JEFFERSON COLLEGE
COURSE SYLLABUS

ETT245
LOCAL AREA NETWORKS
3 Credit Hours

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CAREER & TECHNICAL EDUCATION
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ETT245 Local Area Networks
I. CATALOG DESCRIPTION

Prerequisite: None

Local Area Networks will prepare students to install and maintain local area network (LAN) equipment. Network configurations, file servers, network interface cards, cabling, bridge/routers, and network protocols are covered.

II. GENERAL COURSE OBJECTIVES

Upon Completion of this course, the student will be able to:

1. Install coax, twisted pair, and fiber optic cables to interconnect workstations, file servers, and printers used in a local area network (LAN).
2. Configure and install the hardware for a LAN file server.
3. Configure and install workstations and network interface cards.
4. Install a printer as a part of a workstation or as an independent device on a LAN.
5. Describe how bridges, routers, brouters, repeaters/hubs, and ISDN are used to create wide area networks (WANs) and metropolitan area networks (MANs).
6. Describe various LAN protocols.
7. Troubleshoot common hardware problems found in a LAN.
8. Describe server and peer-to-peer services normally commonly associated with LAN applications.

III. COURSE OUTLINE

A. Introduction to Networking
B. Communication Standards and Data Elements
C. LAN Technologies
D. Classic Ethernet
E. Token Passing Rings
F. Contemporary LAN Standards
G. Internetworking Devices
H. TCP/IP Family Protocol

IV. UNIT OBJECTIVES

A. Introduction to Networking

2. Define networks in terms of geographical scope.
3. Distinguish between open and proprietary systems.
4. Identify and define the most common LAN technologies.
5. Describe the advantages of the hybrid stat-wired topologies.
6. Distinguish between baseband and broadband signaling.
7. Describe the following access methods;
   a. CSMA/CD,
b. Token Passing,
8. Describe the following LAN types;
a. Ethernet,
b. Token Ring,

B. Communication Standards and Data Elements
1. State the seven layers of the OSI Reference Model.
2. Describe the lower three layers of the OSI Reference Model.
3. State and define the following forms of synchronization.
   a. *bit synchronization*
   b. *character synchronization*
   c. *logical synchronization* or *framing*
4. Contrast *connectionless* and *connection-oriented* service.
5. Contrast individual, multicast, and broadcast addressing.
6. *Contrast MAC address* and *LLC address.*
7. Describe the MAC frame format.
8. Identify common operating systems and networking operating systems.

C. LAN Technologies
1. Describe the following access methods;
   a. CSMA/CD,
   b. Token Passing.
2. Describe the following LAN types;
   a. Ethernet,
   b. Token Ring,
   c. FDDI,
3. Describe the Ethernet frame format.
4. State the IEEE standardization for CSMA/CD.
5. Describe the IEEE802.3 frame format.
6. Describe collision detection for 10Base5/10Base2 and 10Base-T mediums.
7. State the IEEE standardization for Token Ring.
8. Describe the basic transmission protocol for Token Ring.
9. Describe the IEEE802.5 frame format.
10. State the purpose of SMP, AMP, and Neighborhood Notification.
11. State the purpose and process of *beaconing.*
12. Define *bit time.*
13. Define *slot time.*

D. Classic Ethernet
1. Describe the Ethernet Transceiver functions.
2. Define the terms: *collisions*, *fragments*, and *jams.*
3. Distinguish between *Manchester* and *differential Manchester* encoding.
4. Compare the following transmission mediums in terms of distance, data rate, electromagnetic isolation, security issues, cost, installation issues;
a. unshielded twisted pair (UTP) (10/100 BaseT),
b. shielded twisted pair (STP),
c. coaxial cable (10Base5, 10BaseT),
d. optical fiber (FOIRL),
e. microwave,
f. infrared.

5. State the application of, and assembly/punch-down order for, Category 5 cable;
   a. patch and station (TIA/EIA 568B),
   b. horizontal.

6. State the following physical parameters for Category 5 UTP cable;
   a. number of cable pairs,
   b. maximum segment length,
   c. attenuation at 100 MHZ,
   d. characteristic impedance,
   e. Near End Cross Talk (NEXT),
   f. wire map.

7. State the application, and the transmit and receive pair pin assignments, for Medium Dependent Interface (MDI), and the Medium Dependent Interface-Crossover (MDI-X).

