SYLLABUS

DATE OF LAST REVIEW: 02/2013

CIP CODE: 11.0901

SEMESTER: Departmental Syllabus

COURSE TITLE: Routing and Switching in the Enterprise

COURSE NUMBER: NETW 0146

CREDIT HOURS: 8

INSTRUCTOR: Departmental Syllabus

OFFICE LOCATION: Departmental Syllabus

OFFICE HOURS: Departmental Syllabus

TELEPHONE: Departmental Syllabus

EMAIL: KCKCC issued email accounts are the official means for electronically communicating with our students.

PREREQUISITE(S): NETW 0144 Small-to-medium Business or ISP

REQUIRED TEXT AND MATERIALS: Please check with the KCKCC bookstore, http://www.kckccbookstore.com/, for the required texts for your particular class.

COURSE DESCRIPTION:
Routing and Switching in the Enterprise is designed to introduce students to networking from a larger business standpoint. Students will learn how to implement a LAN for an approved network design and configure a switch with VLANs and inter-switch communication. Students will also implement access lists to permit or deny specified traffic. Students will learn how to implement WAN links and configure routing protocols on Cisco devices. Students will also perform LAN, WAN, and VLAN troubleshooting using a structured methodology and the OSI model.

METHOD 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. Networking in the Enterprise
   A. Describing the Enterprise Network
   B. Supporting the Business Enterprise
   C. Traffic Flow in the Enterprise Network
   D. Enterprise LANs and WANs
   E. Intranets and Extranets
   F. Identifying Enterprise Applications
   G. Traffic Flow Patterns
   H. Applications and Traffic on an Enterprise Network
   I. Network Traffic Prioritization
   J. Supporting Remote Workers
   K. Teleworking
   L. Virtual Private Networks

II. Exploring the Enterprise Network Infrastructure
   A. Describing the Current Network
   B. Enterprise Network Documentation
   C. Network Operations Center (NOC)
   D. Telecommunication Room Design and Considerations
   E. Supporting the Enterprise Edge
   F. Service Delivery at the Point-of-Presence
   G. Security Considerations at the Enterprise Edge
   H. Connecting the Enterprise Network to External Services
   I. Reviewing Routing and Switching
   J. Router Hardware
   K. Basic Router CLI Show Commands
   L. Basic Router Configuration Using CLI
   M. Switch Hardware
   N. Basic Switch CLI Show Commands

III. Switching in an Enterprise Network
   A. Describing Enterprise Level Switching
   B.witching and Network Segmentation
   C. Multilayer Switching
   D. Types of Switching
   E. Switch Security
   F. Preventing Switching Loops
   G. Redundancy in a Switched Network
   H. Spanning Tree Protocol (STP)
   I. Root Bridges
   J. Spanning Tree in a Hierarchical Network
   K. Rapid Spanning Tree Protocol (RSTP)
   L. Configuring VLANs
M. Virtual LAN
N. Configuring a Virtual LAN
O. Identifying VLANs
P. Trunking and Inter-VLAN Routing
Q. Trunk Ports
R. Extending VLANs Across Switches
S. Inter-VLAN Routing
T. Maintaining VLANs on an Enterprise Network
U. VLAN Trunking Program (VTP)
V. Configuring VTP
W. VLAN Support for IP Telephony and Wireless
X. VLAN Best Practices

IV. Addressing in an Enterprise Network
A. Using a Hierarchical IP Network Address Scheme
B. Flat and Hierarchical Networks
C. Hierarchical Network Addressing
D. Using Subnetting to Structure the Network
E. Using VLSM
F. Subnet Mask
G. Calculating Subnets Using Binary Representation
H. Basic Subnetting Process
I. Variable Length Subnet Masks (VLSM)
J. Implementing VLSM Addressing
K. Using Classless Routing and CIDR
L. Classful and Classless Routing
M. CIDR and Route Summarization
N. Calculating Route Summarization
O. Dis contiguous Subnets
P. Subnetting and Addressing Best Practices
Q. Using NAT and PAT
R. Private IP Address Space
S. NAT at the Enterprise Edge
T. Static and Dynamic NAT
U. Using PAT
V. Routing with a Distance Vector Protocol in an Enterprise Network
W. Managing Enterprise Networks
X. Enterprise Networks
Y. Enterprise Topologies
Z. Static and Dynamic Routing
AA. Configuring Static Routes
BB. Default Routes
CC. Routing Using the RIP Protocol
DD. Distance Vector Routing Protocols
EE. Routing Information Protocol (RIP)
FF. Configuring RIPv2
GG. Problems with RIP
HH. Verifying RIP
II. Routing Using the EIGRP Protocol
JJ. Limitations of RIP
KK. Enhanced Interior Gateway Routing Protocol (EIGRP)
LL. EIGRP Terminology and Tables
MM. EIGRP Neighbors and Adjacencies
NN. EIGRP Metrics and Convergence
OO. Implementing EIGRP
PP. Configuring EIGRP
QQ. EIGRP Route Summarization
RR. Verifying EIGRP Operation
SS. Issues and Limitations of EIGRP

