# COURSE SYLLABUS

**LAST REVIEW**          Fall 2022

**COURSE TITLE**        Server Operating Systems and Virtualization

**COURSE NUMBER**       CRTE 0200

**DIVISION**            Career and Technical Education

**DEPARTMENT**          CRTE

**CIP CODE**            11.1006

**CREDIT HOURS**        3

**CONTACT HOURS/WEEK** Class: 2      Lab:    2

**PREREQUISITES**       None

## COURSE DESCRIPTION
This class will introduce the student to the knowledge and skills required to build, maintain, troubleshoot and support server hardware and software technologies. The successful candidate will be able to identify environmental issues; understand and comply with disaster recovery and physical/software security procedures; be familiar with industry terminology and concepts; understand server roles/specializations and interaction within the overall computing environment.

## PROGRAM ALIGNMENT
This course is part of a program aligned through the Kansas Board of Regents and Technical Education Authority. For more information, please visit:
https://kansasregents.org/workforce_development/program-alignment

## PROGRAM LEARNING OUTCOMES

1. Students will be able to configure a router and a switch for basic functionality
2. Students will be able to configure, monitor and troubleshoot access controls lists for various addressing methods
3. Students will be able to build, maintain and troubleshoot server hardware and software technologies
4. Students will be able to explain and enforce basic concepts of computer network security

## TEXTBOOKS
http://kckccbookstore.com/

## METHODS OF INSTRUCTION
A variety of instructional methods may be used depending on content area. These include but are not limited to: lecture, multimedia, cooperative/collaborative learning, labs and demonstrations, projects and presentations, speeches, debates, panels, conferencing, performances, and learning experiences outside the classroom. Methodology will be selected to best meet student needs.

**COURSE OUTLINE**

I. System Hardware

    A. Differentiate between system board types, features, components and their purposes.

        1. Dip switches / jumpers

        2. Processor (single and multi)

        3. Bus types and bus speeds

        4. On board components

            a. NICs

            b. Video

            c. Audio

            d. USB

            e. HID

            f. Serial

            g. Parallel

        5. Expansion slots

            a. PCI

            b. PCIe

            c. PCIx

            d. AGP

            e. ISA

        6. BIOS

        7. Riser Card / backplane

        8. Storage connectors

            a. SCSI

            b. SATA

            c. IDE

            d. Floppy

    B. Deploy different chassis types and the appropriate components

        1. Cooling

            a. Fans

            b. Water cooled

            c. Passive

            d. Active

            e. Shroud

            f. Ducts

            g. Redundant cooling

            h. Hot swappable

            i. Ventilation

        2. Form Factor

            a. Space utilization (U size, height, width, depth)

        3. Power

            a. Connectors

            b. Voltages

            c. Phase

    4. Redundant power

    5. Shut off switches – chassis intrusion

    6. Power buttons

    7. Reset buttons

    8. Diagnostic LEDs

    9. Expansion bays

C. Differentiate between memory features / types and given a scenario select appropriate memory

    1. Memory pairing

    2. ECC vs. non ECC

    3. Registered vs. non-registered

    4. RAID and hot spares

    5. Types

            a. DDR

            b. Fully buffered DIMM

            c. DDR2

            d. SDRAM

            e. DDR3

    6. Memory compatibility

            a. Speed

            b. Size

            c. Pins

            d. CAS latency

            e. Timing

            f. Vendor specific memory

    7. On board vs. riser card

D. Explain the importance of a Hardware Compatibility List (HCL)

    1. Vendor standards for hardware

    2. Memory and processor compatibility

    3. Expansion cards compatibility

    4. Virtualization requirements

E. Differentiate between processor features / types and given a scenario select the appropriate processor

    1. Multicore

    2. Multiprocessor

    3. Cache levels

    4. Stepping

    5. Speed

    6. VRMs

7. Execute disable (XD) or not execute (NX)
8. Hyper-Threading
9. VT or AMD-V
10. AMD vs.Intel (non-compatible CPUs)
11. Processor architecture (RISC, CISC)
12. Vendor slot types
13. 64bit vs. 32 bit
14. Heat dissipation (heat sinks, fans, liquid cooling)

F. Given a scenario, install appropriate expansion cards into a server while taking fault tolerance into consideration.
  1. Manufacturer specific
      a. Fax cards
      b. PBX cards
      c. Camera cards
      d. VoIP
  2. HBAs
  3. NICs
  4. Video
  5. Audio
  6. Storage controller (SCSI, SATA, RAID)
      a. SCSI low voltage / high voltage (LVD/HVD)
      b. SCSI IDs
      c. Cables and connectors
      d. Active vs. passive termination
  7. Port expansion cards
      a. USB
      b. IEEE 1394
      c. Serial
      d. Parallel

G. Install, update and configure appropriate firmware.
  1. Driver / hardware compatibility
  2. Implications of a failed firmware upgrade (redundant BIOS)
  3. Follow manufacturer instructions and documentation


II. Software
  A. Install, deploy, configure and update NOS (Windows / *nix).
    1. Installation methods (optical media, USB, network share, PXE)
        a. Imaging – system cloning and deployment (Ghost,RIS/WDS, Altiris,
    2. Bootloader
    3. File systems

            a. FAT

            b. FAT32

            c. NTFS

            d. VMFS

            e. ZFS

            f. EXT3

       4. Driver installation

            a. Driver acquisition

            b. Installation methods

            c. Require media

       5. Configure NOS

            a. Initial network

            b. User

            c. Device

            d. Roles

            e. OS environmental settings

            f. Applications and tools

       6. Patch management

B. Explain NOS security software and its features.

       1. Software firewall

            a. Port blocking

            b. Application exception

            c. ACL

       2. Malware protection software

            a. Antivirus

            b. Antispyware

       3. Basics of file level permissions vs. share permissions

           virtualization templates)

