

CMPSCI 653: Computer Networks

Prashant Shenoy

Department of Computer Science,
University of Massachusetts
Amherst, MA 01003

E-mail: shenoy@cs.umass.edu, Phone: (413) 577-0850, Fax: (413) 545-1249
URL: <http://www.cs.umass.edu/~shenoy/courses/653>

Course Goals

- Learn the design and implementation of computer communication networks, and their protocols, services and applications
- Course will focus on both theory and practice of computer network design
- Hands-on experience through programming assignments/projects
- Case studies: learning through examples

- **Recommended texts**
 - Computer Networking: A Top-Down Approach Featuring the Internet
Jim Kurose and Keith Ross
<http://www.seas.upenn.edu/~ross/book/Contents.htm>
 - Computer Networks, 3rd ed, A. Tannenbaum
 - Available from the Textbook Annex (estore.aux.umass.edu, (413) 545-3570)
- **References**
 - Data Networks, 2nd ed, Bertsekas and Gallager
 - Computer Networks, 2nd ed, Peterson and Davie
 - An Engineering Approach to Computer Networks, S. Keshav
 - Comer, Stevens series books on TCP/IP

Course Materials

- **Graduate level course in Computer Networks**
- **Prerequisites**
 - Basics of Operating Systems and Computer Architecture
 - Good programming skills in a high level programming language (C, C++, or Java)
- **Course Grade**
 - Homeworks - 20%
 - Programming assignments/project - 40%
 - Two exams (one midterm, one final) - 40%

Course Requirements

Course Materials

- Video tapes of each lecture on reserve in Physical Sciences library
- Course web site: <http://www.cs.umass.edu/~shenoy/courses/653>
- All class materials (slides, handouts, homeworks) will be posted on the class page
- Broadcast email list: cs653@cs.umass.edu

Course Outline

- **Introduction**
 - Networks, network applications
 - Layered network architecture
 - Brief history
- **Physical Layer**
 - Different transmission media
 - Mixed media in networks

Course Outline

- **Data Link Layer, LANs**
 - Point-to-point DLC: PPP
 - Multiple access Ethernet, IEEE 802.*
 - Address resolution: ARP
 - Switched LANs, ATM LANs
 - Hubs and bridges
 - Network interface: OS issues

Course Outline

- **Network Layer**
 - Service models
 - Routing principles
 - Internet protocol (IPv4, IPv6), ICMP
 - Intradomain and interdomain routing
- **Transport layer**
 - Unreliable and reliable data transfer
 - Congestion and flow control
 - Quality of service
 - Case studies: TCP, UDP, ATM ABR

Course Outline

- **Application layer**
 - Application requirements
 - Case studies: DNS, HTTP, FTP, email
- **Multimedia networking**
 - Audio and video streaming, RTP, RTSP
 - Quality of service in networks
 - * Packet scheduling
 - * RSVP
 - * Integrated and differentiated services

Course Outline

- **Network Security and Management**
 - Network management issues, SNMP
 - Cryptography
 - Authentication
 - Public key encryption
 - Case studies: PGP, IPsec
- **Future directions**
 - Next generation internet
 - Mobile networks: mobile IP