8. State the purpose of a media converter.

9. Construct and test;
   a. 10Base2 segments,
   b. 10BaseT, Category 5 segments;
      1. patch and station,
      2. horizontal.

E. Token Passing Rings

1. Identify the principal differences between token ring and CDDI.
2. Explain the token passing network assess protocol.
3. State the function of the MSAU.
4. Describe the various STP cables supported by token ring.
5. Describe the differences between FDDI and CDDI.
6. State the definition for DAS, DAC, and SAS.
7. State the encoding schemes used by token ring, FDDI, and CDDI.

F. Contemporary LAN Standards

1. Contrast classic Ethernet and Fast Ethernet.
2. Contrast Fast Ethernet and Gigabit Ethernet.
3. Contrast 100Base-TX, 100Base-FX, 100Base-T4, and 100Base-T2 physical medium specifications.
4. Contrast half-duplex and full-duplex operation in an Ethernet environment.
5. Describe \textit{auto-negotiation} in a 10Base/100Base Ethernet environment.

G. Internetworking Devices

1. State the purpose of a repeater.
2. State the difference between a Class I and Class II repeater.
3. State the definition of the term: *Ethernet Collision Domain*.
4. Identify the differences between repeaters designed for 10 Mbps, 100Mbps, and 1000Mbps.
5. State the difference between a repeater and a buffered distributor.
6. State the purpose of a multiplexer.
7. State the purpose of a bridge.
8. State the purpose of a router.
9. Explain the purpose and process of route discovery.
10. State the application for *source route bridging*.
11. State the application for the *Translation and Encapsulation* bridges.
12. State the function of the *transparent bridge*.
13. State the differences between a bridge and a Layer 2 switch.
14. State the purpose and functions of the 802.1D Spanning Tree Protocol.
15. State the purpose of a switch.
16. Contrast *static* and *dynamic* routing.
17. Identify various interior and exterior gateway protocols.
18. State the difference between *routable* and *non-routable* protocols.
19. Contrast RIP and OSPF.
20. Identify several popular operating systems that provide routing functions.
21. Explain the concept of OSPF *areas* and *route summaries*.
22. Identify the problems with RIP-based routing.

H. **TCP/IP Family Protocol**

1. State the principal purpose of TCP/IP as a networking protocol.
2. Describe the dotted decimal notation used for IP addressing.
3. State the range of the first octet of the IP address for class A, B, and C networks.
4. State the default subnet mask for class A, B, and C networks.
5. State the purpose for extending the subnet mask.
6. Distinguish between connection oriented and connectionless protocols.
7. Describe TCP, UDP, and IP in terms of connection and connection less protocols.
8. State the purpose of an IP gateway.
9. State the application for the following TCP/IP utilities:
   a. ftp,
   b. telnet,
   c. arp,
   d. ping,
   e. tracert.
10. State the four states of the Point-to-Point Protocol (PPP).
11. State the purpose served by the Dynamic Host Configuration Protocol (DHCP).
12. State the purpose served by a NAT (Network Address Translation) device.
13. Describe the purpose served by the Domain Name System.
V. METHODS OF INSTRUCTION

A. Lecture
B. Textbook Exercises
C. Demonstration
D. Laboratory
E. Computer Based Circuit Simulation
F. Group Participation

VI. REQUIRED TEXTBOOKS

ISBN 0-7668-3374-7

VII. REQUIRED MATERIALS

Scientific Calculator

VIII. SUPPLEMENTAL MATERIALS

None

IX. METHODS OF EVALUATION

A. Quizzes
B. Unit Examinations
C. Student Participation
D. Laboratory Performance
E. Homework Assignments

X. GRADE ASSIGNMENT

A. Distribution of the Final Grade:

  60% - Theory
  30% - Laboratory performance
  10% - Instructor evaluation of observed traits and characteristics

B. Assignment of Final Letter Grade:

  A - 90 to 100%
  B - 80 to 89%
  C - 70 to 79%
  D - 65 to 69%
  F - Below 65%
XI. ACADEMIC HONESTY

As a student in the Electronics Department, you are advised of the Statement of Academic Honesty published in the Jefferson College Student Handbook. Plagiarism, Cheating, and Computer misuse violate the College’s standards of academic honesty, and the expectations for conduct in the Electronics Department. Conduct related to assignments, examinations, or computer usage during the completion of assignments or examinations in violation of the standards of academic honesty may result in a failing (F) grade given for the assignment or examination, and potentially, the course.