CPE 400/600 Computer Communication Networks

Spring 2024

Course Information

Instructor Information

Instructor: Igor Remizov, MBA, MSIS, CISSP
Class Time: 5:30pm – 6:45pm
Room: WRB 2003
Email: iremizov@unr.edu
Office Hours: by appointment

Course Description

ISO model, protocol layers, circuit/packet switching, sockets, reliable transport, congestion control, routing, addressing, switching, multiple access, error correction, coding, and digital modulation.

Course Pre/Co-requisites

Corequisite : CS 446.

Required Texts/Course Materials

Required textbook:

- James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach", Addison-Wesley, 8th edition.

Reference Books:

- Andrew S. Tanenbaum and David J. Wetherall, "Computer Networks", Prentice Hall.
- Articles from Internet as provided by Instructor

Other required course materials:

- Computer with Internet connectivity
- Software to be downloaded as instruction provided by Instructor
- Webcam
- Microphone

Class Procedures/Structures

This is an **in-person class**, so we will meet at William J. Raggio (WRB) 2003 at the scheduled class time starting on Monday, January 22 at 5.30 pm.

Syllabus (Tentative and Subject to Change):

This is a tentative list of topics, subject to modification and reorganization.

1. **Introduction to Computer Networks**
    - Internet
    - Network Concepts
    - Protocols

- Wireshark
- Intro to Network Security

2. **Application Layer**
   - Web: HTTP
   - File Transfer: FTP
   - Electronic Mail: SMTP
   - Domain Name Service: DNS
   - VoIP
3. **Transport Layer**
   - Connectionless Transport: UDP
   - Reliable Data Transfer
   - Connection-Oriented Transport: TCP
   - Flow/Congestion Control
   - NTP
4. **Network Layer**
   - Internet Protocol: IP, IPV4
   - DHCP
   - NAT
   - IPV6
   - Routing protocols and algorithms: RIP, OSPF, DSR, BGP
   - Supernetting and Subnetting
   - ICMP
   - SNMP & Netflow
   - Multicast routing
5. **Link Layer**
   - Network media
   - ARP/RARP
   - MAC protocols, Ethernet
   - Common network devices
   - Wireless Networks and Link Layer
6. **Security Concepts & Special Topics**
   - Firewall, DMZ, Enclaves
   - SSH
   - NetBIOS
   - Internet of Things

Organization:

1. All presentations slides will be posted at WebCampus. All assignment submissions will be through WebCampus.

2. Class participation in terms of asking questions is highly encouraged. Please do not be afraid to ask questions no matter how simple you might think the answer could be. This type of interaction helps improve the effectiveness of the class and breaks the monotony.

3. Regular attendance is highly recommended. If you miss a class, you are responsible for all material covered or assigned in class. You should arrive on time and be prepared to discuss the session's topic. The underlying notion of the class is interaction, not passivity.

4. From time to time, we may discuss vulnerabilities in networking systems. This is not intended as an invitation to go exploit those vulnerabilities! It is important that we be able to discuss real-world experience candidly; everyone is expected to behave responsibly.

5. Quizzes and exams must be prepared strictly individually. You may discuss and consult with your team mates on the homework assignments and semester project; however, I will encourage an independent preparation of those homework assignments. Any form of cheating such as plagiarism or ghostwriting will incur a severe penalty, usually failure in the course

Student Learning Outcomes

Undergraduate Student Learning Outcomes – UG-SLOs (ABET)

Our graduates will have an ability to:

(1) Identify, formulate, analyze, and solve complex computing or engineering problems by applying principles of computing, engineering, science, and mathematics.

(2) Recognize professional responsibilities and make informed judgments in engineering and computing practice based on legal and ethical principles, considering the impact of solutions in global, economic, environmental, and societal contexts.

(3) Develop and conduct appropriate experimentation, analyze, and interpret data, and use engineering judgment to draw conclusions.

(4) Acquire and apply new knowledge as needed, using appropriate learning strategies.

