Communication Networks (55:054)
(Required: Information Engineering Track)

Catalog Description:
Communication networks, layered network architectures, applications, network programming interfaces (e.g., sockets), transport, congestion, routing, data link protocols, local area networks, emerging high-speed networks, multimedia networks, network security, Internet protocol and technology examples

Pre(co)requisites:
057:017 [P], 22S:043 [C]

Textbook:
Kurose and Ross, Computer Networking: A Top-Down Approach Featuring the Internet, Fourth, Edition, Addison Wesley, 2007

References:
None

Topics (Class Hours):
1. Introduction to networking (3)
2. Application layer protocols: HTTP, FTP, SMTP, DNS, peer-to peer apps. (6)
3. Sockets API: sockets and sockets programming (UNIX or Java) (2)
4. Transport layer: reliable data transfer (GBN, SR) and congestion control (TCP, ABR) (6)
5. Network layer: service models, routing algorithms, addressing, Internet protocols (8)
6. Link layer: services, multiple access protocols, LAN technologies, interconnections (8)
7. Mobility and wireless issues—WiFi, Mobile-IP, cellular networks (4)
8. Multimedia networking: requirements, best effort approaches, regulated approaches (5)
9. Examinations (2)

Laboratory Projects:
Students conduct laboratory experiments using a network traffic analyzer (packet sniffer) to examine and analyze the behavior of network applications and protocols.

Class/Laboratory Schedule:
Three 50-minute lectures per week; lab is arranged

Writing Assignments and Oral Presentations:
None

Design Component:
None

Contribution to the Requirements of Criterion 5:
Engineering topics: 3 s.h.

Course Goals: Basis for Assessment and Mapping onto Outcomes

Course Goal	Basis For Goal Assessment	Supports ABET Outcomes
1. The student will be able to list and classify network services, explain why they may be layered and use standard reference models to anticipate the service relationships encountered in real networks.	Exam questions, lab reports	e(●), j(●), k(●)
2. The student will know why network applications use the client/server model and be able to explain how persistency, pipelining, parallelism and caching may impact application performance.	Homework, exam questions	e(●), j(●), k(●)
3. The student will have experimented with, and be able to explain, key Internet applications and their protocols, and will have written and tested several of their own applications using the sockets API.	Lab reports, homework (programming assignments)	a(●), c(●), e(●), g(○), j(●), k(●)
4. The student will know how TCP and UDP connections are set up and torn down, how TCP's slow start scheme controls rate, and why set-up and tear-down conventions, and rate controls, are needed	Lab reports, Homework, exam questions	e(●), j(●), k(●)
5. The student will understand the pros and cons of circuit and packet switching, and datagram and virtual circuit routing, and will be able to explain how key switching and routing algorithms work.	Homework, exam questions	e(●), j(●), k(●)
6. The student will know how Internet hosts, connections, packets and frames are addressed; how these addresses are assigned and maintained; and how routing and switching algorithms use them.	Lab reports, homework, exam questions	e(●), j(●), k(●)
7. The student will know how coding and ARQ schemes detect and correct errors and will be able to explain, and estimate the efficiency of, standard sliding window flow and error control protocols.	Homework, exam questions	a(●), e(●), j(●), k(●)
8. The student will be able to explain, and estimate the efficiency of, key media access control protocols including ALOHA, slotted ALOHA, CSMA-CD, and collision avoidance.		a(●), e(●), j(●), k(●)
9. The student will be able to list and explain application layer and next generation Internet approaches to providing the service quality required for multimedia networking.	Homework, exam questions	e(●), j(●), k(●)
10. The student will gain an appreciation of emerging networking issues and technologies, and the rapid pace at which networking traffic and infrastructure are changing.	Homework, exam questions	a(●), e(●), f(○), h(○), i(○), j(●)

◦ denote moderate contribution to the outcome; • denote substantial contribution to the outcome

Performance Criteria:

Instructor completes a Course Outcome Rating (COR) that quantitatively evaluates student performance for each course goal-related outcome using a standard scale (4.0 = outstanding ability; 3.0 = good ability; 2.0 = adequate ability; 1.0 = poor ability; 0.0 = no ability). Instructor chooses appropriate graded course artifacts (homework questions, exam questions, etc) for each outcome rating. COR scores below 2.5 are indicative of problems with meeting course goals/outcomes and COR scores below 2.0 indicate failure to adequately meet course goals/outcomes.

Prepared By:

Jon Kuhl (January, 2007)