Catalog description:
This laboratory course covers the technologies and protocols of the Internet. The experiments cover the Internet Protocol (IP), Address Resolution Protocol (ARP), Internet Control Message Protocol (ICMP), User Datagram Protocol (UDP) and Transmission Control Protocol (TCP), the Domain Name System (DNS), routing protocols (RIP, OSPF, BGP), network address translation (NAT), dynamic host configuration (DHCP), network management protocols (SNMP), and IP multicast.

Credit hours: 1 credit

Required or elective: Elective for CCE / ECE students

Prerequisites:
By course: EECE 450,
By topic: Internetworking (TCP/IP) concepts


References: None

Computer usage: Linux, Cisco IOS.

Course Objectives
1. Provide students with a hands-on experience in engineering an internet.
2. Provide students with an understanding of Internet technologies including addressing, routing, switching, network management, naming, address translation, and multicasting.
3. Train students to analyze, evaluate, and improve actual network configurations of IP routers and Internet servers.

Course Topics
1. Introduction to the Internet Lab
2. Single Segment IP Networks
3. Static Routing
4. Dynamic Routing Protocols (RIP, OSPF and BGP)
5. LAN Switching
6. Transport Protocols (UDP and TCP)
7. NAT and DHCP
8. The Domain Name System
9. SNMP
10. IP Multicast
Course Learning Outcomes

1. Can easily manipulate IP addresses and netmasks
2. Are able to wire a network and choose appropriate type of cables (straight-through cables / crossover cables / serial cables)
3. Are familiar with navigating and manipulating the Linux directory tree using basic Linux commands
4. Are able to run different network protocol analyzers, set up proper filters, and analyze the output data
5. Know basic IOS commands that are needed to configure a Cisco router on an TCP/IP network
6. Know basic Linux commands and files to edit that are needed to configure a Linux machine on an IP network (including Ethernet interfaces, default route and DNS)
7. Can configure an IP routing table on a Cisco router and on Linux using static entries
8. Know different methods to configure a Linux machine as an IP router
9. Understand the OSPF routing protocol and are familiar with OSPF default timers and convergence
10. Understand the RIP routing protocol and are familiar with its default timers, count-to-infinity problem and corresponding solutions as well as its convergence
11. Can configure RIP on a Cisco router as well as on a Linux machine
12. Can configure OSPF on a Cisco router as well as on a Linux machine
13. Are able to troubleshoot a simple network using IOS and Linux commands
14. Understand ProxyARP and its advantages
15. Understand ICMPredirect and its advantages
16. Understand the difference between FTP, TFTP and remote terminal protocols
17. Understand the differences between data transfers with UDP and with TCP
18. Understand IP fragmentation and its impact on UDP and TCP traffic
19. Understand how to analyze measurements of a TCP connection
20. Understand how TCP works: flow control, congestion control and retransmissions
21. Know how to configure a Linux machine as a bridge
22. Know how to configure a Cisco router as a bridge
23. Understand the Spanning Tree protocol (STP) and how it avoids forwarding loops that occur on a LAN
24. Understand the DHCP configuration protocol used and know what is a DHCP relay agent
25. Understand the main features of DNS
26. Understand the basics of IP multicast and IGMP

Class/laboratory schedule: One three-hour lab session per week.

Evaluation methods

1. Lab reports 75%
2. Final exam 20%
3. Lab participation 5%
Professional component
Engineering topics: 100%
General education: 0%
Mathematics and basic sciences: 0%

Person(s) who prepared this description and date of preparation
Ayman Kayssi, September 2004

Date of last revision
Revised by Ayman Kayssi in January 2009