VI. Routing With a Link-State Protocol
A. Routing Using the OSPF Protocol
B. Link-State Protocol Operation
C. OSPF Metrics and Convergence
D. OSPF Neighbors and Adjacencies
E. OSPF Areas
F. Implementing Single-Area OSPF
G. Configuring Basic OSPF in a Single Area
H. Configuring OSPF Authentication
I. Tuning OSPF Parameters
J. Verifying OSPF Operation
K. Using Multiple Routing Protocols
L. Configuring and Propagating a Default Route
M. Configuring OSPF Summarization
N. OSPF Issues and Limitations
O. Using Multiple Protocols in the Enterprise

VII. Implementing Enterprise Wan Links
A. Connecting the Enterprise WAN
B. WAN Devices and Technology
C. WAN Standards
D. Accessing the WAN
E. Packet and Circuit Switching
F. Last Mile and Long Range Wan Technologies
G. Comparing Common WAN Encapsulations
H. Ethernet and WAN Encapsulation
I. HDLC and PPP
J. Configuring PPP
K. Configuring PAP and CHAP
L. Using Frame Relay
M. Overview of Frame Relay
N. Frame Relay Functionality

VIII. Filtering Traffic by Using Access Control Lists
A. Using Access Control Lists
B. Traffic Filtering
C. Access Control Lists
D. Types and Usage of ACLs
E. ACL Processing
F. Using a Wildcard Mask
G. ACL Wildcard Mask Purpose and Structure
H. Analyzing the Effects of the Wildcard Mask
I. Configuring Access Control Lists
J. Placing Standard and Extended ACLs
K. Basic ACL Configuration Process
L. Configuring Numbered Standard ACLs
M. Configuring Numbered Extended ACLs
N. Configuring Named ACLs
O. Configure Router VTY Access
P. Permitting and Denying Specific Types of Traffic
Q. Configuring ACLs for Application and Port Filtering
R. Configuring ACLs to Support Established Traffic
S. Effects of NAT and PAT on ACL Placement
T. Analyzing Network ACLs and Placement
U. Configuring ACLs with Inter-VLAN Routing
V. Filtering Traffic Using Access Control Lists
W. Using Logging to Verify ACL Functionality
X. Analyzing Router Logs
Y. ACL Best Practices

IX. Troubleshooting an Enterprise Network
A. Understanding the Impact of Network Failure
B. Enterprise Network Requirements
C. Monitoring and Proactive Maintenance
D. Troubleshooting and the Failure Domain
E. Troubleshooting Process
F. Troubleshooting Switching and Connectivity Issues
G. Troubleshooting Basic Switching
H. Troubleshooting VLAN Configuration Issues
I. Troubleshooting VTP
J. Troubleshooting Routing Issues
K. RIP Issues
L. EIGRP Issues
M. OSPF Issues
N. Route Redistribution Issues
O. Troubleshooting WAN Configurations
P. Troubleshooting WAN Connectivity
Q. Troubleshooting WAN Authentication
R. Troubleshooting ACL Issues
S. Determining if an ACL is the Issue
T. ACL Configuration and Placement Issues

EXPECTED LEARNER OUTCOMES:
A. The student will be able to describe Networking in the Enterprise
B. The student will be able to describe Exploring the Enterprise Network Infrastructure
C. The student will be able to describe Switching in an Enterprise Network
D. The student will be able to describe Addressing in an Enterprise Network
E. The student will be able to describe Routing With a Link-State Protocol
F. The student will be able to describe Implementing Enterprise Wan Links
G. The student will be able to describe Filtering Traffic by Using Access Control Lists
H. The student will be able to describe Troubleshooting an Enterprise Network

COURSE COMPETENCIES:

