://hub.ncat.edu/administration/student-affairs/staff-resources/studen_activity_travel_waiver.pdf

OTHER POLICIES *(e.g., Copyright Guidelines, Confidentiality, etc.)*

STUDENT HANDBOOK

https://www.ncat.edu/campus-life/student-affairs/departments/dean-of-students/student-handbook.php

Graduate Catalog

SEXUAL MISCONDUCT POLICY

https://www.ncat.edu/legal/title-ix/sexual-harassment-and-misconduct-policies/index.php

FAMILY EDUCATIONAL RIGHTS AND PRIVACY ACT (FERPA)

https://www.ncat.edu/registrar/ferpa.php

STUDENT COMPLAINT PROCEDURES

https://www.ncat.edu/current-students/student-complaint-form.php

STUDENT CONDUCT AND DISCIPLINE

North Carolina A&T State University has rules and regulations that govern student conduct and discipline meant to ensure the orderly and efficient conduct of the educational enterprise. It is the responsibility of each student to be knowledgeable about these rules and regulations.

Please consult the following about specific policies such as academic dishonesty, cell phones, change of grade, disability services, disruptive behavior, general class attendance, grade appeal, incomplete grades, make-up work, student grievance procedures, withdrawal, etc.:

- Undergraduate Bulletin
  https://www.ncat.edu/provost/academic-affairs/bulletins/index.php

- Graduate Catalog
  https://www.ncat.edu/tgc/graduate-catalog/index.php

- Student Handbook
  https://www.ncat.edu/campus-life/student-affairs/departments/dean-of-students/student-handbook.php

ACADEMIC DISHONESTY POLICY

Academic dishonesty includes but is not limited to the following:

1. Cheating or knowingly assisting another student in committing an act of cheating or other academic dishonesty;
2. Plagiarism (unauthorized use of another's words or ideas as one's own), which includes but is not limited to submitting exams, theses, reports, drawings, laboratory notes or other materials as one's own work when such work has been prepared by or copied from another person;
3. Unauthorized possession of exams or reserved library materials; destroying or hiding source, library or laboratory materials or experiments or any other similar actions;
4. Unauthorized changing of grades, or marking on an exam or in an instructor's grade book or such change of any grade record;
5. Aiding or abetting in the infraction of any of the provisions anticipated under the general standards of student conduct;
6. Hacking into a computer and gaining access to a test or answer key prior to the test being given. N.C. A&T reserves the right to search the emails and computers of any student suspected of such computer hacking (if a police report of the suspected hacking was submitted prior to the search); and
7. Assisting another student in violating any of the above rules.

A student who has committed an act of academic dishonesty has failed to meet a basic requirement of satisfactory academic performance. Thus, academic dishonesty is not only a basis for disciplinary action, but may also affect the evaluation of a student's level of performance. Any student who commits an act of academic dishonesty is subject to disciplinary action.

In instances where a student has clearly been identified as having committed an act of academic dishonesty, an instructor may take appropriate disciplinary action, including loss of credit for an assignment, exam, or project; or awarding a grade of "F" for the course, **subject to review and endorsement by the chairperson and dean**.

For GRADUATE STUDENTS: Reference for academic dishonesty – 2010-2020 Graduate Catalog, p.58-59

For GRADUATE STUDENTS: STUDENT RELIGIOUS OBSERVANCE (see Graduate Catalog, p.55)

ASSIGNMENTS AND ACADEMIC CALENDAR

Include topics, reading assignments, due dates, exam dates, withdrawal dates, pre-registration and registration dates, all holidays, and convocations.*