Graduate Student Learning Outcomes – G-SLOs

Our graduates will have:
An ability to apply engineering and computer science research and theory to advance the art, science, and practice of the discipline.

Course Requirements

There will be **five online quizzes**. These quizzes will be timed for 10 minutes each. Questions in these quizzes will be designed to give you an opportunity to test and affirm your knowledge of the course content. Quizzes will be due before the class specified on the schedule below.

There will be **three homework assignments**. Providing hands-on experience, the assignments will provide an in-depth analysis of some protocols. **Late homework assignments will be penalized by 20% per day, up to 3 days late, but submissions will not be accepted beyond that time frame.**

There will be **one project**. For CPE 400 level it is a programming project. For CPE 600 level, it is a research paper project. It may require turning in code that compiles and runs properly and a report on the project. **Late submissions will be penalized by 20% per day, up to 3 days late, but submissions will not be accepted beyond that time frame.**

There will be **one midterm exam and one final exam**. You should plan on taking the exams at the scheduled times. No late/early exams unless in case of an emergency such as a health emergency or similar un-avoidable situations and you need to provide convincing documentation for it.

Grading Criteria, Scale, and Standards

Both grading policy and scale (400 points) are subject to change.

(1) Midterm Exam: 25% (100 points)
(1) Final Exam: 25% (100 points)
(5) Quiz: 10% total (8 points each, 40 points total)
(3) Homework assignments: 20% total (26.6 points each, 80 points total)
(1) Project: 20% (80 points)

Grading Scale (tentative):

A: 92% - 100%
A-: 87% - 91.9%
B+: 83% - 86.9%
B: 79% - 82.9%
B-: 74% - 78.9%
C+:70% - 73.9%
C: 67% - 69.9%
C-: 64% - 66.9%
D+: 59% - 63.9%
D: 54% - 58.9%
D-: 50% - 53.9%
F: <50% (or caught cheating)

Late Work or Make-up Exams Policies

Late homework assignments will be penalized by 20% per day, up to 3 days late, but submissions will not be accepted beyond that time frame.

Late project submission will be penalized by 20% per day, up to 3 days late, but submissions will not be accepted beyond that time frame.

No late quizzes unless in case of emergency such as a health emergency or similar un-avoidable situations and you need to provide convincing documentation for it.

No late/early midterm/final exams unless in case of an emergency such as a health emergency or similar un-avoidable situations and you need to provide convincing documentation for it. Makeup exams/assignments will be provided in case of emergency situations.

Course Calendar or Topics Outline

Tentative outline:

