Course ID: CIS 320	**Course Name:** Computer Networks and Comm. Sys.
Instructor: Taylan Sen, PhD, JD	**E-mail:** tsen@niagara.edu
Office Hours: MW: 9:30-11am 3-4pm; F: 9:30am-12pm & by appt.	**Cell Phone:** 716-939-1426
Office Location: Glynn 107d	**General Education Designation:** AS
Course Time: MWF 11:10-12:05; 12:15-1:10pm	**Course Room:** Glynn 115

Personal Mission Statement

My mission is to provide students the highest quality educational experience that is fair, accessible, efficient, current, and complete. Please come and talk to me (or call/email) if there is any way I can help you learn the material, or deal with a problem throughout the semester, I am behind you 100%.

Department Mission Statement

"The computer and information sciences department will provide students with the ability to develop, implement and critically assess vital informational and technological systems within organizational contexts and governmental agencies. Current key technological competences include, but are not limited to, information security and computer forensics, programming, database administration, Web technologies and networking."

Course Description

"This course introduces the broad and constantly changing field of networking and communication technologies. The course emphasizes technology and architecture issues such as transmission medium, network topology, communications protocols, and hardware/software interfaces."

Textbooks

There is no required textbook for the class. I will provide a course handouts and web links which will contain required reading.

Recommended reference textbooks:

- **Introduction to Networking** by Severance (avalable free at https://www.net-intro.com/) This

freely available book provides a good introduction to networking basics.

- **CompTIA Network+ Certification All-in-One Exam Guide, Eighth Edition** by Jernigan & Meyers. While this book's focus is on the Network+ exam, it does a great job of covering Networking topics.

- **Network+ Guide to Networks** by West et al. This is a good book. It does tend to focus more on "IT" than network theory or programming which may be a good or bad thing depending upon your focus. Parts of it are also directed to the CompTIA Network+ IT certification exam.

- **Computer Networking: A Top Down Approach** by Kurose and Ross. This also is a good book, but is a bit more comprehensive than we need.

* All of these books are available to be borrowed from me.

The following websites will also be used:

- https://www.w3schools.com/python/
- https://www.w3schools.com/git/default.asp

I will additionally provide a course handouts and web links which will contain required reading.

Software & Computing Resources

- **Google Cloud**

  - We will primarily use the virtual machine services called **Compute Engine** made available through an educational grant to Niagara University, where we will run virtual machines (primarily ubuntu linux) on **Virtual Private Clouds** (virtual networks connected to the Internet).

- **Virtualbox** - we will use this free program will to run virtual machines (Windows 10, Windows Server, and Ubuntu linux) on your own computer (or a laboratory computer) as opposed to in the cloud.

- **Jupyter notebook**

  - We will primarily use jupyter notebooks for lessons and assignments. Google provides a free online jupyter notebook service called Colab, you can also install a jupyter notebook server on your own computer.

    - free online jupyter server: **Google Colab:** https://colab.research.google.com
    - free download for self install: **Anaconda:** https://www.anaconda.com/

- **CIS linux server** you will be given accounts on the CIS networking server.

- **Wireshark** - free software network analyzer https://www.wireshark.org/

- **Nmap: Network Mapper** we will use this free program to analyze a given network. Available at: https://nmap.org/

Each of the above resources will be available at no cost to students.

Method of Teaching

The class will include in-class "hands-on" guided instruction (labs), homework assignments, quizzes, and lectures.

A class goal is to focus efforts towards the production of a computer networking *portfolio* that can help students document their skills and experience to prospective employers.

Assessment

Unless there are extenuating circumstances, the class will follow the following assessment percentages: ~30% Homework ~30% Quizzes & attendence. ~30% Exams (15% midterm, 15% final) ~10% Participation and citizenship.

FINAL GRADE	PERCENTAGE
A+	98-100%
A	94-98%
A-	90-94%
B+	88-90%
B	84-88%
B-	80-84%
C+	78-80%
C	74-78%
C-	70-74%
D+	68-70%
D	60-68%
F	60% or less

Outline of Course

- Introduction
    - history and overview
    - major problems addressed
    - big picture: current events and outlook
- Virtualization

- - Cloud computing: Google cloud
    - Virtual Private Cloud networks
    - Compute Engine vms
  - Type 2: Virtualbox
- Commandline Basics
  - linux shell
  - powershell
  - network diagnostics
  - OS commands
- Networking Basics
  - TCP/IP basics
  - Peer to peer networks
  - Physical data transfer
  - Network models/architectures
    - client/server
    - peer-to-peer
- Physical layer
  - electricity basics & POE
  - Topologies
  - ethernet
  - wifi
  - fiber optics
- Link layer
  - MAC
- Internet Protocol
  - theory: control & data plane
- Transport Layer
  - UDP
  - TCP
- DNS
- Network Security
  - isolation

○ management
        ○ authentication
            ▪ public key
            ▪ multifactor authentication
  • Other

        ○ Software Defined Networks
        ○ Government Regulation & Ethical Issues
            ▪ net neutrality
            ▪ surveilance
            ▪ Copyright

Requirements of Course and Workload Information

According to Niagara University guidelines, a typical three-credit course expects an average of two hours of coursework outside of the classroom for every one hour of in-class instruction.