C. Given a scenario, implement and administer NOS management features based

      on procedures and guidelines

       1. User management

       2. Resource management

       3. Monitoring (tools and agents)

            a. Add and remove users

            b. Setting permissions

            c. Group memberships

            d. Policies

            e. Logon scripts

            f. ACLs

            g. Quotas

            h. Shadow volumes

            i. Disk management

          j. Performance monitoring

          k. Baselining

          l. SNMP (MIBs)

          m. WBEM (WMI)

D. Explain different server roles, their purpose and how they interact

    1. File and print server

    2. Database server

    3. Web server

    4. Messaging server

    5. DHCP server

    6. Directory services server

    7. DNS server

    8. Application server

          a. Update server and proxy server

          b. Filtering server

          c. Monitoring server

          d. Dedicated

          e. Distributed

          f. Peer to peer

E. Summarize server virtualization concepts, features and considerations

    1. Remote access server

    2. Virtualized services

    3. NTP server

    4. Explain the different between a workstation, desktop and a server

    5. Server shut down and start up sequence (one server vs. multiple servers vs.  attached components)

    6. Resource utilization

    7. Configuration

    8. Interconnectivity

    9. Management server

    10. Reasons for virtualization

          a. Cost benefits

          b. Redundancy

          c. Green initiative

          d. Disaster recovery

          e. Testing environment

          f. Ease of deployment

F. Describe common elements of networking essentials

    1. TCP/IP

          a. Subnetting

          b. DNS

c. DHCP

d. Classes

e. Gateways

f. Static vs. dynamic

g. IP stack

h. Ports

i. Teaming/Link Aggregation

2. Ethernet

a. Types

b. Speeds

c. Cables

3. VPN

4. VLAN

5. DMZ

III. Storage

A. Describe RAID technologies and its features and benefits

1. Hot spare

2. Software vs. hardware

3. Cache read/write levels (data loss potential)

4. Performance benefits and tradeoffs

B. Given a scenario, select the appropriate RAID level

1. 0, 1, 3, 5, 6, 10, 50

2. Performance benefits and tradeoffs

C. Install and configure different internal storage technologies

1. Hot swappable vs. non-hot swappable

2. SCSI, Ultra SCSI, Ultra320 (termination), LUNs

3. SAS, SATA

4. Tape

5. Optical

a. DVD

b. DVD-R

c. CD-ROM

d. CD-R

e. CD-RW

f. Blu-Ray

6. Flash

7. Floppy (USB)

8. Controller (firmware levels)

9. Hard drive (firmware, JBOD)

D. Summarize the purpose of external storage technologies

1. Network attached storage

2. Storage area network

3. Tape library
4. WORM
5. Optical jukebox
6. Transport media
   a. iSCSI
   b. SATA
   c. SAS
   d. SCSI

e. Fiber Channel

**COURSE LEARNING OUTCOMES AND COMPETENCIES**

Upon successful completion of this course, the student will:

A.  Differentiate between system board types, components and  their purposes.
    1.  Determine the location of dip switches and jumpers.
    2.  Differentiate between different processor types.
    3.  Determine the bus type and speed for a server.
    4.  Identify different mainboard components.
    5.  Identify different types of mainboard expansion slots.

B.  Determine the different chassis types and components.
    6.  Identify types of server cooling components.

C.  Differentiate between types of processors and their features.
    7.  Identify memory modules.
    8.  Select the appropriate memory for given hardware.

D.  Utilize appropriate expansion cards.
    9.  Determine the appropriate expansion cards for a server.

E.  Upgrade firmware.
    10.  Describe the firmware upgrade process.

F.  Describe the installation, deployment of a NOS.
    11.  Describe the installation process of a NOS.
    12.  Describe the types of NOS file systems.
    13.  Configure basic NOS functions.

G.  Explain NOS security software and features.
    14.  Describe types of NOS security software.
    15.  Compare and contrast Antivirus and Antispyware software.

H.  Describe NOS management features.
    16.  Utilize NOS management features.

I.  Differentiate between different server roles and purposes.
    17.  Describe the different roles of a server.
    18.  Determine the appropriate type of server for a given role.

J.   Summarize server virtualization.
    19.   Summarize virtualization.
    20.   Compare and contrast current virtualization software.

K.   Explain common networking services in the NOS.
    21.   Commonly utilized services offered by a NOS.

L.   Define raid technologies.
    22.   Describe raid and its purpose.

M.   Select the appropriate raid level for a server.
    23.   Determine the appropriate raid level for a server.

## ASSESSMENT OF COURSE LEARNING OUTCOMES AND COMPETENCIES
Student progress is evaluated through both formative and summative assessment methods. Specific details may be found in the instructor's course information document.

## COLLEGE POLICIES AND PROCEDURES
*Student Handbook*
https://www.kckcc.edu/files/docs/student-resources/student-handbook-and-code-of-conduct.pdf

*College Catalog*
https://www.kckcc.edu/academics/catalog/index.html

*College Policies and Statements*
https://www.kckcc.edu/about/policies-statements/index.html

*Accessibility and Accommodations*
https://www.kckcc.edu/academics/resources/student-accessibility-support-services/index.html.