THE WEEK OF MM/DD/YY	SUBJECT	UNIT LEARNING OUTCOMES (ULO)	READING IN TEXT, ACTIVITY, HOMEWORK, EXAM
	Course Introduction and Orientation	-	1. **Complete Discussion #SI:** Self-Introduction
	Unit 1: Computer Networks and the Internet	ULO 1: Define the Internet. (SLO 1 to 4) ULO 2: Define a protocol in computer networking. (SLO 1 to 4) ULO 3: Describe network edge: hosts, access net, and physical media. (SLO 1 to 4) ULO 4: Discuss network core: packet, circuit switching, and Internet structure. (SLO 1 to 4) ULO 5: Analyze system performance: loss, delay, and throughput. (SLO 1 to 4) ULO 6: Discuss security protocols and issues. (SLO 1 to 4) ULO 7: Describe protocol layers and service models. (SLO 1 to 4) ULO 8: Summarize the history of the internet and computer networks. (SLO 1 to 4)	1. **Read from textbook:** Jim Kurose and Keith Ross (2017), Computer Networking: A Top-Down Approach (7th Edition), Pearson. **Read the following chapter(s):** a. Chapter 1: Computer Networks and the Internet (i.e., pp. 1- 81)
	Unit 2: Computer Networks and the Internet (Contd)	ULO 1: Define the Internet. (SLO 1 to 4) ULO 2: Define a protocol in computer networking. (SLO 1 to 4) ULO 3: Describe network edge: hosts, access net, and physical media. (SLO 1 to 4) ULO 4: Discuss network core: packet and circuit switching, and Internet structure. (SLO 1 to 4) ULO 5: Analyze system performance: loss, delay, and throughput. (SLO 1 to 4)	1. **Read from textbook:** Jim Kurose and Keith Ross (2017), Computer Networking: A Top-Down Approach (7th Edition), Pearson. **Read the following chapter(s):** a. Chapter 1: Computer Networks and the Internet (i.e., pp. 1- 81) 2. **Complete Assignment # 1:** Homework 1. (ULO 1 to 8)

		ULO 6: Discuss security protocols and issues. (SLO 1 to 4) ULO 7: Describe protocol layers and service models. (SLO 1 to 4) ULO 8: Summarize the history of the internet and computer networks. (SLO 1 to 4)	
	Unit 3: Application Layer	ULO 1: Describe the conceptual and implementation aspects of network application protocols: • Transport-layer service models • Client-server and peer-to-peer paradigm • Content distribution networks. (SLO 1 to 4) ULO 2: Discuss the protocols by examining popular application-level protocols: • HTTP, FTP, SMTP/POP3/IMAP, and DNS. (SLO 1 to 4) ULO 3: Create network applications: socket API. (SLO 1 to 4)	1. **Read from textbook:** Jim Kurose and Keith Ross (2017), Computer Networking: A Top-Down Approach (7th Edition), Pearson. **Read the following chapter(s):** a. Chapter 2: Application Layer (i.e., pp. 83-183)
	Unit 4: Application Layer (Contd)	ULO 1: Describe the conceptual and implementation aspects of network application protocols: • Transport-layer service models • Client-server and peer-to-peer paradigm • Content distribution networks. (SLO 1 to 4) ULO 2: Discuss the protocols by examining popular application-level protocols: • HTTP, FTP, SMTP/POP3/IMAP, DNS. (SLO 1 to 4)	1. **Read from textbook:** Jim Kurose and Keith Ross (2017), Computer Networking: A Top-Down Approach (7th Edition), Pearson. **Read the following chapter(s):** a. Chapter 2: Application Layer (i.e., pp. 83-183) 2. **Complete Assignment #2:** Homework 2. (ULO 1 to 3)

		ULO 3: Create network applications socket API. (SLO 1 to 4)	
	Unit 5: Transport Layer	ULO 1: Describe the principles behind transport layer services: • Multiplexing and demultiplexing • Reliable data transfer • Flow control • Congestion control. (SLO 1 to 4) ULO 2: Discuss the Internet transport layer protocols: • UDP: connectionless transport • TCP: connection-oriented reliable transport. (SLO 1 to 4) ULO 3: TCP: congestion control. (SLO 1 to 4)	1. **Read from textbook:** Jim Kurose and Keith Ross (2017), Computer Networking: A Top-Down Approach (7th Edition), Pearson. **Read the following chapter(s):** a. Chapter 3: Transport Layer" (i.e., pp. 187-304)
	Unit 6: Transport Layer (Contd)	ULO 1: Describe the principles behind transport layer services: • Multiplexing and demultiplexing • Reliable data transfer • Flow control • Congestion control. (SLO 1 to 4) ULO 2: Discuss the Internet transport layer protocols: • UDP: connectionless transport • TCP: connection-oriented reliable transport. (SLO 1 to 4) ULO 3: TCP: congestion control. (SLO 1 to 4)	1. **Read from textbook:** Jim Kurose and Keith Ross (2017), Computer Networking: A Top-Down Approach (7th Edition), Pearson. **Read the following chapter(s):** a. Chapter 3: Transport Layer" (i.e., pp. 187-304) 2. **Complete Assignment #3:** Homework 3 3. **Complete:** Exam # I. (ULO 1 to 3)
	Unit 7: Network Layer: Data Plane and Control Plane	ULO 1: Describe the principles behind network layer services, focusing on the data plane: • Network layer service model so forwarding versus routing • How a router works • Generalized forwarding. (SLO 1 to 4) ULO 2: Discuss the instantiation and	1. **Read from textbook:** Jim Kurose and Keith Ross (2017), Computer Networking: A Top-Down Approach (7th Edition), Pearson. **Read the following chapter(s):** a. Chapter 4: The Network Layer: Data Plane" (i.e., pp. 305-372)