Major Assignments
There will be approximately five major labs on the topics of: 1. Virtualization, 2. Client Server Coding, 3. Firewalls, 4. Link/Physical Layer, and 5. DNS.

There will be a final exam following the NU official schedule which is:

  • Section A: Fri May 3, 10:10-12:00
  • Section B: Mon May 6, 12:10-2:00

Attendance Policy
Attendance will be required only for some in-class labs/projects/quizzes. I will try to make clear at least a week in advance if attendance will be mandatory for an upcoming class. If there are extenuating circumstances which cause you to miss such mandatory classes, please come see me and we will try to work something out. In the absence of university approved absence or coming to see me with a reasonable excuse, you will receive a grade of zero for the missed lab/project/quiz.

Grading Policies and Procedures
There will generally be no make ups for quizzes and exams missed without an official university excuse. I will be providing answers soon after the due dates, as such, after answers are handed out, I will not be to give credit for late homework. I plan to give out at least one extra credit assignment to all students towards the end of the semester. Students who are very helpful to other students in class or students who make particularly insightful contributions to class

discussion may also receive extra credit.

The planned breakdown in grading is:

- 30% Homework/labs
- 30% Quizzes/Attendance
- 30% Final
- 10% Participation/citizenship

Student Learning Objectives

College of Arts & Sciences Goals Assessed in This Course:
A&S 1. Ability to use the technological skills appropriate for the major. A&S 2. Demonstrated ability to engage in critical thinking appropriate to the discipline.
A&S 3. Demonstrated ability to use the information literacy skills, including research skills, appropriate to the major.
A&S 4. Demonstrated ability to communicate effectively in the discipline. A&S 5. Demonstrated awareness of key concepts, theories, and/or knowledge in the discipline (content knowledge).
A&S 6. Professional: Able to integrate and apply key principles and concepts in the major field.

Computer & Information Sciences Department Student Learning Outcomes (SLO)
The program enables students to achieve, by the time of graduation:
CIS SLO 1. An ability to apply knowledge of computing and mathematics appropriate to the discipline
CIS SLO 2. An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution
CIS SLO 3. An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs
CIS SLO 4. An ability to function effectively on teams to accomplish a common goal
CIS SLO 5. An understanding of professional, ethical, legal, security and social issues and responsibilities
CIS SLO 6. An ability to communicate effectively with a range of audiences
CIS SLO 7. An ability to analyze the local and global impact of computing on individuals, organizations, and society
CIS SLO 8. Recognition of the need for and an ability to engage in continuing professional development
CIS SLO 9. An ability to use current techniques, skills, and tools necessary for computing practice.

Course Objectives:

- To provide students with an understanding of the major principles and techniques in

computer networking, including network architectures, models, domain name system, network applications, sockets, internetworking, LANs, physical data transmission, and security.

- To provide students experience in a multitude of networking environments including virtual machines, cloud computing, linux/macos/windows, LANs, and internet of things devices.

Course Student Learning Objectives: Upon completion of this course, students will be able to:

SLO 1. Understand the advantages of different network architectures and models, network topologies, different protocols, and physical layer technologies (A&S 1,2,3,5,6; CIS SLO 1, 2, 3, 5, 9)

SLO 2. Be able to design, program, and diagnose networking elements for each conceptual layer of computer networking (A&S 1,2,3,5,9; CIS SLO 1, 2, 3, 9)

SLO 3. Be able to understand and diagnose network security issues (A&S 1,2,3,5,6; CIS SLO 1, 2, 3, 5, 9)

Academic Integrity

Academic honesty – being honest and truthful in academic settings, especially in the communication and presentation of ideas – is required to experience and fulfill the mission of Niagara University. Academic dishonesty – being untruthful, deceptive, or dishonest in academic settings in any way – subverts the university mission, harms faculty and students, damages the reputation of the university, and diminishes public confidence in higher education.

All members of the university community share the responsibility for creating conditions that support academic integrity. Students must abstain from any violations of academic integrity and set examples for each other by assuming full responsibility for their academic and personal development, including informing themselves about and following the university's academic integrity policy.

Violations of academic integrity include but are not limited to the following categories: cheating; plagiarism; fabrication; falsification or sabotage of research data; destruction or misuse of the university's academic resources, alteration or falsification of academic records; academic misconduct; complicity; and copyright violation. This policy applies to all courses, program requirements, and learning contexts in which academic credit is offered, including experiential and service-learning courses, study abroad programs, internships, student teaching and the like. Please refer to the undergraduate catalog for Niagara University's policy on academic integrity or access the policy online, www.niagara.edu/academicintegrity.

