I. INTRODUCTION

A. Describes the architecture, components, and basic operation of routers and explains the basic principles of routing and routing protocols. It also provides an in-depth understanding of how switches operate and are implemented in the LAN environment for small and large networks. By the end of this course, students will be able to configure and troubleshoot routers and switches and resolve common issues with virtual LANs and inter-VLAN routing in both IPv4 and IPv6 networks.

B. This course serves as a required or elective course on various degree plans. Curriculum plans for degrees and certificates, are listed in the current Central Texas College Catalog.

C. The delivery method of this course may be traditional lecture/lab, blended lecture/lab, or online.

D. Prerequisites: ITCC 1414.

II. LEARNING OUTCOMES

Upon successful completion of this course, CCNA 2: Routing and Switching Essentials, the student will be able to:

A. Configure and maintain and troubleshoot routers and switches. (C1, C5, C6, C7, C8, C12, C15, C17, C18, C20, F1, F7, F8, F9, F12)

B. Resolve common issues with virtual LANs and inter-VLAN routing in both IPv4 and IPv6 networks. (C1, C5, C6, C7, C8, C12, C15, C17, C18, C20, F1, F7, F8, F9, F12, F16)
III. INSTRUCTIONAL MATERIALS

A. The instructional materials identified for this course are viewable through www.ctcd.edu/books

B. Lecture classes also require at least one USB storage device. Online students may use cloud based storage.

IV. COURSE REQUIREMENTS

A. Attend both lecture and lab or in the case of online delivery, be actively engaged in Blackboard and maintain constant progress.

B. Be prepared to participate in discussion, team projects/assignments and take unannounced assessments relating to the lecture materials.

C. Complete all exams/assessments.

D. Submit all assignments on time.

V. ASSESSMENTS

A. Student content mastery will be evaluated in the following areas:
   • Assessments (midterm exam, quizzes, projects, etc.)
   • Final Assessment (final exam and/or semester project, participation)

B. Scheduled and unscheduled assessments will be given at the discretion of the instructor.

C. Exams/assessments may be composed of both subjective and objective questions plus computer output.

D. A student must take all exams/assessments. No make-up exams/assessments will be given. Both online and on campus students who know in advance that they will be absent due to school sponsored trips, military duty or orders, or any other valid reason, must arrange to take an early exam/assessment. Unexpected absences due to illness or other extenuating circumstances will require the student to see the instructor about make-up work in lieu of the missed exam/assessment.

E. Students with unexcused absences will be given a zero for each missed assignment.
VI. SEMESTER GRADE COMPUTATIONS

<table>
<thead>
<tr>
<th>Course Requirements</th>
<th>Points</th>
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<tbody>
<tr>
<td>Assignments</td>
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<tr>
<td>Assessments</td>
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<tr>
<td>Final Assessment</td>
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<td><strong>TOTAL</strong></td>
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<table>
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<tr>
<th>Points</th>
<th>Grade</th>
<th>Quality Points</th>
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<tr>
<td>900-1000</td>
<td>A-Superior</td>
<td>4</td>
</tr>
<tr>
<td>800-899</td>
<td>B-Above Average</td>
<td>3</td>
</tr>
<tr>
<td>700-799</td>
<td>C-Average</td>
<td>2</td>
</tr>
<tr>
<td>600 - 699</td>
<td>D – Passing but Unsatisfactory</td>
<td>1</td>
</tr>
<tr>
<td>0 - 599</td>
<td>F-Failure</td>
<td>0</td>
</tr>
</tbody>
</table>

VII. 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 for Withdrawal (CTC Form 59). The student must sign the withdrawal form.

CTC Form 59 will be accepted at any time prior to Friday of the 12th week of classes during the 16-week fall and spring semesters. The deadline for sessions of other lengths is:

- 10-week session Friday of the 8th week
- 8-week session Friday of the 6th week
- 5-week session Friday of the 4th week

The equivalent date (75% of the semester) will be used for sessions of other lengths. The specific last day to withdraw is published each semester in the Schedule Bulletin.

For non-GoArmyEd active military students, the effective date of withdrawal is the filing date with the Education Center. For all other students, the effective date of withdrawal is the date that the withdrawal application is received by the Central Texas College representative.

Students who used financial aid, military tuition assistance, VA benefits, or other non-personal funds may be required to repay tuition and fees to the funding agency. For specific repayment requirements, contact the Office of Student Financial Aid or Veterans Services Office before withdrawing. Military tuition assistance students should visit their military Education Center or Navy College Office.

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 a grade of “F,” “FI,” “FN,” “IP,” or “XN.”

B. Instructor Initiated Withdrawals: Faculty are authorized to withdraw students who are not making satisfactory course progress to include failure to meet College attendance requirements as outlined in the section of the Catalog entitled “Satisfactory Progress Standards.” The instructor will assign the appropriate grade on CTC Form 59 for submission to the registrar.

