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SYLLABUS

COURSE: **ENEE 756 COMPUTER NETWORKS** **TERM:** Fall 2008

INSTRUCTOR: Dr. Charles B. Silio

Office Hours: Tues. & Thurs 8 – 9 a.m., & 11 a.m. – 12 noon; otherwise, by appointment.

Course Days/Times: Tues. & Thurs.: 9:30 – 10:45 a.m. in room CSI 2118

CREDIT HRS: 3 **COURSE LEVEL:** Graduate

PREREQUISITES: Knowledge of probability theory (ENEE 324 or eqivalent) and digital computer architecture/design (e.g., ENEE 446 or ENEE 646).

REQUIRED TEXTBOOK:

L L. Peterson and B. S. Davie, *Computer Networks: A Systems Approach,* 4th Ed., Morgan Kaufmann/Elsevier, 2007, ISBN-13:978-0-12-370548-8 (case bound) or optionally, ISBN-13:978-0-12-374013-7 (paperback)

COURSE OBJECTIVES:

To study the principles, design, evaluation, and use of computer networks, especially local area networks and high speed ring networks.

COURSE DESCRIPTION:

This course will cover various aspects of computer networks including the network architecture, protocol layers, channel coding, data communication concepts, local area network (LAN) topologies and transmission media, basic queueing theory applied to LAN performance modeling, LAN access techniques, network interconnections, network reliability, and network security. Recent performance analysis work in the area of token and circuit-switched rings and reliability of fiber optic ring networks will also be covered.

TOPICAL OUTLINE:

I. Network Architecture
II. Physical Layer, digital communication, coding modulation, and media
III. Data Link Layer and Medium Access Control protocols, framing and reliable transmission
IV. Network Layer, packet switching, virtual circuits, datagrams, bridges, and LAN switches
V. Local Area Networks (e.g., IEEE 802, FDDI, Ethernets)
VI. Self-similar traffic, performance models and comparisons
VII. Internetworking, IP, and routing
VIII. End-to-end protocols, Transport Layer, TCP, UDP, RPC, congestion control
IX. Higher Layers, end-to-end data, and applications
X. Network reliability

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COURSE REQUIREMENTS: Homework, Exams, Term Paper/Project

HOMEWORK: (assigned, solutions provided, not marked)

EXAMS: two 75 minute exams (33.3% each)

Exam I (Thurs., Oct. 16) and Exam II (Tues., Dec. 16) (Tentative dates)

TERM PAPER/PROJECT: (33.3%)

Term Paper/Project Requirements:

Each student can choose to write a term paper or do a group project.

Term Paper:

For a **term paper** an individual student will choose a topic in networking, will research literature on the topic and write a term paper on the subject. The term paper must present a tutorial introduction to the topic, summarize the state of research specifying those problems that have been solved and identifying remaining open problems.

Project:

For a **project** students will form a group of no more than three students, do a project and write a project report. Course projects would typically involve the modeling of network systems and their performance evaluation by analysis and/or simulations.

Term Paper/Project Schedule:

proposal version 1, Tues., Oct. 7

proposal final version, Thurs., Nov. 6

final paper/report, Tues., Nov. 18

COURSE ORGANIZATION: The course is largely lecture/discussion oriented. The two exams the term paper/project are weighted about one-third each. For the first 11 to 12 weeks regular lectures will be held. Then the students will make presentations about their term paper/project. Students will chose a topic from a list to be provided or will make a reasonable alternate proposal. An outline with bibliography is due in about 4 weeks and the report is due in approximately 11 weeks.

REFERENCES:

1. A. S. Tanenbaum, *Computer Networks*, 4th Edition Upper Saddle River, NJ, Prentice-Hall PTR, 2003, ISBN: 0-13-066102-3.
2. W. Stallings, *Computer Networking with Internet Protocols and Technology*, Upper Saddle River, NJ, Pearson Prentice-Hall, 2004, ISBN: 0-13-141098-9.
3. W. Stallings, *High Speed Networks, TCP/IP and ATM Design Principles*, Upper Saddle River, NJ, Prentice Hall, Inc., 1998, ISBN: 0-13-525965-7.
4. D. E. Comer, *Internetworking with TCP/IP Volume I: Principles, Protocols, and Architecture*, 3rd Edition, Englewood Cliffs, NJ, Prentice Hall, Inc., 1995, ISBN 0-13-216987-8.
5. J. L. Hammond and P. J. P. O'Reilly, *Performance Analysis of Local Computer Networks*, Reading, MA, Addison-Wesley Publishing Company, 1986, ISBN 0-201-11530-1.
6. B. Albert and A. P. Jayasumana, *FDDI and FDDI-II Architecture, Protocols, and Performance*, Boston, MA, Artech House, Inc., 1994, ISBN: 0-89006-633-7.
7. G. E. Keiser, *Local Area Networks*, New York, NY, McGraw-Hill, Inc., 1989, ISBN: 0-07-033561-3.
8. W. Stallings, *Data and Computer Communications*, 3rd Edition, New York, NY, Macmillan Publishing Co., 1991, ISBN: 0-02-415454-7.

