I. INTRODUCTION

A. This course covers the skills necessary to install, configure, manage, and support a network infrastructure. Topics include installing and configuring Dynamic Host Configuration Protocol (DHCP) servers, Dynamic Name Services (DNS), remote access, and network security using public key infrastructure. Additionally, students will deploy operating systems using remote installation services.

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: Twelve (12) Hours of Computer Science Courses.

II. LEARNING OUTCOMES

Upon successful completion of this course, Supporting Network Server Infrastructure, the student will be able to:

A. Install and configure DHCP servers and DNS. (C1, C3, C5, C6, C7, C8, C11, C15, C16, C17, C18, C19, C20, F1, F2, F5, F6, F7, F8, F9, F10, F11, F12, F13, F16, F17)

B. Design a remote access that meets the needs of an organization. (C1, C3, C5, C6, C7, C8, C11, C15, C16, C17, C18, C19, C20, F1, F2, F5, F6, F7, F8, F9, F10, F11, F12, F13, F16, F17)

C. Design network security using public key infrastructure. (C1, C3, C5, C6, C7, C8, C11, C15, C16, C17, C18, C19, C20, F1, F2, F5, F6, F7, F8, F9, F10, F11, F12, F13, F16, F17)
D. Integrate network services. (C1, C3, C5, C6, C7, C8, C11, C15, C16, C17, C18, C19, C20, F1, F2, F5, F6, F7, F8, F9, F10, F11, F12, F13, F16, F17)
E. Deploy operating systems using remote installation services. (C1, C3, C5, C6, C7, C8, C11, C15, C16, C17, C18, C19, C20, F1, F2, F5, F6, F7, F8, F9, F10, F11, F12, F13, F16, F17)

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 (4 GB preferred). 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:
   • Assignments (homework, in class assignments, etc.)
   • Assessments (midterm exam, quizzes, projects, etc.)
   • Final Assessment (final exam and/or semester project, participation)
B. Scheduled and unscheduled quizzes will be given at the discretion of the instructor. There is no make-up for these (see IV.C. above).
C. Exams/assessments may be composed of both subjective and objective questions plus computer output.
D. A student must take all exams/assessments. 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 contact the instructor about make-up work in lieu of the missed exam/assessment.

E. Students with unexcused absences will be given a zero for the missed work.

VI. SEMESTER GRADE COMPUTATION

<table>
<thead>
<tr>
<th>Course Requirements</th>
<th>Points</th>
<th>Points</th>
<th>Grade</th>
<th>Quality Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments/Quizzes</td>
<td>300</td>
<td>900</td>
<td>A-Superior</td>
<td>4</td>
</tr>
<tr>
<td>Midterm Assessment</td>
<td>300</td>
<td>800</td>
<td>B-Above Average</td>
<td>3</td>
</tr>
<tr>
<td>Final Assessment</td>
<td>400</td>
<td>700</td>
<td>C-Average</td>
<td>2</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1000</td>
<td>600</td>
<td>D-Below Average</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<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.

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 an “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 also be administratively withdrawn from any class when their absences exceed a total of four class meetings for a 16-week course or three class meetings for less than 16-week courses and; in the opinion of the instructor, the student cannot satisfactorily complete 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 a student who is administratively withdrawn.

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 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.

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 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 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 a “D” are advised not to enroll in the next course for which this course was a prerequisite.

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

L. **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
VIII. COURSE OUTLINE

A. **Unit One: Introduction of course requirements and objectives and deploying Windows Server.** NOTE: This course is organized into eight Units consisting of nineteen lessons, with each lesson corresponding to a particular exam objective for the 70-414 exam, which is the second of the two exams need to obtain a MCSE (Microsoft Certified Solutions Expert)

1. **Learning Outcomes:** Upon completion of this unit, the student will be able to locate information required by the course and present it in an appropriate manner. Topics include designing an administrative model and monitoring strategy and planning an automated remediation.

2. **Learning Activities for Lessons One - Three:**
   a. Read syllabus. (C5, C6, F1, F5)
   b. Read and analyze assignment requirements. (C5, C6, F1, F5)
   c. Design an Administrative Model (C5, C18, C19 C20, F1, F8, F9)
   d. Design a monitoring strategy (C5, C18, C19 C20, F1, F8, F9)
   e. Plan and implement automated remediation (C5, C18, C19 C20, F1, F8, F9)