Students enrolled in distance learning courses are expected to maintain constant progress throughout the course. Failure to do so may result in the student being administratively withdrawn by the instructor.

Students who have not attended class by the 12th class day of a 16-week course or the 6th class day of an 8-week term may be administratively withdrawn by the instructor with a grade of "W." Students may be administratively withdrawn from any class when their absences reach a total equal to 12.5% of the class hours for the course; and in the opinion of the instructor, the student cannot satisfactorily complete the course. An example: Students attending a 48-hour class during an 8-week period normally meet 180 minutes each session for 16 sessions. Those students accumulating two (2) unexcused absences are subject to Administrative Withdrawal since the total unexcused absences equal 12.5% of class hours for the course. Those students attending a 48-hour class during a 16-week period normally meet 90 minutes each session for 32 sessions. Those students accumulating four (4) unexcused absences are subject to Administrative Withdrawal since the total unexcused absences equals 12.5% of class hours for the course. In a distance learning course the last date of attendance is the last activity by the student in the course.

C. Administrative Withdrawal: A student may be administratively withdrawn by a designated member of the administrative staff of the College when the student has been placed on Academic Suspension or Disciplinary Suspension; the student has an outstanding financial obligation owed to the college; or the student registered for a course without the required prerequisite or departmental permission.

The College is under no obligation to refund tuition and fees, or other costs associated with an administrative or instructor initiated withdrawal.

D. Incomplete Grade: The College catalog states, “An incomplete grade may be given in those cases where the student has completed the majority of the coursework 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.
E. **Cell Phones and Pagers:** Students will silence cell phones and mobile devices while in the classroom or lab.

F. **Americans with Disabilities Act (ADA):** Disability Support Services provide 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. Review the website at [www.ctcd.edu/disability-support](http://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.

G. **Instructor Discretion:** The instructor reserves the right of final decision in course requirements and may make changes to the course outline and/or assignments as needed.

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

I. **Degree Progression:** Students who receive a grade of “D” are advised not to enroll in the next course for which this course was a prerequisite.

J. **Failing Grade:** The grade of “F” or “FN” will be given for academic failure, non-attendance or scholastic dishonesty.

K. **Scholastic Honesty:** All students are expected to maintain the highest standards of scholastic honesty in the preparation of all course work and during examinations. The college policy on scholastic honesty, including definitions on plagiarism, collusion, and cheating can be found at the following URL: [http://online.ctcd.edu/plagiarism.cfm](http://online.ctcd.edu/plagiarism.cfm)
VIII. COURSE OUTLINE

A. Lesson One: Routing Concepts

1. Learning Outcomes: Upon successful completion of this lesson the student will be able to:
   a. Configure a router to route between multiple directly connected networks.
   b. Explain how routers use information in data packets to make forwarding decisions in a small to medium sized business network.
   c. Describe how a router learns about remote networks when operating in a small to medium-sized business network.

2. Learning Activities:
   a. Research and discuss the topics of the Lesson in class and in an online collaborative discussion forum (C7, C8, C9, C15, C18, F1, F9, F10, F13)
   b. Perform skills and functions in the section (C1, C5, C7, C8, C9, C16, C18, F1, F9, F10, F13)

3. Unit Outline:
   a. Router Initial Configuration
   b. Routing Decisions
   c. Router Operation

B. Lesson Two: Static Routing

1. Learning Outcomes: Upon successful completion of this lesson the student will be able to:
   a. Explain how static routes are implemented in a small to medium-sized business network.
   b. Configure static routes to enable connectivity in a small to medium-sized business network.
   c. Troubleshoot static and default route configurations.

2. Learning Activities:
   a. Research and discuss the topics of the Lesson in class and in an online collaborative discussion forum (C7, C8, C9, C15, C18, F1, F9, F10, F13)
   b. Perform skills and functions in the section (C1, C5, C7, C8, C9, C16, C18, F1, F9, F10, F13)

3. Unit Outline:
   a. Static Route Implementation
   b. Configuration of Default and Static Routes
   c. Troubleshooting of Default and Static Routes
C. **Lesson Three: Dynamic Routing**

1. **Learning Outcomes:** Upon successful completion of this lesson, the student will be able to:
   a. Explain the function of dynamic routing protocols.
   b. Implement RIPv2 dynamic routing protocol.
   c. Determine the route source, administrative distance, and metric for a given route.

2. **Learning Activities:**
   a. Research and discuss the topics of the Lesson in class and in an online collaborative discussion forum (C7, C8, C9, C15, C18, F1, F9, F10, F13)
   b. Perform skills and functions in the section (C1, C5, C7, C8, C9, C16, C18, F1, F9, F10, F13)

3. **Unit Outline:**
   a. Dynamic Routing Protocols
   b. RIPv2 Routing Protocol
   c. Routing Table Construction and Metrics

D. **Lesson Four: Switched Networks**

1. **Learning Outcomes:** Upon successful completion of this lesson, the student will be able to:
   a. Explain how switched networks support small to medium-sized businesses.
   b. Describe how Layer 2 switches forward data in a small to medium-sized LAN.

