University of Nevada, Reno

UNIVERSITY OF NEVADA, RENO
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CPE 400/600 - COMPUTER COMMUNICATIONS NETWORKS
Fall 2007

Catalog Data: Digital modulation, transmission and synchronization, coding, error detection, interfacing, computer networks, ISO model, circuit/packet switching, local area networks.

Textbook: *Data Communications and Networking*, Behrouz Forouzan, 4th Edition, McGraw Hill, 2007

References:
Computer Networks and Internets with Internet Applications, Douglas Comer, Fourth Edition, Prentice Hall, 2004
Data and Computer Communications, William Stallings, 8th Edition, Prentice Hall, 2007

Instructor: Dwight Egbert, Professor of Computer Science & Engineering (egbert@cse.unr.edu)

Office Hours: 10:00AM - 1:00PM Wednesday (or by appointment); Room 322 SEM; Tel: (775) 784-6952

If you have a disability for which you will need to request accommodations, please contact me or Mary Zabel at the Disability Resource Center (Thompson Student Services - 107), as soon as possible to arrange for appropriate accommodations.

Goals: This course is designed to provide the basic principles of Data Communications and Computer Networks and to give students hands-on experience with commercially available networking hardware and software.

Prerequisites by Topic:
1. Boolean Algebra.
2. Combinatorial network design.
3. Basic understanding of computer architecture.
4. C/C++ Programming Experience
5. Basic WINDOWS & UNIX skills.

Course Topics:
1. Communications, Networking, and Protocols
2. The OSI Seven Layer Model
3. The TCP/IP Layers
4. Data Transmission Concepts and Termnology
5. The Physical Layer: Frequency, Spectrum, and Bandwidth
6. Analog and Digital Data, Signals, and Transmission
7. Data Link Layer Control Protocols
8. Multiplexing
9. Concepts of Spread Spectrum Signals
10. Circuit Switching and Packet Switching
11. Asychronous Transfer Mode
12. Routing in Switched Netwroks
13. Congestions Control
14. Wireless Networks
15. LANs
16. High-Speed LANs
17. Wireless LANs
18. Internetwork Protocols

19. Internetwork Operation
20. Transport Protocols
21. Network Security
22. Distributed Applications

Course Objective:
Students will demonstrate an understanding of the fundamental principles underlying computer data communications and be able to evaluate current technology and devices based on these fundamentals

Course Outcomes:
The course outcomes are skills and abilities students should have acquired by the end of the course. These outcomes are defined in terms of the ABET Accreditation Criterion 3 Program Outcomes which are relevant to this course. All Criterion 3 Outcomes are listed below and those relevant to this course are identified in the following Table.

Engineering programs must demonstrate that their graduates have:
(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs
(d) ability to an function on multi-disciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

ABET Criterion 3 Outcomes	Course Outcomes	Course Strategies & Actions
a	Students demonstrate that they can define and understand the fundamental physical principles of data transmission.	Lectures and homework covering all fundamental concepts of data communications.
e	Students demonstrate that they can apply their understanding of fundamental concepts to existing technological implementations.	Selected homework and lab assignments require students to examine and compare specific current technological devices and underlying fundamentals.
h	Students demonstrate that they understand current communications systems and how they are integrated into consumer products.	Each fundamental topic covered is described as it applies to one or more existing implementations of today's technology. Emerging technologies are examined when applicable.
i	Students demonstrate that they clearly understand the distinction between fundamentals and current implementations.	Each fundamental topic covered is described as both a theoretical concept and as it applies to one or more existing implementations of today's technology.
j	Students demonstrate that they understand the current standards organizations and the process of defining communications standards.	Lectures and homework covering the different standards organizations that define communications standards.

Laboratory Projects:
Each student will choose one hardware and one software laboratory project to be implemented and reported on.

Computer Usage:
The computer laboratory in room SEM 342D will be available for implementing and testing student projects.

