DeVRY UNIVERSITY

Course Syllabus **Fall 2007**

Course Title:	Network Engineering
Course number:	EET301
Credit/Contact hour:	4-0-4
Course Dependency:	Prerequisite: EET202 **Required Co-requisite**: EET301L
Class Schedule:	
Instructor:	Tom Wheeler E-mail: twheeler@devry.edu Voice Mail: 816.941.0430 x5211
Office Hours:	Mon 1-1:50 pm; Wed 3-3:50 pm; Thur 12-12:50 pm Other times possible by appointment

Course Description

This course presents principles and techniques used in designing data networks. Topics include data communications fundamentals, noise effects, multiplexing methods, information theory, protocols, transmission methods, as well as architecture, representation, modeling and performance analysis of local areas networks (LANs).

Textbooks and Materials

Textbook/s Title:	**Ed**	**Author**
CCNA Guide to Cisco Networking	**3rd**	K. Caudle K. Cannon

Useful Resources

- If you're annoyed with HyperTerminal (and who isn't!), try downloading the package *EZ-TERM* from the instructor's web site (http://faculty.kc.devry.edu/twheeler). We use it on our lab computers.

- Other software utilities may be made available by the instructor.

Terminal Course Objectives (TCOs):

Following are the objectives for this course. Individual faculty, based upon their experience and expertise may add to these objectives to meet local campus needs. Any such additions will be communicated to the class. While the instruction remains focused in helping students, accomplishing these objectives is a shared responsibility of students and faculty. The outcomes of this course will depend upon the motivation and capabilities of the students, sufficient time allocation for studying, and the effectiveness of that effort.

DeVry University is committed to the continual improvement of its curriculum and instruction and to meet the needs of students and employers in a rapidly changing global economy. Students, faculty, and the university must all be actively involved to accomplish these objectives, as well as the objectives of this particular course.

Every class is to some extent a unique interactive experience, which may cause some variance within the stated objectives, in either content or level. Individual faculty, based on their experience and expertise, are encouraged to add objectives, as they deem appropriate, and to communicate these directly to the class. The outcomes of the course will depend on the design of the course, the quality of instruction, and the motivation and capabilities of the students, including time available for studying and the effectiveness of the effort.

1...Given specific requirements for various Local Area Networking (LAN) needs, determine whether a Client/Server Network or Peer-to-Peer Network is most appropriate. Also determine the LAN topology best suited for the design and the type of media. Explain the reasons for your choices. Requirements specified include number of hosts, security needs, size of LAN (single or multiple buildings)

2...Given an Ethernet LAN using the TC/IP protocol suite, analyze the creation of a TCP data packet and the flow of the data packet from one host to another on a different network (subnet). Examine the changes in the Ethernet II frame as it travels through the router separating the two networks. Discuss the relevant fields of the IP header and the TCP header.

3...Given a Class A, B or C network, determine the subnet mask required to support a specified number of subnets and/or users. Provide the network address of each subnet, the range of valid host addresses for each subnet and the Broadcast address for each subnet. Also given a host IP address and subnet mask, determine the subnet to which the host belongs.

4...Given a subnetted Local Area Network (LAN) subnet, determine the requirements for a DHCP server that will provide IP addresses, Subnet masks, a Default Gateway IP address and DNS IP addresses to DHCP Clients on the network.

5...Given various intranetwork topologies, determine the most effective distance vector IP routing method to use. Consider static, RIP v1 and IGRP. Justify your decision with an analysis of the capabilities and limitations of each IP routing methodology.

6...Given a specific Local Area Network (LAN) design, analyze the capabilities of a router to restrict IP traffic based on Source and/or Destination IP Addresses, Protocols, Port numbers and MAC addresses.

7...Given a need to connect to two LANs in separate geographical areas, decide on a WAN carrier and WAN technology that will best meet your needs in terms of cost, bandwidth, scalability and type of traffic. Justify your decisions.

8...Given a multiple-subnet network with the number of hosts on each subnet specified, create a subnet design that uses Variable Length Subnet Masking (VLSM) to minimize the number of wasted IP addresses. Specify the routing protocol that will support your design.

9...Given an Enterprise Network design, select a routing protocol to use. Consider RIP version 1, IGRP, RIP version 2, EIGRP and OSPF. Your selection of routing protocol should be based on the size of you network, bandwidth requirements, type of networking equipment used and routing overhead (CPU and memory).

10...Given a multiple switch Local Area Network (LAN), analyze the process by which routing loops are prevented while providing redundancy and load balancing through the switch fabric.

11...Given a large Intranet topology, design a logical set of VLANs on the switches that secure the network by department, floor or function. Indicate VLAN trunks in your design where a VLAN extends beyond a single switch and routing functions where communications must occur between VLANs.