2. **Learning Activities:**
   a. Research and discuss the topics of the Lesson in class and in an online collaborative discussion forum (C7, C8, C9, C15, C18, F1, F9, F10, F13)
   b. Perform skills and functions in the section (C1, C5, C7, C8, C9, C16, C18, F1, F9, F10, F13)

3. **Unit Outline:**
   a. LAN Design Incorporating Fully Switched Network and Micro-segmentation
   b. The Switched Environment

E. **Lesson Five: Switch Configuration**

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

a. Implement basic switch settings to meet network performance requirements.

2. **Learning Activities**:
   a. Research and discuss the topics of the Lesson in class and in an online collaborative discussion forum (C7, C8, C9, C15, C18, F1, F9, F10, F13)
   b. Perform skills and functions in the section (C1, C5, C7, C8, C9, C16, C18, F1, F9, F10, F13)

3. **Unit Outline**:
   a. Basic Switch Configuration
   b. Switch Security

F. **Lesson Six: VLANs**

1. **Learning Outcomes**: Upon successful completion of this lesson, the student will be able to:
   a. Explain how VLANs segment broadcast domains in a small to medium-sized business network.
   b. Implement VLANs to segment a small to medium sized business network.
   c. Configure routing between VLANs in a small to medium-sized business network.

2. **Learning Activities**:
   a. Research and discuss the topics of the Lesson in class and in an online collaborative discussion forum (C7, C8, C9, C15, C18, F1, F9, F10, F13)
   b. Perform skills and functions in the section (C1, C5, C7, C8, C9, C16, C18, F1, F9, F10, F13)

3. **Unit Outline**:
   a. VLAN Segmentation
   b. VLAN Implementations
   c. Inter-VLAN Routing Using Routers

G. **Lesson Seven: Access Control Lists (ACLs)**

1. **Learning Outcomes**: Upon successful completion of this lesson, the student will be able to:
   a. Explain the purpose and operation of ACLs in small to medium-sized business networks.
   b. Configure standard IPv4 ACLs to filter traffic in a small to medium-sized
business network.
c. Troubleshoot IPv4 ACL issues.

2. **Learning Activities:**
   a. Research and discuss the topics of the Lesson in class and in an online collaborative discussion forum (C7, C8, C9, C15, C18, F1, F9, F10, F13)
   b. Perform skills and functions in the section (C1, C5, C7, C8, C9, C16, C18, F1, F9, F10, F13)

3. **Unit Outline:**
   a. ACL Operation
   b. Standard IPv4 ACLs
   c. Troubleshoot ACLs

H. **Lesson Eight: DHCP**

1. **Learning Outcomes:** Upon successful completion of this lesson, the student will be able to:
   a. Implement DHCPv4 to operate across multiple LANs in a small to medium-sized business network.
   b. Implement DHCPv6 to operate across multiple LANs in a small to medium-sized business network.

2. **Learning Activities:**
   a. Research and discuss the topics of the Lesson in class and in an online collaborative discussion forum (C7, C8, C9, C15, C18, F1, F9, F10, F13)
   b. Perform skills and functions in the section (C1, C5, C7, C8, C9, C16, C18, F1, F9, F10, F13)

3. **Unit Outline:**
   a. DHCPv4
   b. DHCPv6

I. **Lesson Nine: NAT for IPv4**

1. **Learning Outcomes:** Upon successful completion of this lesson, the student will be able to:
   a. Explain how NAT provides IPv4 address scalability in a small to medium-sized business network.
   b. Configure NAT services on the edge router to provide IPv4 address scalability in a small to medium-sized business network.
   c. Troubleshoot NAT issues in a small to medium-sized business network.

2. **Learning Activities:**
a. Research and discuss the topics of the Lesson in class and in an online collaborative discussion forum (C7, C8, C9, C15, C18, F1, F9, F10, F13)
b. Perform skills and functions in the section (C1, C5, C7, C8, C9, C16, C18, F1, F9, F10, F13)

3. **Unit Outline:**
   a. NAT Operation
   b. Configure NAT
   c. Troubleshoot NAT

J. **Lesson Ten: Device Discovery, Management, and Maintenance**

1. **Learning Outcomes:** Upon successful completion of this lesson, the student will be able to:
   a. Use discovery protocols to map a network topology.
   b. Configure NTP and Syslog in a small to medium-sized business network.
   c. Maintain router and switch configuration and IOS files.

2. **Learning Activities:**
   a. Research and discuss the topics of the Lesson in class and in an online collaborative discussion forum (C7, C8, C9, C15, C18, F1, F9, F10, F13)
   b. Perform skills and functions in the section (C1, C5, C7, C8, C9, C16, C18, F1, F9, F10, F13)

3. **Unit Outline:**
   a. Device Discovery
   b. Device Management
   c. Device Maintenance