3. **Unit Outline for Lessons One - Three:**
   a. Discuss Course objectives and requirements including course activities and grading of assignments and assessments.
   b. Design user rights and built-in groups
   c. Design a delegation of administration structure for Microsoft System Center 2012 R2
   d. Delegate rights for managing private cloud by using App controller and System Center Virtual Machine Manager
   e. Delegate self-service portals by using System Center Service Manager
   f. Create and employ centralized monitoring
   g. Monitor servers using System Center Global Service Monitor
   h. Implement and optimize System Center 2012 Operations Manager management packs
   i. Manage performance and application monitoring
   j. Create centralized reports
   k. Plan for monitoring Active Directory
   l. Create an Update Baseline in Virtual Machine Manager
   m. Implement a Desired Configuration Management (DCM) Baseline
   n. Implement Virtual Machine Manager integration with Operations Manager
   o. Configure Virtual Machine Manager to move a VM dynamically based on policy
   p. Integrate System Center 2012 for automatic remediation into the existing enterprise infrastructure
   q. Design and implement a Windows PowerShell Desired State
B. Unit Two: Planning and Implementing a Highly Available Enterprise Infrastructure and Network Services

1. Learning Outcomes for Lessons Four and Five: Describe processes needed to plan and implement Highly Available Enterprise Infrastructure and Networks Services including implementation of multi-node and multi-site clustering and configuration of Network Load Balancing (NLB).

2. Learning Activities for Lessons Four and Five:
   a. Lecture and discussion. (C5, C6, F1, F5)
   b. Hands-on lab activities. (C5, C6, F1, F5, F6, F15)
   c. Quizzes. (F17, F1, F2, C7, C4)

2. Unit Outline for Lessons Four and Five:
   a. Use of networking storage, name resolution, and Global Update Manager (GUM);
   b. Create design considerations including redundant networks, network priority settings, resource failover and failback, heartbeat and DNS settings, Quorum configuration, storage placement and replication, and cluster-aware updates.
   c. Plan for and configure Network Load Balancing (NLB);
   d. Create design considerations including fault-tolerant networking, multicast vs. unicast configuration, state management, and automated deployment of NLB using Virtual Machine Manager service templates.

C. Unit Three: Planning and Implementing Highly Available Storage Solutions and Roles

1. Learning Outcomes for Lessons 6 and 7: Plan and implement highly available storage solutions and roles.

2. Learning Activities for Lessons 6 - 7:
   a. Lecture and discussion. (C5, C6, F1, F5)
   b. Hands-on lab activities. (C5, C6, F1, F5, F6, F15)
   c. Quizzes. (F17, F1, F2, C7, C4)

3. Unit Outline for Lessons 6- 7:
   a. Plan for and configure Storage Spaces and Storage Pools
   b. Design highly available, multi-replica DFS namespaces
   c. Plan for and configure multi-path I/O (MPIO)
   d. Configure highly available iSCSI Target and iSNS Server
e. Plan for and implement storage using RDMA and SMB multi-channel
f. Plan for a highly available Dynamic Host Configuration Protocol (DHCP) Server, Hyper-V clustering, Continuously Available File Shares, and a DFS Namespace Server
g. Plan for and implement highly available applications, services, and scripts using Generic Application, Generic Script, and Generic Service clustering roles

D. **Unit Four: Planning and Implementing a Business Continuity and Disaster Recovery solution as well as planning and implementing virtualization hosts and virtual machines.**

1. **Learning Outcomes for Lessons Eight - Ten:** This unit focuses on business continuity and disaster recovery as well as the creation of virtualization hosts and machines.

2. **Learning Activities for Lessons Eight - Ten:**
   a. Lecture and discussion. (C5, C6, F1, F5)
   b. Hands-on lab activities. (C5, C6, F1, F5, F6, F15)
   c. Quizzes. (F17, F1, F2, C7, C4)

3. **Unit Outline for Lessons Eight - Ten:**
   a. Plan a backup and recovery strategy;
   b. Employ planning considerations, including Active Directory domain and forest recovery, Hyper-V replica, including using Microsoft Azure Site Recovery, domain controller restore and cloning, and Active Directory object and container restore using authoritative restore and Recycle Bin;
   c. Plan for and implement backup and recovery by using System Center Data Protection Manager (DPM)
   d. Plan for and implement delegation of virtualization environment (hosts, services, and VMs), including self-service capabilities;
   e. Plan and implement multi-host libraries, including equivalent objects;
   f. Plan for and implement host resource optimization;
   g. Integrate third-party virtualization platforms;
   h. Deploy Hyper-V hosts to bare metal
   i. Plan for and implement delegation of virtualization environment (hosts, services, and VMs), including self-service capabilities
   j. Plan and implement multi-host libraries, including equivalent objects
   k. Plan for and implement host resource optimization; integrate third-party virtualization platforms; deploying Hyper-V hosts to bare metal
   l. Plan for and implement highly available VMs
   m. Plan for and implement guest resource optimization, including shared VHDx
   n. Configure placement rules
   o. Create Virtual Machine Manager templates.
E. Unit Five: Planning and Implementing Virtualization Networking and Storage

1. Learning Outcomes for Lessons 11 and 12: This unit explores the design and implementation of virtualization networking and storage.

