I. INTRODUCTION
   A. An advanced course in Voice Over Internet Protocol (VOIP) architecture, components, and functionality. Includes VOIP signaling, call control, voice dial plans, configuring voice interfaces, dial peers, and quality of service (QoS) technologies.
   
   B. This course is a requirement/recommended course option for the Network Professional Specialization degree.
   
   C. Prerequisite: Departmental Approval

II. LEARNING OUTCOMES

   Upon successful completion of this course, the student will be able to:
   
   A. Describe the advantages of VOIP networking capabilities
   B. Identify classes of service
   C. Distinguish methods used by SMTP, AMIS, and VPIM to deliver messages
   D. Implement call handling systems

III. INSTRUCTIONAL MATERIALS

   A. The instructional materials identified for this course are viewable through www.ctcd.edu/books
   
   B. Other Instructional Materials:
IV. COURSE REQUIREMENTS

A. Reading Assignments: Chapter text as assigned. The student may be quizzed at end of each chapter.

B. Projects:

C. Class Performance: Students are required to be in class on time. Excessive tardiness (four) will result in a five point reduction to the final grade. It is the recommendation of this department that students exchange telephone numbers so that they may acquire missed lecture notes and assignments.

D. Class Participation: Students are expected to be interactive with the instructor during lecture. A question/response format will be used. Class participation is part of the Lab Experiment grade and is based on the amount of participation each student contributes to the lab’s results.

V. EXAMINATIONS

There will be two exams, a Mid-Term and a Final Exam, each covering the chapters completed in class. A general review will be given before each exam. Should a test be missed due to extenuating circumstances, you may contact the instructor for a make-up exam. Make-up exams may have more questions than the normally scheduled test. In addition to the two exams, other exams or quizzes may be given at the discretion of the instructor.

VI. SEMESTER GRADE COMPUTATION

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Points</th>
<th>Grade Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework/Quizzes</td>
<td>200</td>
<td>1000 - 900 = A</td>
</tr>
<tr>
<td>Exam One</td>
<td>200</td>
<td>899 - 800 = B</td>
</tr>
<tr>
<td>Exam Two</td>
<td>200</td>
<td>799 - 700 = C</td>
</tr>
<tr>
<td>Lab Projects</td>
<td>400</td>
<td>699 - 600 = D</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1000</td>
<td>599 - 0 = F</td>
</tr>
</tbody>
</table>

Students who do not complete all projects successfully, with approval by the instructor, will receive an Incomplete for the course grade and will have three weeks into the next semester to finish the projects or their grade will become an F.
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, an administrative withdrawal will be submitted.

A. Four Classes of 2 ½ 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. **Lesson One:** Perspectives on Voice Before Convergence

1. **Learning Outcomes:** Upon successful completion of this lesson the student will be able to:

   a. Describe the services provided by the PSTN.
   b. Describe time division and statistical multiplexing.
   c. Describe supervisory, informational, and address signaling.
   d. Describe numbering plans.
   e. Describe analog circuits.
   f. Describe digital voice circuits.
   g. Describe PBX, trunk lines, key-systems, and tie lines.

2. **Learning Activities:***

   a. Classroom Lecture/Discussion
   b. Take the chapter pre-quiz.
   c. Reading Assignment: As assigned
   d. Define the chapter Key Terms.
   e. Complete lab exercises as assigned.

B. **Lesson Two:** Perspectives on Voice After Convergence

1. **Learning Outcomes:** Upon successful completion of this lesson the student will be able to:

   a. Describe the function of the infrastructure in a UC environment.
   b. Describe the function of endpoints in a UC environment.
   c. Describe the function of the call processing agent in a UC environment.
   d. Describe the function of messaging in a UC environment.
   e. Describe the function of auto attendants and IVRs in a UC environment.
   f. Describe the function of contact center in a UC environment.
g. Describe the applications available in the UC environment, including Mobility, Presence, and Telepresence.
h. Describe how the Unified Communications components work together to create the Cisco Unified Communications Architecture.

2. **Learning Activities:**
   
a. Classroom Lecture/Discussion
b. Take the chapter pre-quiz.
c. Reading Assignment: As assigned
d. Define the chapter Key Terms.
e. Complete lab exercises as assigned.

C. **Lesson Three:** Connecting IP Phones to the LAN Infrastructure

1. **Learning Outcomes:** Upon successful completion of this lesson the student will be able to:
   
a. Describe the purpose of VLANs in a VoIP environment.
b. Describe the environmental considerations to support VoIP.
c. Configure switched infrastructure to support voice and data VLANs.
d. Describe the purpose and operation of PoE.
e. Describe the requirements and correct settings for DHCP, NTP, and TFTP.
f. Configure DHCP, NTP, and TFTP.

2. **Learning Activities:**
   
a. Classroom Lecture/Discussion
b. Take the chapter pre-quiz.
c. Reading Assignment: As assigned
d. Define the chapter Key Terms.
e. Complete lab exercises as assigned.

