I. INTRODUCTION

A. Networks are complex environments involving multiple media, multiple protocols, and interconnections to networks outside an organization’s central office. Well-designed and carefully installed networks can reduce the problems associated with growth as a networking environment evolves.

B. Designing, building, and maintaining a network can be a challenging task. Even a small network that consists of only fifty nodes can pose complex problems that lead to unpredictable results. Large networks that feature thousands of nodes can pose even more complex problems. Despite improvements in equipment performance and media capabilities, designing and building a network is difficult.

C. This chapter provides a review of the Open System Interconnection (OSI) reference model and an overview of network planning and design considerations related to routing. Using the OSI reference model as a guide for network design can facilitate changes. Using the OSI reference model as a hierarchical structure for network design allows you to design networks in layers. The OSI reference model is at the heart of building and designing networks, with every layer performing a specific task to promote data communications. In this semester, the focus is on Layer 1 through Layer 4.

D. Prerequisite: ITCC 1401, ITCC 1404, and ITCC 1408

Departmental approval is required.

II. LEARNING OUTCOMES

Upon successful completion of this course, the student will be able to determine:

A. The type and speed of LAN and WAN media to be implemented
B. How data is sent across the media
C. The type of addressing schemes used
D. How data will be reliably sent across the network and how flow control will be accomplished
E. The type of routing protocol implemented.

III. INSTRUCTIONAL MATERIALS

Required Text:
A. The instructional materials identified for this course are viewable through www.ctcd.edu/books
B. Required Equipment Provided by Department: Computer System

IV. COURSE REQUIREMENTS

A. This course has been designed with an on-line component to the curriculum. The student will be required to attend classes and labs. Tests are taken on-line. It is suggested that the student read the text and then take notes on the lecture. A complete journal will be due as requested. Late assignments will result in 10% less than full credit.

V. EXAMINATIONS

There are exams for each completed chapter, a skills-based exam, and a final exam. All exams will be taken on-line on the CISCO server and DURING CLASS TIME ONLY.

VI. SEMESTER GRADE COMPUTATION

The course grade will be calculated according to the following weights:

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
<th>Range</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab Exercise</td>
<td>200</td>
<td>1000 – 900</td>
<td>A</td>
</tr>
<tr>
<td>On-line tests</td>
<td>400</td>
<td>899 – 800</td>
<td>B</td>
</tr>
<tr>
<td>Case Study</td>
<td>200</td>
<td>799 – 700</td>
<td>C</td>
</tr>
<tr>
<td>Final Exam</td>
<td>200</td>
<td>699 – 600</td>
<td>D</td>
</tr>
<tr>
<td>Skill-based Exam</td>
<td>P/F *</td>
<td>599 – 000</td>
<td>F</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1000</td>
<td></td>
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</tbody>
</table>

* A student who fails the skills-based exam will fail the course, NO EXCEPTIONS.

Students who do not complete All Projects successfully will receive an “F” for the course grade and will have to retake the course. The Practical Final is a Pass/fail Grade and must be completed Satisfactory by Final Exam Day to receive a Passing Grade in the Course.
VII. ATTENDANCE

Students are required to attend all classes in which they have enrolled. Students are required to be in the classrooms on time and remain for the duration of the class. Any time a student has 10 hours absence and administrative withdrawal will be submitted.

A. Four Classes of 21/2 hours = 10 Hours
B. Late for Class = 1 Hour Absence: 10 Times = 10 Hours

VIII. NOTES AND ADDITIONAL INSTRUCTIONS FROM THE INSTRUCTOR

A. Course Withdrawal: It is the student’s responsibility to officially withdraw from a course if circumstances prevent attendance. Any student who desires to, or must, officially withdraw from a course after the first scheduled class meeting must file a Central Texas College Application of Withdrawal (CTC Form 59). The withdrawal form must be signed by the student.

A student who officially withdraws will be awarded the grade of “W” provided the student’s attendance and academic performance are satisfactory at the time of official withdrawal. Students must file a withdrawal application with the College before they may be considered for withdrawal.

A student may not withdraw from a class for which the instructor has previously issued the student a grade of “F.”

B. Administrative Withdrawal: An administrative withdrawal may be initiated when the student fails to meet College attendance requirements.

C. Incomplete Grade: The College catalog states, an incomplete grade may be given in those cases where the student has completed the majority of the course work but, because of personal illness, death in the immediate family, or military orders, the student is unable to complete the requirements for a course. Prior approval from the instructor is required before the grade of “IP” for Incomplete is recorded. A student who merely fails to show for the final examination will receive a zero for the final and an “F” for the course.

D. Cellular Phones and Beepers: Cellular phones and beepers will be turned off while the student is in the classroom or laboratory.

E. Americans with Disabilities Act (ADA): Disability Support Services provides services to students who have appropriate documentation of a disability. Students requiring accommodations for class are responsible for contacting the Office of Disability Support Services (DSS) located on the central campus. This service is available to all students, regardless of location. Explore the website at www.ctcd.edu/disability-support for further information. Reasonable
accommodations will be given in accordance with the federal and state laws through the DSS office.

F. Instructor Discretion: The instructor reserves the right of final decision in course requirements.

G. Civility: Individuals are expected to be cognizant of what a constructive educational experience is and respectful of those participating in a learning environment. Failure to do so can result in disciplinary action up to and including expulsion.