Week	Day	Date	Chapters	Lec #	Topic	HW	Quiz	Project
Week 1	Mo	22-Jan	Firdt Day, Intro	1	Class Overview			
	Wed	24-Jan	1	2	Network Overview: Internet, Protocols, Network Structure, Communication Medium			
Week 2	Mo	29-Jan	1	3	Network Overview: Network Core, Switching, ISP, Network Performance			
	Wed	31-Jan	1	4	Network Overview: Secuirty, Layers, Wireshark Overview			
Week 3	Mo	5-Feb	2	5	Application Layer: Web and HTTP			
	Wed	7-Feb	2	6	Application Layer: Cookies, E-mail, SMTP, IMAP, DNS	**HW1 Posted**		
Week 4	Mo	12-Feb	2	7	Application Layer: P2P, Video Streaming, CDNs		**Quiz 1 Posted**	**Project Abstract Submission**
	Wed	14-Feb	3	8	Transport Layer: Multiplexing/demultiplexingUDP	**HW1 Due**		
Week 5	Mo	**19-Feb**	**No School- President's Day**		**No School- President's Day**			
	Wed	21-Feb	3	9	Transport Layer: reliable data, TCP		**Quiz 1 Due**	
Week 6	Mo	26-Feb	3	10	Transport Layer: TCP RTT, temeout, connection management			
	Wed	28-Feb	3	11	Transport layer: flow control, congestion control, midterm review	**HW2 Posted**	**Quiz 2 Posted**	
Week 7	Mo	4-Mar	**Midterm**	**12**	**Midterm exam**		**Quiz 2 Due**	
	Wed	6-Mar	4	13	Network Layer: Router Architecture Overview			
Week 8	Mo	11-Mar	4	14	Natwork Layer: IP and subnetting. DHCP	**HW2 Due**	**Quiz 3 Posted**	
	Wed	13-Mar	4	15	Network Layer: NAT, IPv6, Tunneling, OpenFlow			
Week 9	Mo	18-Mar	5	16	Network Layer: Routing Algorithms		**Quiz 3 Due**	**Project progress Submission**
	Wed	20-Mar	5	17	Network Layer: AS, Intra AS Routing, RIP, OSPF			
Week 10	Mo	25-Mar	**No School - Spring Break**		**No School - Spring Break**			
	Wed	27-Mar						
Week 11	Mo	1-Apr	5	18	Network Layer: Inter AS Routing, BGP	**HW3 Posted**	**Quiz 4 Posted**	
	Wed	3-Apr	5	19	Network Layer: ICMP, Broadcast and Multicast			
Week 12	Mo	8-Apr	6	20	Link Layer: MAC, ARP, Error Detection and Correction			
	Wed	10-Apr	6	21	Link Layer: Multiple Access protocols		**Quiz 4 Due**	
Week 13	Mo	15-Apr	6, 8	22	Link Layer: Ethernet, Hubs, Switches. Network Security: Principles of Cryptography	**HW3 Due**		
	Wed	17-Apr	8	23	Network Security: Principles of Cryptography		**Quiz 5 Posted**	
Week 14	Mo	22-Apr	8	24	**Online Class Via ZOOM** Network Security: Authentication, Message Integrity			
	Wed	**24-Apr**	**8**	**25**	**NO CLASS**			
Week 15	Mo	29-Apr	7	26	Network Security: Ipsec, Firewalls, Wireless and Mobile Networks			
	Wed	1-May	7	27	Wireless and Mobile Networks		**Quiz 5 Due**	**Project Submission**
Week 16	Mo	6-May	N/A	28	Final Exam Review			
	Wed	**8-May**	**No School - Preparation Day**					
Week 17	Mo	**5/13/2024 530pm-730pm**						
	Wed							

University Policies

Failure to Comply with Policy (including as outlined in this Syllabus) or Directives of a University Employee

In accordance with section 6,502 of the University Administrative Manual, a student may receive academic and disciplinary sanctions for failure to comply with policy, including this syllabus, for failure to comply with the directions of a University Official, for disruptive behavior in the classroom, or any other prohibited action. “Disruptive behavior" is defined in part as behavior, including but not limited to failure to follow course, laboratory or safety rules, or endangering the health of others. A student may be dropped from class at any time for misconduct or disruptive behavior in the classroom upon recommendation of the instructor and with approval of the college dean. A student may also receive disciplinary sanctions through the Office of Student Conduct for

misconduct or disruptive behavior, including endangering the health of others, in the classroom. The student shall not receive a refund for course fees or tuition.

Attendance
Class attendance is expected.

Canceled Classes
If classes are canceled by the University, be prepared to cover both the missed and current reading assignments at the next scheduled class meeting.

Communication
All messages outside of the classroom will be broadcast to the class electronically through WebCampus.

Course Evaluation
Course evaluations will be conducted during the last few weeks of the semester. Your constructive assessment of this course plays an indispensable role in shaping education at UNR.

Disability Services
Any student with a disability needing academic adjustments or accommodations is requested to speak with me or the Disability Resource Center (Thompson Building, Suite 101) as soon as possible to arrange for appropriate accommodations.

Disruptive Behavior
Do not disrupt, distract, or prevent others from learning by arriving late, leaving early, or failing to silence all electronic devices during the scheduled class.

Make-Up Exams
Make-up exams will only be given for a documented religious observance, a documented illness, or a documented work-related reason. You must inform the instructor ahead of time if you will be unable to take an exam at the scheduled date and time. If you cannot document that you had a valid reason for missing an exam, you will not be able to take a makeup exam, and your grade for that exam will be a zero (0).

