

ECE 544: Communication Networks II, Spring 2013

This course is intended to provide an in-depth and practical understanding of modern computer networks that constitute the Internet. The scope includes network architecture, key technologies, layer 2 and layer 3 protocols, and examples of specific systems. Emphasis will be on network protocols and related software implementation. The course includes a hands-on “clean-slate” network prototyping project involving specification, standardization and software implementation.

Meeting Time: Fridays, 3:45-6:30PM, Hill 116

Course Instructors: Prof. D. Raychaudhuri (ray@winlab.rutgers.edu). Office Hours: 2:00-3:30 Fri by appt (send email to request), WINLAB Tech Center C103 & CORE 501. Teaching Assistant (for prototyping project): Mr. Akash Baid (baid@winlab.rutgers.edu). Selected classes will be taught by guest lecturers.

Text: Peterson & Davie, “Computer Networks: A Systems Approach”, Morgan Kaufman, 4th or 5th ed. This is a required textbook used for about 60-70% of the material covered. Additional reading materials to be distributed or downloaded, including IEEE standard specs (e.g. 802.3 and 802.11), Internet RFC’s (e.g. 793, 768 & 791), and papers on specific systems.

Course Information: comnet2 mailing list comnet2@winlab.rutgers.edu (to be activated by 2/1), website: www.winlab.rutgers.edu/comnet2 . Register for the mailing list at: <http://lists.winlab.rutgers.edu/listinfo/comnet2>

Grading Policy:

Midterm exam	(25%)	Final exam	(35%)
Network architecture paper	(10%)	Protocol project and report	(25%)
Class participation & homework	(5%)		

Course Outline: (some topics may not be covered in sequence or may be omitted; includes some guest lectures)

- L1----- 1/25 Introduction
- What is a network?
 - Different types of networks
 - How to specify requirements
 - Protocol layering and OSI architecture
 - Network API's/sockets & software issues
- Overview of Networking Fundamentals
- Network topologies
 - Packet formats
 - Resource Sharing
 - Packet forwarding & routing
 - Flow & congestion control
 - Transport layer
 - QoS, performance evaluation basics
- L2----- 2/1 Shared Media Protocols and LAN's
- MAC:
- 802.3 Ethernet,
 - 802.5 Token Ring
 - 802.11 Wireless LAN
- Bridges and LAN switching:
- learning bridge
 - spanning tree
 - multicast
- L3----- 2/8 Switched Networks
- Cell switching (ATM)
 - Cell format, SAR
 - VPI/VCI, signaling

- QoS control
- L4----- 2/15 Internet Protocol (IP) Basics
 - IP address
 - ARP
 - DHCP
 - ICMP
 - intra-domain routing (RIP, OSPF)
- L5-----2/22 Internet Protocol (IP) Advanced
 - subnets
 - classless inter-domain routing (CIDR)
 - inter-domain routing (BGP)
 - IPv6, IP QoS (diff serve, RSVP)
- L6-----3/1 IP Multicast
 - DVMRP
 - PIM
 - Reliable Multicast
- L7-----3/8 Network Hardware and Software
 - Wireless (802.11, 3G, WiMax)
 - Switches (Ethernet, ATM/MPLS, OpenFlow)
 - IP Routers
 - Network software basics (OS, drivers, protocols, management)
 - Socket programming intro

3/15 Mid-term exam

- L7-----3/29 Quality of Service (QoS)
 - Traffic Shaping
 - Flow Control
 - Admission Control
 - RSVP
 - IP Diff Serve
 - IP Int Serve and ATM QoS
- L8-----4/5 Protocol Project tutorial & standards meeting
(2-3 additional meetings to be scheduled as needed)
- L9-----4/12 Transport layer protocols
 - UDP
 - TCP
 - RTP
- L10-----4/19 Mobility protocols
 - mobile IP
 - ad-hoc routing, DTN
 - alternative approaches
- L11-----4/26 Security protocols
 - DES
 - RSA
 - public key
 - PGP
 - IPsec
- L12-----5/3 Advanced Topics
 - Content delivery networks (CDN)
 - Future Internet architecture

---- Final Exam (between 5/6-10, specific date TBA)

Course Projects:

1. Network Architecture project due on 3/29 (instructions to be given separately)
2. Routing protocol prototyping project due on 4/29 (instructions to be given separately)