

Saint Leo University

COM 309

Network Theory and Design

Course Description:

An introduction to the theory, design, and application of networks, the course will include the creation and operation of an actual network.

Prerequisite:

COM203

Textbooks:

White, C. (2016). *Data communications and computer networks: A business user's approach* (8th ed.). Boston, MA: Cengage Custom Publishing. ISBN-13: 978-1-305-76791-1

Learning Outcomes:

Upon completion of this course, the student will be able to describe and utilize the contents of the network theory and design course. Specific learning outcomes for this course are:

1. Describe basic configurations and architectures used for networks, their applications and development.
2. Describe and evaluate the TCP/IP protocol suite and define key terms used in describing the protocol in action.
3. Describe or discuss fundamentals of data analog or digital signals and representation codes such as EBCDIC, ASCII and Unicode and evaluate the organization and control of information.
4. Describe and evaluate conducted and wireless media including modems, ISDN, DSL, and cable, USB, SCSI, iSCSI, and fiber.
5. Describe and evaluate how to plan for multiplex environments, LAN, MAN and WAN systems and how to incorporate network security considerations into network design.
6. Utilize the SDLC design approach to develop a Network Design Project or Case that includes a Feasibility Study and Capacity Planning document.
7. **VALUES OUTCOME:** Utilize the Network Design Project or Case to give the student an opportunity to discuss, integrate and explain the element of integrity within the relevance of their project or case.

Core Value:

Integrity: The commitment of Saint Leo University to excellence demands that its members live its mission and deliver on its promise. The faculty, staff, and students pledge to be honest, just, and consistent in word and deed.

Evaluation:

The following criteria will be used to determine a final grade in the course:

Assessments:	Quizzes (8)	15%
Term Paper:	Proposal & Annotated Bibliography	5%
	First Draft	5%
	Final Draft	10%
	PowerPoint Presentation	5%
Assignments:	Labs (3)	18%
	Assignments (8)	32%
	Discussion Questions	10%
	Total	100%

Grading Scale:

Grade	Score (%)
A	94-100
A-	90-93
B+	87-89
B	84-86
B-	80-83
C+	77-79
C	74-76
C-	70-73
D+	67-69
D	60-66
F	0-59

Description of Assignments and Assessments

Quizzes:

There will be 8 quizzes in this course that will assess the learning objectives in each module. Students will have 30 minutes to complete each quiz, which will consist of 10 short-answer questions.

Assignments:

Students must complete all eight assignments in the course. The assignments will consist of questions from the required textbook. All questions must be answered and when possible, the students must show their work. Students will submit each assignment to the Assignment folder.

Discussion Questions:

Each module, students are to answer a discussion questions by posting their initial response. These represent an opportunity to interact with your classmates and hopefully reinforce the ideas in the lessons by allowing you to provide each other feedback. In each module, students are expected to post their own reply to the discussion question and also respectfully comment on at least two classmates' posts.

Term Paper:

In this course, students are responsible for completing a Term Paper. The Term Paper must be 8 -10 pages. There is an 8 page minimum length of content required, not including the title page and reference page. The Term Paper must be typed in APA format. Each student is required to choose a different topic to report on. The Term Paper will be submitted in four installments:

The topic should be related to computer networks or digital communication networks and also interesting to you, personally. The topic must be pre-approved by the instructor. **No two students may select the same topic**, so selection will be first-come, first-served. Sample topics might include ATM, BLOGs, Bluetooth, Cyber-stalking, Data Encryption Standard, Denial of Service Attacks, Digital Signatures, E-mail Fraud, Ethernet, Fiber Optics, HDTV, Evolution of HTML, Feistel Ciphers, Hash Functions, History of the Internet, iSCS, Man in the Middle Fraud, Online Banking, Online Privacy, Online Retail, the "Paperless Office", Password Quality, PGP, Phishing, Public Key Cryptography, Routing Algorithms, Secure Financial Transactions on the Web, Social Conventions on the Web, Spam, Structure of TCP/IP Packets, Virtual Private Networks (VPNs), VOIP (Voice over IP) Telephony, Telephone Cells, Web Filters, Wireless Hotspots, and Wireless Networking.

The term paper will be created in four stages: (1) proposal with annotated bibliography; (2) first draft; (3) final draft; and (4) PowerPoint presentation. The PowerPoint presentation will consist of 10-15 slides on the paper topic and will be posted to the Doc Sharing section for peers to review. Please note that the entire project is worth 25% of the class grade, with each individual stage being weighted as follows: (1) proposal with annotated bibliography - 5%; (2) first draft - 5%; (3) final draft - 10%; and (4) PowerPoint

Presentation - 5%. The first draft will be returned with instructions for correcting problems for the final draft. Please note that this is a development process: the bibliography from the proposal will become the "works cited" section of the paper, and the final draft will simply be a revision of the first draft.

The annotated bibliography, first draft, and final draft will be submitted via the Assignment folder. (The Assignment folder is linked to Turnitin.) The PowerPoint Presentation will also be submitted to the Assignment folder. In addition, the PowerPoint Presentation will be uploaded to Doc Sharing as a PowerPoint slideshow. Each component of the term paper must be written to high standards, with correct grammar, spelling, and appropriate usage.

The paper will be eight (8) to ten (10) pages in length, not including the "works cited" section. You must use APA formatting, including the use of proper citations. At least seven (7) reputable sources will be cited, and at least three (3) of those will be non-electronic, print sources. The citation of online encyclopedias such as Wikipedia is prohibited; however, other reputable online sources such as homepages of software or hardware manufacturers are fine and will probably prove useful for very current information as long as the appropriate citations are included. Visit Saint Leo's online library resources for assistance with APA formatting.

Due Dates:

Module 1: Topic must be selected and approved by the instructor.

Module 2: Proposal and annotated bibliography is due. (Do not begin before you receive approval from your instructor for your topic.)

Module 3: Continue working on Term Paper draft and PowerPoint Presentation

Module 4: Continue working on Term Paper draft and PowerPoint Presentation

Module 5: Submit your Term Paper draft. Continue working on the PowerPoint Presentation

Module 6: Continue working on the PowerPoint Presentation. After you receive feedback from the instructor on the Term Paper Draft, begin final revision for the Term Paper

Module 7: Final Term Paper and PowerPoint Presentation must be submitted. Also, upload PowerPoint Presentation for classmates to view

Proposal and Annotated Bibliography Guidelines (Due Module 2):

The research paper proposal should be typed using the APA style format. The proposal and final paper will be evaluated based on how extensively the student develop the issue and demonstrates depth and understanding of the subject. The Term Paper should show scholarly quality by demonstrating acceptable college level standards with respect to form and substance. The student should present the subject in a clear and concise manner. Points will be deducted for typographical, spelling, or grammatical errors. The format of the prospectus is as follows:

- Title: It must tell the reader the specific focus of the paper.
- Topic: Describe your personal interest. Show why the reader should be interested as well. What drew you to select this particular topic? Any personal or professional experiences that influenced your choice? Any biases you feel you may bring to the research topic as you begin? How can you address these biases?
- Importance: What is the significance of your work? You must address the daunting questions: Why should others care? So what? Why is this research a worthy enterprise?
- Literature Review/Background: Indicate what you have read and what you have not yet read. Indicate why you think sources are promising and relevant, what they contain or what you think they contain. It must include how will you structure your final paper. What will be some of the sections and subsections of your investigation? What is your strategy for the way your paper will proceed? You should describe what plan you will use in the text of your paper as background. A good research paper would include:
 - Tables (optional)
 - Figures (optional)

- Definition of terms: Define any technical term that is essential to readers understanding the research paper.
- Annotated Bibliography: The annotated bibliography section contains a complete listing of every pertinent work that has been personally reviewed by you in the process of completing your research paper. You must discuss the relationship of the literature you have reviewed to your topic. Search the web for additional information on how to prepare an annotated bibliography and review the sample provided in the Assignment folder area. 12 annotated bibliographies are required. In addition, explain how you found your resources. Provide keyword searches and database navigation so that other students may benefit from your strategies. Your completed annotated bibliography should be 500-750 words.

Rubrics

Term Paper Scoring Rubric:

Criteria	Points Possible	Score
The Term Paper is scholarly in nature and is complete.	10	
The topic, research, and main idea are identified and logically addressed.	10	
The Term Paper includes an extensive analysis of the evidence-based research.	20	
The research is properly defined and explained and includes a discussion of how the Saint Leo core value of Integrity is related to the topic.	30	
Writing and grammar skills are appropriate to the undergraduate level.	20	
APA Abstract and Table of Contents is complete and includes headings.	5	
The resources are completed and appropriately cited, and references use APA Style.	5	
Total	100	

PowerPoint Presentation Scoring Rubric

Criteria	Points Possible	Score
The PowerPoint is well researched and well presented.	20	
The PowerPoint uses appropriate instructional aids and graphics.	15	
The PowerPoint includes an extensive analysis of the information.	20	
The PowerPoint is scholarly, complete, and notes are included.	20	
Resources are completed and appropriately cited, and references use APA Style.	10	
Writing and grammar skills are appropriate to the undergraduate level.	15	
Total	100	

Module 1 Getting Started

Objectives: After completing this module, you should be able to:

- Define the basic terminology of computer networks.
- Outline the basic network layouts.
- Cite the reasons for using a network architecture.
- List and describe the layers of the TCP/IP protocol suite and the layers of the OSI model.
- Distinguish between data and signals.
- Identify the different data codes and how they are used in communication systems.

Assignments:

Items to be Completed:	Due No Later Than:
Post an introduction to the class	Thursday 11:59 PM EST/EDT
Read assigned material	
Post an initial response to the discussion question	Thursday 11:59 PM EST/EDT
Post responses to at least two classmates	Sunday 11:59 PM EST/EDT
Submit Lab 1	Sunday 11:59 PM EST/EDT
Submit Assignment 1	Sunday 11:59 PM EST/EDT
Complete Quiz 1	Sunday 11:59 PM EST/EDT
Email instructor Term Paper Topic for approval	Sunday 11:59 PM EST/EDT

Module 2 Plugging In

Objectives: After completing this module, you should be able to:

- Outline the characteristics of terrestrial and satellite microwave systems.
- Describe the basics of cellular telephones and the characteristics of short-range transmissions.
- Describe the characteristics of Wireless Application Protocol.
- Apply the media selection criteria of cost, speed, expandability, and distance, environment, and security.
- Cite the advantages of FireWire, SCSI, iSCSI, InfiniBand, and Fibre Channel interface standards.

Assignments:

Items to be Completed:	Due No Later Than:
Read assigned material	
Post an initial response to the discussion question	Thursday 11:59 PM EST/EDT
Post responses to at least two classmates	Sunday 11:59 PM EST/EDT
Submit Assignment 2	Sunday 11:59 PM EST/EDT
Complete Quiz 2	Sunday 11:59 PM EST/EDT
Submit Term Paper proposal and annotated bibliography	Sunday 11:59 PM EST/EDT

Module 3 Getting It There Efficiently and Safely

Objectives: **After completing this module, you should be able to:**

- Describe frequency division multiplexing.
- Describe synchronous time division multiplexing.
- Describe statistical time division multiplexing.
- Cite the characteristics of wavelength division multiplexing.
- Identify the different types of noise commonly found in a computer network.
- Specify and compare the different error-prevention techniques.

Assignments:

Items to be Completed:	Due No Later Than:
Read assigned material	
Post an initial response to the discussion question	Thursday 11:59 PM EST/EDT
Post responses to at least two classmates	Sunday 11:59 PM EST/EDT
Submit Assignment 3	Sunday 11:59 PM EST/EDT
Submit Lab 2	Sunday 11:59 PM EST/EDT
Complete Quiz 3	Sunday 11:59 PM EST/EDT
Continue working on Term Paper and PowerPoint presentation	

Module 4 The Local Area Neighborhood

Objectives: **After completing this module, you should be able to:**

- State the definition of a local area network.
- List the primary function, activities, and application areas of a local area network.
- Cite the advantages and disadvantages of local area networks.
- Identify the physical and logical layouts (topologies) of local area networks.
- Describe the common local area network systems.
- Compare and contrast wireless LANs to wired LANs.

