

CSUS

COLLEGE OF ENGINEERING AND COMPUTER SCIENCE
Department of Computer Science
ECS 3018 Phone: 278-6834

C Sc 275 - Advanced Data Communication Systems

Spring 1999

INSTRUCTOR: *Isaac Ghansah*

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CATALOG DATA:

Fundamental concepts, principles and issues of Data Communication Systems. The ISO/OSI reference model is used as a vehicle for discussion and the course emphasizes lower layers of the model. Specific topics include: motivation and objectives, layered architectures, physical layer principles and protocols, data link and multiple-access control principles and protocols, circuit and packet switching, local area network design principles and performance comparisons, introduction to wide area network architectures. Typical examples and standards are cited for point-to-point, satellite, packet radio and local area networks.

PREREQUISITE: C Sc/Cp E 175, or C Sc 205, or permission of instructor. Not offered every semester.

TEXTBOOKS:

- 1. *W. Stallings, Data and Computer Communications, 5ed Macmillan, 1997***
- 2. *I. Ghansah, C Sc 275 Class Notes, 1999***

REFERENCES:

1. F. Halsall, *Data Communications, Computer Networks, and Open Systems*, 3 ed., Addison Wesley Press, 1992
2. W. Stallings, *High-Speed Networks*, Prentice Hall, 1998
3. J. Spragins, *Telecommunications: Protocols and Design*. 1991, Addison Wesley.
4. C. Patridge, *Gigabit Networking* 1994, Addison Wesley.
5. L. Peterson and B. Davie, *Computer Networks*, 1996, Morgan Kaufmann.
6. *Recent Articles* from the technical literature and product information from manufacturer's literature.

GOALS:

1. To develop state-of-the-art knowledge of advanced topics in data communications.
2. To develop breadth and depth of knowledge of commercially available local and metropolitan area networks.

3. To provide understanding of modern data communication hardware/software interfaces, architectures, configurations, and protocols.
4. To provide programming experience in implementing serial drivers for data link protocols.

PREREQUISITES BY TOPIC:

1. Computer Organization principles including DMA
2. Telecommunication vocabulary and concepts
3. Parallel and Serial Interfacing
4. Probability theory

GRADING POLICY:

Midterm	30%
Final	40%
Homework	10%
Project	20%

Grading Breakdown (%)

A=93-100	C=73-76
A-=90-92	C-=70-72
B+=87-89	D+=67-69
B=83-86	D=63-66
B-=80-82	D-=60-62
C+=77-79	F=59 or below

COURSE POLICIES:

1. Late assignment/project will be penalized by 20% if one lecture late. Nothing will be accepted if more than one lecture late.
2. Make-up exams will only be given under extreme circumstances. The instructor reserves the right to reject make-up requests.
3. Attendance will not be taken after first week of classes. However, you are responsible for material presented and announcements made in class.
4. Be aware of the school's policy on *drops, incompletes, and cheating*.
5. **Discussion among students in assignments and projects is part of the educational process and is encouraged. No discussion among students is allowed in any exams/quizzes. However, each student must make an effort to do his/her own work in all assignments and exams. No type of plagiarism will be tolerated except in the case of group work. In that case each student should indicate the part of the work which was their major responsibility in their final joint submission. Nevertheless, any work submitted is a contractual obligation that the work is the student's and for which he/she could be quizzed in detail. The Dean of Students will handle any type of cheating which is brought to the attention of the instructor.**

ADVICE on WORKLOAD and CLASS NOTES:

This course covers several different contemporary topics in data communications. It is a *fast-paced* course and hence a busy one. There is a lot of reading assignments.

You should endeavor to read the assigned pages before coming to class. There will also be *homework* assignments to be handed in. In addition, you will be required to complete an *independent project*, which is worth a considerable fraction of your grade for the course.

The *class notes* you will purchase should be considered as a guide. Many parts of it are not detailed enough to be self-contained. Therefore, *attendance* to class is necessary in order to understand the details.

Independent Projects:

Independent student projects involving programming (ie. simulation or implementation), or research paper. The instructor provides a list of possible projects. Students may choose their own topics upon approval of instructor. Joint programming projects are encouraged.