12...Given a large Wired and Wireless Intranet topology with WAN connections to the Internet, create a high-level security plan that will provide protection against Internet intrusions and unauthorized access from internal users. The plan should address Physical Security, the use of Fire Walls and a DMZ, Private addressing, VLANs, ACLs and Controlling Wireless Access Points.

13...Given two building with established wired intranets within line of site of each other (separated by a distance 5 kilometers), produce a design for a wireless link to connect the two intranets. Specify the IEEE wireless standard to be used and the necessary equipment including Access-Points, Wireless Bridges and Antennas.

14...Document achievement of at least one Lab or Lecture Class TCO with a formal written report and/or an oral presentation in accordance with prescribed guidelines.

EET/CET Program Objectives and Outcomes:

(Student competencies achieved at the time of graduation)

1. Conduct experiments involving electronic systems using modern test equipment, interpret test results and use them to improve products or methodologies.
   - 1.1. Performs Needs Analysis – define the problem
   - 1.2. States goals and objectives of the experiment
   - 1.3. Identifies resources to conduct experiment (parts, equipment, data sheets, etc.)
   - 1.4. Develops a procedure and collect data using modern test equipment
   - 1.5. Analyzes test results and draw conclusions.

2. Create, implement high-level and Assembly language programs in support of technical activities.
   - 2.1. Analyzes the problem logically
   - 2.2. Designs the solution
   - 2.3. Implements the solution
   - 2.4. Tests and debugs the software

3. For EET: Use the principles of science, mathematics, and engineering technology to design, implement, and evaluate hardware and software solutions to complex technical problems,
   - 3.1. Selects and defines a meaningful problem taking safety, ethical, social, economic, and technical constraints into consideration.
   - 3.2. Devises process to solve problem
   - 3.3. Applies appropriate knowledge of scientific, mathematical, and engineering design tools toward the design and analysis of problem solutions.
   - 3.4. Identifies key issues in designing and building a prototype
   - 3.5. Builds, tests and troubleshoots prototype
   - 3.6. Optimizes prototype with a commitment to quality, timeliness, and continuous improvement.

For CET: Use the principles of science, mathematics, software engineering, and engineering technology to design, implement, and evaluate software solutions to complex technical problems.
   - 3.1 Identifies a meaningful problem and defines preliminary solution specifications taking safety, ethical, social, economic, technical constraints, and user requirement into consideration
   - 3.2 Designs and implements appropriate data structures and algorithms
   - 3.3 Prepares a plan of action to implement the system
   - 3.4 Applies scientific, mathematical, software, and engineering design tools toward the design and analysis of problem solution
   - 3.5 Writes and tests readable and maintainable code
   - 3.6 Optimizes code with a commitment to quality, timeliness, and continuous improvement

4. Communicate effectively both orally and in writing.
   - 4.1 Communicates effectively in wiring
   - 4.2 Communicates effectively orally

5. Work effectively in a team environment.
   - 5.1 Exhibits good dialoguing skills
   - 5.2 As part of a small group project, when assigned roles, performs roles effectively

6. Apply applied research and problem-solving skills to support learning at DeVry as well as life-long personal and professional development.
   - 6.1 Recognizes the need to know information beyond one's own expertise and has the ability to gather and synthesize the necessary information into the solution of a problem
   - 6.2 Uses engineering problem-solving methodology in solving problems

7. Evaluate the broader effects of technology and to identify connections between technology and economics, politics, culture, ethical responsibility, social structure, the environment and other areas.
   - 7.1 Identifies linkages and causal relationships between technology and social, political, economic, cultural, and environmental conditions.
   - 7.2 Works effectively in diverse environments and adapts technical solution to solution a diverse audience
   - 7.3 Pursues technical work within guidelines for professional, ethical, and social responsibility

Class Policies and Procedures:

Attendance

Each student is required to attend every lecture and laboratory session in which he or she is enrolled. A swipe-card terminal (ATS) in each classroom is used to record attendance electronically. Students are responsible for arriving before class begins, sliding their identification card through the wall-mounted reader, and remaining for the duration of the course meeting. Students who are absent for two or more days should notify their Professor or assigned Academic Advisor in advance. Students who miss more than five (5) consecutive days of school are in violation of the DeVry attendance policy and will be dismissed. **Unexcused absence in excess of 5 hours will result in a reduction of the final course grade by one letter**.

Homework Expectations

Homework is due at the beginning of class (xx00 UTC). *Late homework is not accepted unless mitigating circumstances are present (documentation will be required), and is not accepted more than one week past the due date.* Homework carries the weight of one major exam (100 points) in the course. Failure to do homework will do severe damage to your grade. (UTC=Universal Coordinated Time, or Standard World Time.)

Homework Performance Standards

- Unless specifically noted, all homework is to be done individually. If you need help solving a problem, it is acceptable to ask the instructor or a fellow student for assistance as long as you do your own work.

- For problems involving calculations, all work must be shown. If a numerical answer is obtained without doing a calculation, state clearly that this is the case. For example: "By inspection, the potential is 25 Volts."