Religious Observance

It is the policy of NSHE (Title 4 Chapter 20 A, Section 3, paragraph 2), to be sensitive to the religious obligations of its students. Any student missing classes, quizzes, examinations, or any other class or lab work because of observance of religious holy days should, whenever possible, be given an opportunity during that semester to make up the missed work. The make-up will apply to the religious holy day absence only. It shall be the responsibility of the student to notify the instructor in advance in writing, if the student intends to participate in a religious holy day which does not fall on state holidays or periods of class recess. This policy shall not apply in the event that administering the assignment at an alternate time would impose an undue hardship on the instructor or the institution which could not reasonably have been avoided.

Student Absences
By NSHE policy (Title 4 Chapter 20 A, Section 3, paragraph 1), there are no official absences from any university class. It is the personal responsibility of the student to consult with the instructor regarding absence from class. In the event that a student misses a class because of an official university function or event or because of serious personal issues, the Office of the Vice President for Student Services may, at its discretion, send an explanation to affected faculty. The instructor shall make the final determination on whether the missed work can be done at a time other than during the regularly scheduled class period.

Study
In order to receive a satisfactory grade in this course, students should plan to devote at least six (6) hours per week (on average) outside of class to studying course materials and working on course assessments.

Syllabus
Read and study this syllabus carefully. The syllabus lays out the responsibilities of both the professor and student parties. If there are questions, consult with the professor before the end of the second week of class. Your continued registration in this class after the initial drop date signifies that you have read and understand this syllabus and will abide by the course policies.

Statement on Academic Dishonesty

"Cheating, plagiarism or otherwise obtaining grades under false pretenses constitute academic dishonesty according to the code of this university. Academic dishonesty will not be tolerated, and penalties can include filing a final grade of "F"; reducing the student's final course grade one or two full grade points; awarding a failing mark on the coursework in question; or requiring the student to retake or resubmit the coursework.

"The University Academic Standards Policy defines academic dishonesty, and mandates specific sanctions for violations. See the University Academic Standards policy: UAM 6,502."

Statement of Disability Services

Use either the traditional or online statement, in addition to the last sentence regarding third party materials.

For Traditional and Seated Classrooms:

"Any student with a disability needing academic adjustments or accommodations is requested to speak with me or the Disability Resource Center (Pennington Achievement Center Suite 230) as soon as possible to arrange for appropriate accommodations."

For Online Courses:

"If you are a student who would normally seek accommodations in a traditional classroom, please contact me as soon as possible. You may also contact the Disability Resource Center for services for online courses by emailing drc@unr.edu or calling 775-784-6000. Academic accommodations for online courses may be different than those for seated classrooms; it is important that you contact us as soon as possible to discuss services. The University of Nevada, Reno supports equal access for students with disabilities. For more information, visit the Disability Resource Center."

This course may leverage 3rd party web/multimedia content, if you experience any issues accessing this content, please notify your instructor.

Statement on Audio and Video Recording

"Surreptitious or covert video-taping of class or unauthorized audio recording of class is prohibited by law and by Board of Regents policy. This class may be videotaped, or audio recorded only with the written permission of the instructor. To accommodate students with disabilities, some students may have been given permission to record class lectures and discussions. Therefore, students should understand that their comments during class may be recorded."

Statement on Maintaining a Safe Learning and Work Environment

The University of Nevada, Reno is committed to providing a safe learning and work environment for all. If you believe you have experienced discrimination, sexual harassment, sexual assault, domestic/dating violence, or stalking, whether on or off campus, or need information related to immigration concerns, please contact the University's Equal Opportunity & Title IX office at 775-784-1547. Resources and interim measures are available to assist you. For more information, please visit the Equal Opportunity and Title IX page.

- **Statement for Academic Success Services**: "Your student fees cover usage of the Math Center (775) 784-4433, Tutoring Center (775) 784-6801, and University Writing Center (775) 784-6030. These centers support your classroom learning; it is your responsibility to take advantage of their services. Keep in mind that seeking help outside of class is the sign of a responsible and successful student."