D. **Lesson Four:** Installing Cisco Unified Communications Manager Express

1. **Learning Outcomes:** Upon successful completion of this lesson the student will be able to:
   
a. Describe the appropriate software components needed to support endpoints.
b. Describe the differences between key system and PBX mode.

2. **Learning Activities:**
a. Classroom Lecture/Discussion
b. Take the chapter pre-quiz.
c. Reading Assignment: As assigned
d. Define the chapter Key Terms.
e. Complete lab exercises as assigned.

E. Lesson Five: Basic CME IP Phone Configuration

1. **Learning Outcomes:** Upon successful completion of this lesson the student will be able to:

   a. Describe the differences between the different types of ephones and ephone-dns.
   b. Configure Cisco Unified Communications Manager Express endpoints.

2. **Learning Activities:**

   a. Classroom Lecture/Discussion
   b. Take the chapter pre-quiz.
   c. Reading Assignment: As assigned
d. Define the chapter Key Terms.
e. Complete lab exercises as assigned.

F. Lesson Six: Configuring Cisco Unified CME Voice Productivity Features

1. **Learning Outcomes:** Upon successful completion of this lesson the student will be able to:

   a. Configure call-transfer per design specifications.
   b. Configure voice productivity features, including hunt groups, call park, call pickup, paging groups, and paging/intercom.
   c. Configure Music on Hold.

2. **Learning Activities:**

   a. Classroom Lecture/Discussion
   b. Take chapter pre-quiz.
   c. Reading Assignment: As assigned
d. Define the chapter Key Terms.
e. Complete lab exercises as assigned.
G. **Lesson Seven: Gateway and Trunk Concepts**

1. **Learning Outcomes:** Upon successful completion of this lesson the student will be able to:
   
   a. Describe the process of voice packetization.
   b. Describe RTP and RTCP.
   c. Describe the function of and differences between codecs.
   d. Describe H.323, MGCP, SIP, and SCCP signaling protocols.

2. **Learning Activities:**
   
   a. Classroom Lecture/Discussion
   b. Take chapter pre-quiz.
   c. Reading Assignment: As assigned
   d. Define the chapter Key Terms.
   e. Complete lab exercises as assigned.

H. **Lesson Eight: Configuring and Verifying Gateways and Trunks**

1. **Learning Outcomes:** Upon successful completion of this lesson the student will be able to:
   
   a. Describe the function and application of a dial plan.
   b. Describe the function and application of voice Gateways.
   c. Describe the function and application of voice ports in a Gateway.
   d. Describe the function and operation of call-legs.
   e. Describe and configure voice dial peers.
   f. Describe the differences between PSTN and Internet Telephony Service Provider circuits.
   g. Identify the factors that impact voice quality.
   h. Describe how QoS addresses voice quality issues.
   i. Identify where QoS is deployed in the UC infrastructure.

2. **Learning Activities:**
   
   a. Classroom Lecture/Discussion
   b. Take chapter pre-quiz.
   c. Reading Assignment: As assigned
   d. Define the chapter Key Terms.
   e. Complete lab exercises as assigned.
I. Lesson Nine: Cisco Unity Express Concepts

1. Learning Outcomes: Upon successful completion of this lesson the student will be able to:

   a. Describe the Cisco Unity Express hardware platforms.
   b. Configure the foundational elements required for Cisco Unified Communications Manager Express to support Cisco Unity Express.
   c. Describe the features available in Cisco Unity Express.

2. Learning Activities:

   a. Classroom Lecture/Discussion
   b. Take chapter pre-quiz.
   c. Reading Assignment: As assigned
   d. Define the chapter Key Terms.
   e. Complete lab exercises as assigned.

J. Lesson Ten: Cisco Unity Express Configuration

1. Learning Outcomes: Upon successful completion of this lesson the student will be able to:

   a. Configure AutoAttendant services using Cisco Unity Express.
   b. Configure basic voicemail features using Cisco Unity Express.

2. Learning Activities:

   a. Classroom Lecture/Discussion
   b. Take chapter pre-quiz.
   c. Reading Assignment: As assigned
   d. Define the chapter Key Terms.
   e. Complete lab exercises as assigned.

K. Lesson Eleven: Introducing the Smart Business Communications System

1. Learning Outcomes: Upon successful completion of this lesson the student will be able to:

   a. Describe the function and operation of Cisco Configuration Assistant.

2. Learning Activities:
J. **Lesson Twelve**: Configuring and Maintaining the UC500 Series for Voice

1. **Learning Outcomes**: Upon successful completion of this lesson the student will be able to:
   
   a. Configure UC500 device parameters.
   b. Configure UC500 network parameters.
   c. Configure UC500 dial plan and voicemail parameters.
   d. Configure UC500 SIP trunk parameters.
   e. Configure UC500 voice system features.
   f. Configure UC500 user parameters.

2. **Learning Activities**:
   
   f. Classroom Lecture/Discussion
   g. Take chapter pre-quiz.
   h. Reading Assignment: As assigned
   i. Define the chapter Key Terms.
   j. Complete lab exercises as assigned.