- When showing work for numerical problems, all defining equations will be stated first. The last step in the problem will be substitution of values into the equations. For example:

  Given V = 20V and R = 5 Ohms, find the current I.

  $I = \frac{V}{R}$ (Comment: The defining equation, Ohm's law, is stated.)

  $I = \frac{20V}{5\Omega} = \underline{\underline{4A}}$ (Comment: Note that units are clearly displayed for the answer.)

- When a numerical answer is given, it must be boxed or underlined and have correct units attached.

- For program listings, your name must appear at the top of the listing. Each function must have a comment header stating the function name, purpose, arguments, and return conditions. Each major idea within the code must be properly commented.

- Programs that that lack appropriate division of functionality will receive a grade of zero (0). An example of such code would be a program performing all of its functionality within a single function such as `main()` when it would be more appropriate to divide the workload among several related functions.

(Homework Performance Standards are continued on next page)

Homework Performance Standards (Continued)

No credit will be given for any problems that have not been worked according to these instructions, or any additional instructions given by the instructor.

Homework will be kept in a 3-tab flexible folder, with the latest assignment in front. Your name, the course number, and the instructor's name must appear in clearly-readable form on the front of the folder.

Make-Up Exams

No make up exams are given in EET301 for any reason.

Course Grading Standards

There are three major exams, an unspecified number of quizzes given at random intervals, various homework assignments, and a final examination given in the 15th week of the course. Your grade will be determined as follows:

2 Best Major Exams	200 points (18% each, 36% total)
Quizzes/Homework	100 points (18%)
Labs	100 points (18%)
Final Exam	150 points (28%)
	550 points total for course

Note: No makeup exams are given. All examinations will be announced at least 1 week prior to administration. All students must take the final exam. A passing grade in lecture and laboratory is necessary in order to pass the course.

A final letter grade is to be awarded to each enrolled student in accordance with the 4.00 grading system shown below:

Letter Grade	***Percent of Total Points***	***Grade Points***
A	90 – 100%	4.00
B	80 – 89%	3.00
C	70 – 79%	2.00
D	60 – 69%	1.00
F	Below 60%	0.00

Academic Integrity Policy

Ideas and learning form the core of the academic community. In all centers of education, learning is valued and honored. No learning community can thrive if its members counterfeit their achievement and seek to establish an unfair advantage over their fellow students. The academic standards at DeVry are based on a pursuit of knowledge and assume a high level of integrity in every one of its members. When this trust is violated, the academic community suffers injury and must act to ensure that its standards remain meaningful. The vehicle for this action is the Academic Integrity Policy outlined in the *Student Handbook*.

The Academic Integrity Policy is designed to foster a fair and impartial set of standards upon which academic dishonesty will be judged. All students are required to read, understand, and adhere to these standards, which define and specify the following mandatory sanctions for such dishonest acts as copying, plagiarism, lying, unauthorized collaboration, alteration of records, bribery, and misrepresentation for the purpose of enhancing one's academic standing:

- The ***first recorded offense*** will result in the student receiving zero credit for the entire paper, exam, quiz, lab, homework assignment, or other graded activity in which the incident of academic dishonesty occurred. No partial credit may be given. Where the incident involved a graded assignment normally subject to a "drop" option, the student may not exercise that option.

- The ***second recorded offense*** will result in the student receiving a failing grade for the course in which the second offense occurs. The second offense need not be in the same course, program, or term as the first offense to invoke this sanction.

- The ***third recorded offense*** will result in the student being permanently expelled from the DeVry system. Again, the third offense need not be in the same course, program, or term as either the first or second offense to invoke the sanction.

Changes to Syllabus:

The contents of this syllabus are subject to change with appropriate notice to the students.

Weekly Course Schedule:

Week	Topics	TCO's	Reading Assignment	What's Due
1	OSI Model	1,2	C-1	
2	Serial Data Formats, Communications Codes & Information Theory	1,2	W-15	
3	Error Checking and Correction Coding	1,2,7,8	W-15	
4	**Exam #1**			Homework 1
5	LAN Networking Topologies, Media, and Devices	4,6	W-16,C-2	
6	Data Link Layer Protocols, Encapsulation & Multiplexing	2	Handout	
7	TCP/IP Introduction, IP Addressing	3	C-3	
8	Router Basics and Configuration	6	C-6	
9	**Exam #2**			Homework 2
10	Data Link Layer Switching and VLANs	7,11	C-13	
11	Network Routing: Interior routing protocols	5	C-8,C-9	
12	Network Security Introduction	12	C-10	
13	Network Security (Methods)	13	C-5	
14	**Exam #3**			Homework 3

* This schedule is tentative and subject to change to meet the needs of the class members.

Note: W = Wheeler Handout, excerpts from *Electronic Communications for Technicians, 2/e* (These PDFs will be posted under the Document Sharing feature of eCollege); C = Caudle/Cannon Text (CCNA)