2. Learning Activities for Lessons 11 and 12:
   a. Lecture and discussion. (C5, C6, F1, F5)
   b. Hands-on lab activities. (C5, C6, F1, F5, F6, F15)
   c. Quizzes. (F17, F1, F2, C7, C4)

3. Unit Outline for Lessons 11 and 12:
   a. Plan for and configure Virtual Machine Manager logical networks, including virtual switch extensions and logical switches
   b. Plan for and configure IP address and MAC address settings across multiple Hyper-V hosts, including network virtualization
   c. Plan for and configure virtual network optimization
   d. Plan and implement Windows Server Gateway
   e. Plan and implement VLANs and pVLANs
   f. Plan and implement virtual machine (VM) networks
   g. Plan and implement converged networks.
   h. Plan for and configure Hyper-V host clustered storage
   i. Plan for and configure Hyper-V virtual machine storage, including Virtual Fibre Channel, iSCSI, and shared VHDx
   j. Plan for storage optimization
   k. Plan and implement storage using SMB 3.0 file shares

F. Unit Six: Planning and Implementing Virtual Machine Movement and Managing and Maintaining a Server Virtualization Infrastructure

1. Learning Outcomes for Lesson 13 and 14: This unit focuses on planning and implementing virtual machine movement as well and managing and maintaining a server virtualization infrastructure

2. Learning Activities for Lessons 13 and 14:
   a. Lecture and discussion. (C5, C6, F1, F5)
   b. Hands-on lab activities. (C5, C6, F1, F5, F6, F15)
   c. Quizzes. (F17, F1, F2, C7, C4)

2. Unit Outline for Lessons 13 and 14:
   a. Plan for and configure live and storage migration between Hyper-V hosts
   b. Plan for and manage P2V and V2V
   c. Plan for and implement virtual machine migration between clouds
   d. Manage dynamic optimization and resource optimization
e. Integrate Operations Manager with System Center Virtual Machine Manager and System Center Service Manager
f. Update virtual machine images in libraries
g. Plan for and implement backup and recovery of virtualization infrastructure by using System Center Data Protection Manager (DPM).

G. Unit Seven: Designing, Implementing, and Managing a Certificate Services Infrastructure

1. Learning Outcomes for Lessons 15-16: Upon completion of this unit, students will be able to design, implement and manage a certificate services infrastructure

2. Learning Activities for Lessons 15-16:
   a. Lecture and discussion. (C5, C6, F1, F5)
   b. Hands-on lab activities. (C5, C6, F1, F5, F6, F15)
   c. Quizzes. (F17, F1, F2, C7, C4)

2. Unit Outline for Lessons 15-16:
   a. Design a multi-tier Certificate Authority (CA) hierarchy with offline root CA
   b. Plan for multi-forest CA deployment
   d. Plan for Network Device Enrollment Services (NDES)
   e. Plan for certificate validation and revocation
   f. Plan for disaster recovery
   g. Plan for trust between organizations, including Certificate Trust Lists (CTL), cross certifications, and bridge CAs
   h. Configure and manage offline root CA
   i. Configure and manage Certificate Enrollment Web Services and Certificate Enrollment Policy Web Services
   j. Configure and manage Network Device Enrollment Services
   k. Configure Online Certificates Status Protocol (OCSP) responders
   l. Migrate CA
   m. Implement administrator role separation
   n. Implement and manage trust between organizations, including Certificate Trust Lists (CTL), cross certifications, and bridge CAs
   o. Monitor CA health.

H. Unit Eight: Implementing and Managing Certificates, a Federated Identity solutions, and Active Directory Rights Services

1. Learning Outcomes for Lessons 17-19: This unit focuses on the design
necessary for planning, designing, managing, and implementing Federated Identity and Active Directory rights including managing certificates.

2. Learning Activities for Lessons 17-19:
   a. Lecture and discussion. (C5, C6, F1, F5)
   b. Hands-on lab activities. (C5, C6, F1, F5, F6, F15)
   c. Quizzes. (F17, F1, F2, C7, C4)

3. Unit Outline for Lessons 17 - 19:
   a. Manage certificate templates
   b. Implement and manage certificate deployment, validation, renewal, revocation, and publishing, including Internet-based clients, CAs, and network devices
   c. Configure and manage key archival and recovery.
   d. Plan for and implement claims-based authentication, including planning and implementing Relying Party Trusts
   e. Plan for and configure Claims Provider and Relying Party Trust claim rules
   f. Plan for and configure attribute stores, including Active Directory Lightweight Directory Services (AD LDS)
   g. Plan for and manage Active Directory Federation Services (AD FS) certificates
   h. Plan for and implement Identity Integration with cloud services
   i. Integrate Web Application Proxy with AD FS.
   j. Plan for highly available AD RMS deployment
   k. Plan for AD RMS client deployment
   l. Manage Trusted User Domains
   m. Manage Trusted Publishing Domains
   n. Manage Federated Identity support
   o. Upgrade or migrate AD RMS
   p. Decommission AD RMS.