Student Participation:
Students are expected to attend all classes and read all of the assigned sections of the textbook. Often, material will not be covered in both lectures and reading assignments. Thus, both are essential to a full understanding of the course content. Also, completion of homework is essential. Homework will be due each TUESDAY, or the next following class if there is no Tuesday class.

LATE HOMEWORK WILL NOT BE ACCEPTED OR GRADED.

Students are encouraged to study together, but each person must prepare his or her solutions and have a firm understanding of any work turned in. When you put your name on your homework you are stating that it is your own work and not the work of another person. As a reminder of UNR academic standards, please read page 80 in the 2007-2008 University Catalog defining these standards. Specifically, the following: "*Plagiarism is defined as submitting the language, ideas, thoughts or work of another as one's own; or assisting in the act of plagiarism by allowing one's work to be used in this fashion*." This means that if another student asks to borrow your work to copy - JUST SAY NO - or you are participating in plagiarism.

Students enrolled in CPE 600:
1. Graduate students will achieve a deeper understanding of the material presented to the combined group through several course activities including special meetings, a design paper, a research paper, and an oral presentation of their research results.

2. Graduate students are expected to perform at a level which demonstrates active interest and initiative in searching out knowledge of embedded game technology. This means that for each common assignment the graduate students are expected to demonstrate that they have mastered the concepts involve in the assignment. They are also expected to have examined some consequences of the game technology being studied and searched out others' comments on these consequences.

3. Graduate students meet as a group with the course instructor at least once per month for discussion of research methodologies and appropriateness of specific journals and conference proceedings for source material. Further, each graduate student meets individually with the course instructor at least once per month.

4. Graduate students must complete a game project design which involves the synthesis of a game device of their choice which integrates hardware and software to interface human input to an embedded games system. An example of such a project would be the design of modifications needed for a typical game controller which is designed for use with two hands to be effectively used by a person with only one hand.

5. These items 1 through 7 demonstrate the opportunities which graduate students have in this course for work at a higher academic level.

6. Graduate student work will be graded based upon the criteria defined in item 2 above. The assignments must be completed successfully and the student must demonstrate that he or she understands the context within which the assignment material exists in the larger filed of games and human computer interaction.

7. Graduate students are required to complete a research paper which details the evolution of a chosen aspect of video game technology and give an oral presentation of their results to the class. This research paper must include appropriate references from the scientific journals which have presented each step in the development of the technology as it evolved.

For example, the pivotal paper describing the development of computer generated sound is: *The Synthesis of Complex Audio Spectra by Means of Frequency Modulation*, by John M. Chowning, Stanford Artificial Intelligence Laboratory, Stanford, California, J*OURNAL OF THE AUDIO ENGINEERING SOCIETY*, pp 526-534, 1973. The abstract for this paper is included below.

> "A new application of the well-known process of frequency modulation is shown to result in a surprising control of audio spectra. The technique provides a means of great simplicity to control the spectral components and their evolution in time. Such dynamic spectra are diverse in their subjective impressions and include sounds both known and unknown."

The experience gained from preparing the research paper will contribute directly to graduate student capabilities for thesis and dissertation preparation.

Course Grade Structure:
Each course activity will contribute to the course grade as shown below. All activities will be graded on a scale of 0-100 points, and the final course grade will be determined as shown below. All quizzes and exams given in this course will be closed notes and closed books. Only calculators and materials handed out at the time of the exam may be used.

Normally, plus/minus grades are not given in this class. The instructor reserves the right to assign plus/minus grades under special circumstances involving borderline grades based upon class participation. Your grade will never be lower than defined below unless you have an excessive number (3 or more) of un-excused absences from class, however, positive class participation can be used as a basis for raising your grade.

UNDERGRADUATE		GRADUATE	
Homework and quizzes	25%	Homework and quizzes	20%
Mid-term exam	25%	Mid-term exam	20%
Final exam	50%	Final exam	25%
		Research Paper	20%
		Design Paper	15%
= COURSE GRADE	100%	= COURSE GRADE	100%

90 - 100 points = A
80 - 89 points = B
65 - 79 points = C
50 - 64 points = D
00 - 49 points = F