Academic Integrity violations will result in getting an F in the class. However, if the violation is minor, students may only receive a 0 on the assignment involved.

Inclusivity, Diversity & Support for Students at Niagara University

Inclusivity, Diversity & Support for Students at Niagara University

Niagara University supports a learning environment that fosters inclusiveness where diversity is respected and valued. It is expected that students in this class will respect differences and develop an understanding of how other people's perspectives, behaviors, and worldviews may be different from their own. Students are always encouraged to meet with faculty as early as possible in the semester to discuss their needs or concerns. Students may also seek additional assistance from a variety of resources available on campus:

Academic Success Center – Seton 1st floor, 716-286-8072, www.niagara.edu/asc Provides peer tutoring, Writing Center, reading assistance, and study skills training.

Accessibility Services – Seton 1st floor, 716-286-8072, https://www.niagara.edu/accessibility-services/
Provides academic accommodations for students with documented disabilities, and assists with access, evacuation, and emergency medical notifications.

Office of the Dean of Students – Gallagher 111, 716-286-8405, provides a wide range of support services including Counseling Services, Health Services, Multicultural Affairs, Residence Life, and Veterans Services. For a full explanation of services and direct contact information please go to: www.niagara.edu/student-affairs ; www.niagara.edu/veterans. The Dean of Students serves as deputy Title IX Coordinator who advocates for students regarding harassment and sexual misconduct issues, and can offer information regarding students' rights and responsibilities under the student code of conduct.

Students are always encouraged to meet with faculty as early as possible in the semester to discuss their needs or concerns. Students may also seek additional assistance from a variety of resources available on campus such as Academic Success Center, counseling services, Accessibility Services, etc. For more information on these resources, please visit http://mynu.niagara.edu/services.

Reporting of Sexual Violence, Sexual Harassment, and Unlawful Discrimination

The University's Office for Equity & Inclusion (OEI) handles all matters involving allegations and complaints of discrimination based on a protected category (see http://www.niagara.edu/oei for the policy). Any student who believes they have been subjected to behavior that may constitute harassment, discrimination, or retaliation is encouraged to report such concerns to the University's Title IX Coordinator and Civil Rights Officer at 716-286-8324.

Date	Day	Topic	AssignmentsGiven	AssignmentsDue
01/22	Wed	Intro-Colab		
01/24	Fri	Intro-Binary#'s,Shell,Github	A2-Getting Started	
01/27	Mon	Google Cloud Setup,github/colab,Reading questions		
01/29	Wed	Google Cloud and Shell Commands Lab		

01/31	Fri	Networking Tools	A3-Shell Commands
02/03	Mon	Linking to git hub in VM;python in VM;sockets	
02/05	Wed	github config;tshark;VMcloning	
02/07	Fri	quiz;VPC firewall config;firewall debugging;netcat	
02/10	Mon	link layer lab	
02/12	Wed	link layer & sockets	
02/14	Fri	TCP/IP	
02/17	Mon	socket commands;UDP Broadcast;Groupchat	
02/19	Wed	Network quizgame!;python sockets	
02/21	Fri	network diagrams	
02/24	Mon	Hacking into HTTP protocol:pretending to be a webclient/server	
02/26	Wed	life of apacket	
02/28	Fri	Address Resolution Protocol	
03/03	Mon	Network Address Translation	
03/05	Wed	Review	
03/07	Fri	MIDTERM	
03/10	Mon	SPRINGBREAK	
03/12	Wed	SPRINGBREAK	
03/14	Fri	SPRINGBREAK	
03/17	Mon	Network Security-TLS	
03/19	Wed	Transport Layer headers;TLS	
03/21	Fri	Webserver lab	
03/24	Mon	Proxy lab	
03/26	Wed	Ethernet cable lab	
03/28	Fri	Virtualization	
03/31	Mon	Virtualization	
04/02	Wed	Virtualization	
04/04	Fri	Quizgame	
04/07	Mon	Network Security	
04/09	Wed	Network Management Lab:Router,Switch,Access Point	
04/11	Fri	Virtualbox	
04/14	Mon	VirtualboxLab	
04/16	Wed	openlab	
04/18	Fri	EASTER RECESS	
04/21	Mon	EASTER RECESS	
04/23	Wed	TBD	
04/25	Fri	TBD	
04/28	Mon	TBD	
04/30	Wed	Future trends in networks	
05/02	Fri	Pizza Party & Network Escape Room Challenge	

05/09   Fri   **FINAL EXAM - 320 Section A, 10:10-12:00**

05/12   Mon   **FINAL EXAM - 320 Section B, 12:10-2:00**