9. A. Mills, *Understanding FDDI*, Englewood Cliffs, NJ, Prentice Hall, Inc., 1995.
10. N. Lin and C. B. Silio, Jr., "A Reliability Comparison of Single and Double Rings," *IEEE Proceedings of INFOCOM '90*, San Francisco, CA, June 1990, ISBN 0-8186-2049-8, vol. II, pp. 504-511.
11. J. Yin and C. B. Silio, Jr., "A Reliability Analysis of Failsoft FDDI Networks," *IEEE Proceedings of the 17th Conference on Local Computer Networks*, Minneapolis, MN, Sept. 1992, ISBN 0-8186-3095-7, pp. 158-167.
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13. J. Yin and C. B. Silio, Jr., "K-Terminal Reliability in Ring Networks," *IEEE Transactions on Reliability*, vol. 43, no. 3, Sept. 1994, pp. 389-401.
14. C. B. Silio, Jr., H. M. Ghafir, and M. R. Parikh "An Approximate Method for the Performance Analysis of PLAYTHROUGH Rings," *IEEE Transactions on Computers*, vol. 41, no. 9, Sept. 1992, pp. 1137-1155.
15. M. R. Henry, "Performance Modeling of Asymmetric Traffic Patterns on Ring Networks," Ph.D. Dissertation, Univ. of Maryland, 1998.
16. H. Dao and C. B. Silio, Jr., "Ring Network with a Constrained Number of Consecutively-Bypassed Stations," *IEEE Trans. on Reliability*, vol. 47, no. 1, Mar. 1998, pp. 35–43.
17. L. B. Chai and C. B. Silio, Jr., "Voice Packet Transfer Time on an Integrated Services MARI-LAN," *Proceedings of the Twenty-ninth Annual Conference on Information Sciences and Systems*, The Johns Hopkins University, Baltimore, MD, Mar. 1995, pp. 725-730.
18. P. C. Hershey, C. B. Silio, Jr., and J. G. Waclawsky, "Real Time Traffic Measurements for High-speed Networks," *BT Technology Journal*, Vol. 13, No. 3, July, 1995, pp. 113-122.
19. S. Keshav, *An Engineering Approach to Computer Networking: ATM Networks, the Internet, and the Telephone Network*, Reading, MA, Addison-Wesley, 1997, ISBN: 0-201-63442-2.
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21. L. Kleinrock, *Queueing Systems, Vol. II: Computer Applications*, New York, NY, John Wiley & Sons, Inc., 1976, ISBN 0-471-49111-X.
22. H. Kobayashi, *Modeling and Analysis: An Introduction to System Performance Evaluation Methodology*, Reading, MA, Addison-Wesley Publishing Co., 1978, ISBN 0-201-14457-3.
23. A. Feldmann, "Characteristics of TCP Connection Arrivals," Chapt. 15 in *Self-Similar Network Traffic and Performance Evaluation*, eds. K. Park and W. Willinger, New York, NY, J. Wiley & Sons, 2000, ISBN: 0-471-31974-0.
24. S. Wantou-Siantou, "The Effects of Self-similar Traffic on the Performance of PLAYTHROUGH Ring Networks," Ph.D. Dissertation, Univ. of Maryland, 2006.
25. P. C. Hershey and C. B. Silio, Jr.,"Surmounting Data Overflow Problems in the Collection of Information for High Speed Communications Systems," *Proc. 2nd Annual IEEE International Systems Conference*, Montreal, Quebec, Canada, April 2008, ISBN: 978-1-4244-2150-3, pp. 493-500.

26 P. C. Hershey and C. B. Silio, Jr.,"Procedure for Information Collection on High-Speed, High-Bandwidth Communication Systems to Enable Network Management," *Proc. 6th Annual Conference on Communication Networks and Services Research (CNSR2008)*, Halifax, Nova Scotia, Canada, May 2008, IEEE Computer Society, ISBN 978-0-7695-3135-9, pp. 308-315.