SOME USEFUL REFERENCES

BOOKS:

- 1) A. S. Tanenbaum, "Computer Networks, 3ed.", Englewood Cliffs: Prentice Hall, 1996
- 2) J. E. McNamara, "Technical Aspects of Data Communication, 3ed." Maynard, MA: Digital Press, 1988
- 3) W. Chou (editor), "Computer Communications, Vol. 1 Principles" Englewood Cliffs, NJ: Prentice Hall, 1983
- 4) A. Meijer and P. Peeters, "Computer Network Architectures" Rockville, MD: Computer Science Press, 1982
- 5) W. Stallings, "ISDN and Broadband ISDN", Macmillan 1992
- 6) M. Schwartz, "Telecommunication Networks: Protocols, Modeling and Analysis," Reading, MA: Addison Wesley, 1987
- 7) L. Kleinrock, "Queuing Systems, Vol. I & II," New York: John Wiley and Sons, 1976
- 8) W. Stallings, Local and Metropolitan Area Networks, 5ed., Macmillan 1997.
- 9) F. da Cruz, Kermit: A File Transfer Protocol, 1987.
- 10) J. Walrand, "Communication Networks: A First Course", 1991, Aksen Assoc

JOURNALS:

- 1) Data Communications (Published monthly by McGraw Hill)
- 2) Computer Networks and ISDN. (Published monthly by North-Holland)
- 3) IEEE Communication magazine (Published monthly by IEEE Commun. Soc.)
- 4) IEEE Journal of Selected Areas in Communication
- 5) Conference Proceedings. IEEE INFOCOM
- 6) Conference Proceedings. IEEE GLOBECOM
- 7) Conference Proceedings. International Conference on Communications
- 8) IEEE Network Magazine
- 9) Computer Communication Review (Publ. ACM SIGCOMM)
- 10) IEEE/ACM Transactions on Networks.

NOTES:

- 1) Principles, Concepts, and Performance will be stressed rather than detailed descriptions of Implementations.
- 2) Supplementary reading material will be provided at appropriate times if necessary.

C Sc 275 - TENTATIVE SCHEDULE

week	SUBJECT MATTER	READING
1	Introduction and Review. Motivation. Types. Examples. The ISO/OSI and TCP/IP Architectures.	Chap. 1, 15
2	Physical Layer Concepts- capacity, bandwidth, data rate. Nyquist and Shannon's Theorem. Physical layer protocol examples.	Ch.2-5
3	Data Link Control. Functions. Errors. Cyclic Redundancy Check (CRC). Proof of CRC algorithm; Hardware implementation. ARQ protocol. Flow control. HDLC and variants. DDCMP. Performance issues.	Ch. 6
4	Circuit, Message and Packet Switching. Performance. Multiplexing. T1 and SONET Multiplexing. DS-n, OC-n, and STS-n Formats.	pp. 230-264; 198-225
5	Packet Broadcast Systems. Multiple Access Protocols: Random access, polling/token passing, and reservation protocols.	Class Notes
6	Local Area Networks (LANs) - Principles, Implementation and Design issues. ISO/IEEE 802.x LAN standards.	Ch. 9;Class Notes
7-8	High Speed LANs and Metropolitan Area Networks (MANs). Fast Ethernet; 100VG AnyLAN. FDDI; Distributed Queue Dual Bus (DQDB) (IEEE 802.6 Standard); Integrated Services in LANs. FDDI-2. LAN Performance Comparison and Interconnections. Transparent and Source Routing Bridges	P411-412; 427-431; 420-427; Ch. 14; Class Notes
9-11	Fast packet switching. Frame Relay. Cell Networking. Asynchronous Transfer Mode (ATM). ATM LANs. Traffic Policing. ATM Congestion Control.	Ch. 11;Class Notes.
12-13	Integrated Services Digital Networks (ISDN) and Broadband ISDN. Advanced Topics.	740-768; Notes
14-15	Project Presentations.	
16	Final Exam	

SPRING BREAK:

FINAL EXAM SCHEDULE: