Computer Science and Engineering CSE 4153
Data Communications and Computer Networks

REQUIRED/ELECTIVE:
Computer Science: Elective
Software Engineering: Required
Computer Engineering: Required

CATALOG DATA:
(Prerequisites: CS 2383 and ECE 3724, all with a grade of C or better) The concepts and practices of data communications to provide the student with an understanding of the hardware and software used for data communications.

PREREQUISITE BY TOPIC:
1. Introduction to computers and computing.
2. Data representation and structures.
3. Elementary algorithm design and analysis.
4. C or C++ Programming.

TEXTBOOKS AND OTHER REQUIRED MATERIAL:
Andrew Tanenbaum, *Computer Networks,4th* Ed., Prentice-Hall*,* 2003.

J. F. Kurose, K. W. Ross, C*omputer Networking: A Top Down Approach Featuring the Internet , T*hird Edition*,* Addison-Wesley, 2004.

COORDINATOR:
Mahalingam Ramkumar, Assistant Professor, Department of Computer Science and Engineering

COURSE OBJECTIVES:
1. To develop students' ability to understand network hardware, software, and protocol architecture and to use standard APIs for client-server computing across the Internet or in intranets.
2. To further students' network performance analysis capability through evaluation of network protocol behavior and performance in problem-oriented settings.
3. To introduce students to state-of-the-art networking hardware and software systems, relevant to the modern, networked infrastructure of the world, with practical lessons about evolution of such systems.

TOPICS COVERED: (Number of class hrs)
1. Introductory material – overview of networks (layers, uses, types of networks, protocols). 3
2. Methodology for network design/construction - ISO OSI RM seven-layer model, separation of concerns, LANS, MANS, WANS, and how networks are composed. 5
3. Qualitative design issues – naming, multiplexing, de-multiplexing, diversity of network connectivity, compatibility, data formatting, frame formats and encoding, alignment. 2
4. Quantitative design issues – latency, bandwidth, network capacity, error detection, link-layer reliability protocols. 6

5. Ethernet : the physical layer and data-link layer, composition of Ethernet segments, different Ethernet variations (10BaseT, 100BaseT, Gigabit/s Ethernet, other legacy forms). 5
6. Network topologies: metrics (diameter, connectivity, cost, bisection width, bandwidth), stars, busses, store-and-forward, cut-through, packet-switched. 2
7. Topological devices: routers, switches, bridges, repeaters; cut-through vs. store/forward. 2
8. Network layer: internetworking, routing, and IP-relevant strategies/approaches. 5
9. Protocols: go-back-N, selective repeat, TCP/IP, UDP/IP, and related protocols. 8
10. The Berkeley sockets API, client-server and peer distributed application, programming strategies, and examples. 4
11. Exams 3

CONTRIBUTION TO PROFESSIONAL COMPONENT:

List Professional component appropriate for this course: Math & Basic Sciences, Engineering Topics or General Education. There is no need to break down hours of engineering science and/or design. If program specific criteria are addressed in the course, they should be listed here as well.

ASSESSMENTS:

1. Quizzes
2. Exams
3. Programming assignments

RELATIONSHIP TO PROGRAM OUTCOMES:

1. The student will be able to list and explain the ISO OSI Reference Model (seven layers plus MAC) and the TCP/IP model. (7, 8; a, b, e, k)
2. The student will be able to explain roles of repeaters, bridges, routers and switches in networks and inter-networks, including the Internet. (7, 8; a, b, e, k)
3. The student will be able to quantify the behavior of simple protocol scenarios, and compare and contrast the performance of link-layer reliability protocols under varying error conditions. (7, 8; a, b, e, k)
4. The student will be able to design, implement and test client-server applications using the Berkley sockets API. (3, 5, 7; a, b, c, e, k)
5. The student will be familiar with the distinctive roles of network hardware, software, and protocols in practical systems, and how LANs and MANs are composed to form the Internet. (7, 8; a, b, e, k)

PREPARED BY:

Mahalingam Ramkumar, Assistant Professor, Department of Computer Science and Engineering, Dec 22, 2004.

ESTIMATE CSAB CATEGORY CONTENT:

	CORE	ADVANCED		CORE	ADVANCED
Data Structures		1	Computer Organization and Architecture		
Algorithms		1	Concepts of Programming Languages		
Software Design		1			

ORAL AND WRITTEN COMMUNICATIONS:

Every student is required to submit at least __1___ written reports (not including exams, tests, quizzes, or commented programs) of typically __5___ pages and to make __0___ oral presentations of typically __n/a___ minutes duration. Include only material that is graded for grammar, spelling, style, and so forth, as well as for technical content, completeness, and accuracy.

SOCIAL AND ETHICAL ISSUES:

Security, privacy and ethical issues in the Internet are mentioned. Coverage is about 1 hour distributed over the term.

THEORETICAL CONTENT:

Analysis of Protocols (3-5 lectures)

PROBLEM ANALYSIS:

Students are expected to analyze performance of protocols as part of their various programming assignments.

SOLUTION DESIGN:

All students are expected to design, implement and test client-server based programs for a few commonly used applications.