IX. COURSE OUTLINE

A. Unit One: Introduction to WANs

1. Unit Objectives: Upon successful completion of this unit the student will be able to:

   a. Describe different methods for connecting to a WAN
   b. Describe the impact of Voice Over IP and Video Over IP applications on a network
   c. Interpret network diagrams
   d. Describe the components required for network and Internet communications

2. Learning Activities

   a. Read and discuss Unit One of course text. (F1, F5, F6)
   b. Complete the on-line exam for this unit. (F12)
   c. Complete all Lab Exercises given out by the Instructor. (C5, C6, C7, C8, C9, C14, C19, C20) (F9)
   d. Complete all TCS requirements for Chapter 1 (F7, F8, F10)

B. Unit Two: PPP

1. Unit Objectives: Upon successful completion of this unit the student will be able to:

   a. Configure and verify a Point-to-Point Protocol (PPP) connection between Cisco routers

2. Learning Activities

   a. Read and discuss Unit Two of course text. (F1, F5, F6)
   b. Complete the on-line exam for this unit. (F12)
c. Complete all Lab Exercises given out by the Instructor. (C5, C6, C7, C8, C9, C14, C19, C20) (F9)
d. Complete all TCS requirements for Chapter 2 (F7, F8, F10)

C. **Unit Three: Frame Relay**

1. **Unit Objectives**: Upon successful completion of this unit the student will be able to:
   
a. Configure and verify a basic WAN serial connection  
b. Configure and verify Frame Relay on Cisco routers

2. **Learning Activities**

   c. Read and discuss Unit Three of course text. (F1, F5, F6)  
d. Complete the on-line exam for this unit. (F12)  
e. Complete all Lab Exercises given out by the Instructor. (C5, C6, C7, C8, C9, C14, C19, C20) (F9)  
f. Complete all TCS requirements for Chapter 3 (F7, F8, F10)

D. **Unit Four: Network Security**

1. **Unit Objectives**: Upon successful completion of this unit the student will be able to:
a. Describe current network security threats and explain how to implement a comprehensive security policy to mitigate common threats to network devices, hosts, and applications
b. Describe the functions of common security appliances and applications
c. Describe recommended security practices to secure network devices
d. Implement basic switch security measures such as port security, trunk access, and management VLANs
e. Security Device Manager command-line interface (SDM/CLI)

2. Learning Activities
   a. Read Unit Four of course text. (F1, F5, F6)
   b. Complete the on-line exam for this unit. (F12)
   c. Complete all Lab Exercises given out by the Instructor. (C5, C6, C7, C8, C9, C14, C10, C20)(F9)
   d. Complete all TCS requirements for Chapter 4. (F, 8, F10)

E. Unit Five: ACLs
   1. Unit Objectives: Upon successful completion of this unit the student will be able to:
      a. Describe the purpose and types of access control lists (ACLs)
      b. Configure and apply ACLs based on network filtering requirements
      c. Configure and apply an ACL to limit Telnet and SSH access to the router using the CLI
   2. Learning Activities
      a. Read Unit Five of course text. (F1, F5, F6)
      b. Complete the on-line exam for this unit. (F12)
      c. Complete all Lab Exercises given out by the Instructor. (C5, C6, C7, C8, C9, C14, C19, C20) (F9)
      d. Complete all TCS requirements for Chapter 5 (F7, F8, F10)

F. Unit Six: Teleworker Services
   1. Unit Objectives: Upon successful completion of this unit the student will be able to:
      a. Describe the importance, benefits, role, impact, and components of VPN technology
2. Learning Activities
   a. Read Unit Six of course text. (F1, F5, F6)
   b. Complete the on-line exam for this unit. (F12)
   c. Complete all Lab Exercises given out by the Instructor. (C5, C6, C7, C8, C9, C14, C19, C20) (F9)
   d. Complete all TCS requirements for Chapter 6 (F7, F8, F10)

G. Unit Seven: IP Addressing Services

1. Unit Objectives: Upon successful completion of this unit, the student will be able to:
   a. Explain the basic operation of Network Address Translation (NAT)
   b. Configure NAT for given network requirements using SDM/CLI
   c. Explain the operation and benefits of DHCP and DNS

2. Learning Activities
   a. Read Unit Seven of course text. (F1, F5, F6)
   b. Complete the on-line exam for this unit. (F12)
   c. Complete all Lab Exercises given out by the Instructor. (C5, C6, C7, C8, C9, C14, C19, C20) (F9)
   d. Complete all TCS requirements for Chapter 7 (F7, F8, F10)

H. Unit Eight: Network Troubleshooting

1. Unit Objectives: Upon successful completion of this unit, the student will be able to:
   a. Troubleshoot NAT issues
   b. Troubleshoot WAN implementation issues
   c. Configure, verify, and troubleshoot DHCP and DNS operations on a router
   d. Verify, monitor, and troubleshoot ACLs in a network environment
   e. Identify and correct common network problems at layers 1, 2, 3, and 7 using a layered model approach

2. Learning Activities
   a. Read Unit Eight of course text. (F1, F5, F6)
   b. Complete the on-line exam for this unit. (F12)
   c. Complete all Lab Exercises given out by the Instructor. (C5, C6, C7, C8, C9, C14, C19, C20) (F9)
   d. Complete all TCS requirements for Chapter 8 (F7, F8, F10)