		implementation in the Internet. (SLO 1 to 4) ULO 3: Describe the principles behind network control plane • traditional routing algorithms • SDN controller so Internet Control Message Protocol • network management. (SLO 1 to 4) ULO 4: Discuss the instantiation and implementation in the Internet: OSPF, BGP, OpenFlow, ODL and ONOS controllers, ICMP, SNMP. (SLO 1 to 4)	b. Chapter 5 "The Network Layer: Control Plane" (i.e., pp. 373-438)
	Unit 8: Network Layer: Data Plane and Control Plane (Contd)	ULO 1: Describe the principles behind network layer services, focusing on the data plane: • Network layer service model so forwarding versus routing • How a router works • Generalized forwarding. (SLO 1 to 4) ULO 2: Discuss the instantiation and implementation in the Internet. (SLO 1 to 4) ULO 3: Describe the principles behind network control plane • traditional routing algorithms • SDN controller so Internet Control Message Protocol • network management. (SLO 1 to 4) ULO 4: Discuss the instantiation and implementation in the Internet: OSPF, BGP, OpenFlow, ODL and ONOS controllers, ICMP, SNMP. (SLO 1 to 4)	1. **Read from textbook:** Jim Kurose and Keith Ross (2017), Computer Networking: A Top-Down Approach (7th Edition), Pearson. **Read the following chapter(s):** a. Chapter 4: The Network Layer: Data Plane" (i.e., pp. 305-372) b. Chapter 5 "The Network Layer: Control Plane" (i.e., pp. 373-438) 2. **Complete Assignment #4:** Homework 04. (ULO 1 to 4)
	Unit 9: The Link Layer and LANs	ULO 1: Describe the principles behind link layer services:	1. **Read from textbook:** Jim Kurose and Keith Ross (2017), Computer Networking:

		• error detection, and correction • sharing a broadcast channel: multiple access • link layer addressing • local area networks: Ethernet, VLANs. (SLO 1 to 4) ULO 2: Discuss the instantiation and implementation of various link layer technologies. (SLO 1 to 4)	A Top-Down Approach (7th Edition), Pearson. **Read the following chapter(s):** a. Chapter 6: The Link Layer and LANs" (i.e., pp. 439-518) 2. **Complete Hands-on Project# 1:** Getting Started with Wireshark Lab . (ULO 1, 2)
	Unit 10: The Link Layer and LANs (Contd)	ULO 1: Describe the principles behind link layer services: • error detection, and correction • sharing a broadcast channel: multiple access • link layer addressing • local area networks: Ethernet, VLANs. (SLO 1 to 4) ULO 2: Discuss the instantiation and implementation of various link layer technologies. (SLO 1 to 4)	1. **Read from textbook:** Jim Kurose and Keith Ross (2017), Computer Networking: A Top-Down Approach (7th Edition), Pearson. **Read the following chapter(s):** a. Chapter 6: The Link Layer and LANs" (i.e., pp. 439-518) 2. **Complete Assignment #5:** Homework 5 . (ULO 1, 2)
	Unit 11: Wireless and Mobile Networks	ULO 1: Describe the Wireless links, characteristics: FDMA, TDMA, CDMA etc. (SLO 1 to 4). ULO 2: Discuss the IEEE 802.11 Wireless LANs (i.e., WiFi) access technologies. (SLO 1 to 4) ULO 3: Describe the cellular Internet access: • Architecture • Standards (e.g., 1G, 2G, 3G, LTE etc.) . (SLO 1 to 4) ULO 4: Describe the principles of mobile user's addressing and routing. (SLO 1 to 4) ULO 5: Discuss the Mobile IP. (SLO 1 to 4)	1. **Read from textbook:** Jim Kurose and Keith Ross (2017), Computer Networking: A Top-Down Approach (7th Edition), Pearson. **Read the following chapter(s):** a. Chapter 7: Wireless and Mobile Networks (i.e., pp. 519-591)

		ULO 6: Handle the mobility in cellular networks. (SLO 1 to 4) ULO 7: Discuss the mobility and higher-layer protocols. (SLO 1 to 4)	
	Unit 12: Wireless and Mobile Networks (Contd)	ULO 1: Describe the Wireless links, characteristics: FDMA, TDMA, CDMA etc. (SLO 1 to 4) ULO 2: Discuss the IEEE 802.11 Wireless LANs (i.e., WiFi) access technologies. (SLO 1 to 4) ULO 3: Describe the cellular Internet access: • Architecture • Standards (e.g., 1G, 2G, 3G, LTE etc.) . (SLO 1 to 4) ULO 4: Describe the principles of mobile user's addressing and routing. (SLO 1 to 4) ULO 5: Discuss the Mobile IP. (SLO 1 to 4) ULO 6: Handle the mobility in cellular networks. (SLO 1 to 4) ULO 7: Discuss the mobility and higher-layer protocols. (SLO 1 to 4)	1. **Read from textbook:** Jim Kurose and Keith Ross (2017), Computer Networking: A Top-Down Approach (7th Edition), Pearson. **Read the following chapter(s):** a. Chapter 7: Wireless and Mobile Networks (i.e., pp. 519-591) **2. Complete Assignment #6:** Homework 6. (ULO 1 to 7)
	Unit 13: Security in Computer Networks	ULO 1: Determine the definition of network security. (SLO 1 to 4) ULO 2: Describe the principles of cryptography. (SLO 1 to 4) ULO 3: Discuss the message confidentiality, integrity, and authentication. (SLO 1 to 4) ULO 4: Discuss the securing e-mail. (SLO 1 to 4) ULO 5: Discuss securing TCP connections: SSL. (SLO 1 to 4) ULO 6: Describe the network layer security: IPsec. (SLO 1 to 4)	1. **Read from textbook:** Jim Kurose and Keith Ross (2017), Computer Networking: A Top-Down Approach (7th Edition), Pearson. **Read the following chapter(s):** a. Chapter 8: Security in Computer Networks(i.e., pp. 593-674)

		ULO 7: Discuss securing wireless LANs. (SLO 1 to 4) ULO 8: Discuss the operational security: firewalls and IDS. (SLO 1 to 4)	
	Unit 14: Security in Computer Networks (Contd)	ULO 1: Determine the definition of network security. (SLO 1 to 4) ULO 2: Describe the principles of cryptography. (SLO 1 to 4) ULO 3: Discuss the message confidentiality, integrity, and authentication. (SLO 1 to 4) ULO 4: Discuss the securing e-mail. (SLO 1 to 4) ULO 5: Discuss securing TCP connections: SSL. (SLO 1 to 4) ULO 6: Describe the network layer security: IPsec. (SLO 1 to 4) ULO 7: Discuss securing wireless LANs. (SLO 1 to 4) ULO 8: Discuss the operational security: firewalls and IDS. (SLO 1 to 4)	1. **Read from textbook:** Jim Kurose and Keith Ross (2017), Computer Networking: A Top-Down Approach (7th Edition), Pearson. **Read the following chapter(s):** a. Chapter 8: Security in Computer Networks(i.e., pp. 593-674) 2. **Complete Assignment #7:** Homework 7. (ULO 1 to 8)
	Unit 15: Reading and Review: Project Report and Exam II	N/A	1. **Complete:** Exam #II (SLO 1 to 4) 2. **Complete Hands-on Project #2:** Project Report (SLO 1 to 4)

** These descriptions and timelines are subject to change at the discretion of the instructor.*