Assignments:

Items to be Completed:	Due No Later Than:
Read assigned material	
Post an initial response to the discussion question	Thursday 11:59 PM EST/EDT
Post responses to at least two classmates	Sunday 11:59 PM EST/EDT
Submit Assignment 4	Sunday 11:59 PM EST/EDT
Complete Quiz 4	Sunday 11:59 PM EST/EDT
Continue working on Term Paper and PowerPoint Presentation	

Module 5 **Going Big: LANs to MANs and WANs**

Objectives: **After completing this module, you should be able to:**

- Identify the characteristics of metropolitan area networks.
- Describe how circuit, datagram, and virtual circuit packet-switched networks work.
- Identify the differences between connection-oriented and connectionless networks.
- Describe the differences between centralized and distributed routing.
- Describe the differences between static and adaptive routing.
- Discuss the basic concepts of network congestion.

Assignments:

Items to be Completed:	Due No Later Than:
Read assigned material	
Post an initial response to the discussion question	Thursday 11:59 PM EST/EDT
Post responses to at least two classmates	Sunday 11:59 PM EST/EDT
Submit Assignment 5	Sunday 11:59 PM EST/EDT
Complete Quiz 5	Sunday 11:59 PM EST/EDT
Submit Term Paper first draft and continue working on PowerPoint Presentation	Sunday 11:59 PM EST/EDT

Module 6 **The Internet and Delivery Networks**

Objectives: **After completing this module, you should be able to:**

- Discuss the responsibilities of the Internet Protocol (IP).
- Identify both IPv4 and IPv6 addresses.
- Identify the basic elements of a telephone system.
- List the basic characteristics of frame relay.
- Identify the main characteristics of asynchronous transfer mode.
- Describe the concept of convergence.

Assignments:

Items to be Completed:	Due No Later Than:
Read assigned material	
Post an initial response to the discussion question	Thursday 11:59 PM EST/EDT
Post responses to at least two classmates	Sunday 11:59 PM EST/EDT
Submit Assignment 6	
Submit Lab 3	Sunday 11:59 PM EST/EDT
Complete Quiz 6	Sunday 11:59 PM EST/EDT
Continue working on Term Paper and PowerPoint (Note: Make revisions after receiving instructor feedback for Term Paper)	Sunday of Module 7

Module 7**Keep It Secret, Keep It Safe: Network Security****Objectives:****After completing this module, you should be able to:**

- Recognize the basic forms of system attacks.
- List the techniques used to make data secure.
- Explain the difference between a substitution-based cipher and a transposition-based cipher.
- Outline the basic features of public key cryptography, Advanced Encryption Standard, digital signatures, and the public key infrastructure.
- Cite the techniques used to secure communications.
- Recognize the importance of a firewall.

Assignments:

Items to be Completed:	Due No Later Than:
Read assigned material	
Post an initial response to the discussion question	Thursday 11:59 PM EST/EDT
Post responses to at least two classmates	Sunday 11:59 PM EST/EDT
Submit Assignment 7	Sunday 11:59 PM EST/EDT
Complete Quiz 7	
Submit Term Paper final draft and PowerPoint	Sunday 11:59 PM EST/EDT
Upload PowerPoint Presentation to Doc Sharing for peers to review	Sunday 11:59 PM EST/EDT

Module 8**Network Design and Management****Objectives:****After completing this module, you should be able to:**

- Recognize the systems development life cycle and define each of its phases.
- Outline the differences among technical, financial, operational, and time feasibility.
- Describe the steps involved in performing a baseline study.
- Discuss the importance of a network administrator.
- Recognize the basic hardware and software network diagnostic tools.

Assignments:

Items to be Completed:	Due No Later Than:
Read assigned material	
Post an initial response to the discussion question	
Post initial response to the discussion question	Thursday 11:59 PM EST/EDT
Post responses to at least two classmates	Sunday 11:59 PM EST/EDT
Submit Assignment 8	Sunday 11:59 PM EST/EDT
Complete Quiz 8	Sunday 11:59 PM EST/EDT