The student will be able to describe Networking in the Enterprise
1. The student will be able to describe the Enterprise Network
2. The student will be able to describe Supporting the Business Enterprise
3. The student will be able to describe Traffic Flow in the Enterprise Network
4. The student will be able to describe Enterprise LANs and WANs
5. The student will be able to describe Intranets and Extranets
6. The student will be able to describe Identifying Enterprise Applications
7. The student will be able to describe Traffic Flow Patterns
8. The student will be able to describe Applications and Traffic on an Enterprise Network
9. The student will be able to describe Network Traffic Prioritization
10. The student will be able to describe Supporting Remote Workers
11. The student will be able to describe Teleworking
12. The student will be able to describe Virtual Private Networks

The student will be able to describe Exploring the Enterprise Network Infrastructure
13. The student will be able to describe Describing the Current Network
14. The student will be able to describe Enterprise Network Documentation
15. The student will be able to describe Network Operations Center (NOC)
16. The student will be able to describe Telecommunication Room Design and Considerations
17. The student will be able to describe Supporting the Enterprise Edge
18. The student will be able to describe Service Delivery at the Point-of-Presence
19. The student will be able to describe Security Considerations at the Enterprise Edge
20. The student will be able to describe Connecting the Enterprise Network to External Services
21. The student will be able to describe Reviewing Routing and Switching
22. The student will be able to describe Router Hardware
23. The student will be able to describe Basic Router CLI Show Commands
24. The student will be able to describe Basic Router Configuration Using CLI
25. The student will be able to describe Switch Hardware
26. The student will be able to describe Basic Switch CLI Show Commands
The student will be able to describe Switching in an Enterprise Network

27. The student will be able to describe Enterprise Level Switching
28. The student will be able to describe Switching and Network Segmentation
29. The student will be able to describe Multilayer Switching
30. The student will be able to describe Types of Switching
31. The student will be able to describe Switch Security
32. The student will be able to describe Preventing Switching Loops
33. The student will be able to describe Redundancy in a Switched Network
34. The student will be able to describe Spanning Tree Protocol (STP)
35. The student will be able to describe Root Bridges
36. The student will be able to describe Spanning Tree in a Hierarchical Network
37. The student will be able to describe Rapid Spanning Tree Protocol (RSTP)
38. The student will be able to describe Configuring VLANs
39. The student will be able to describe Types of Switching
40. The student will be able to demonstrate Configuring a Virtual LAN
41. The student will be able to describe Identifying VLANs
42. The student will be able to describe Trunking and Inter-VLAN Routing
43. The student will be able to describe Trunk Ports
44. The student will be able to describe Extending VLANs Across Switches
45. The student will be able to describe Inter-VLAN Routing
46. The student will be able to describe Maintaining VLANs on an Enterprise Network
47. The student will be able to describe VLAN Trunking Program (VTP)
48. The student will be able to describe Configuring VTP
49. The student will be able to describe VLAN Support for IP Telephony and Wireless
50. The student will be able to describe VLAN Best Practices

The student will be able to describe Addressing in an Enterprise Network

51. The student will be able to describe Using a Hierarchical IP Network Address Scheme
52. The student will be able to describe Flat and Hierarchical Networks
53. The student will be able to describe Hierarchical Network Addressing
54. The student will be able to describe Using Subnetting to Structure the Network
55. The student will be able to describe Using VLSM
56. The student will be able to describe Subnet Mask
57. The student will be able to describe Calculating Subnets Using Binary Representation
58. The student will be able to describe Basic Subnetting Process
59. The student will be able to describe Variable Length Subnet Masks (VLSM)
60. The student will be able to demonstrate Implementing VLSM Addressing
61. The student will be able to describe Using Classless Routing and CIDR
62. The student will be able to describe Classful and Classless Routing
63. The student will be able to describe CIDR and Route Summarization
64. The student will be able to describe Calculating Route Summarization
65. The student will be able to describe Discontiguous Subnets
66. The student will be able to describe Subnetting and Addressing Best Practices
67. The student will be able to describe Using NAT and PAT
68. The student will be able to describe Private IP Address Space
69. The student will be able to describe NAT at the Enterprise Edge
70. The student will be able to describe Static and Dynamic NAT
71. The student will be able to describe Using PAT
72. The student will be able to describe Routing with a Distance Vector Protocol in an Enterprise Network
73. The student will be able to describe Managing Enterprise Networks
74. The student will be able to describe Enterprise Networks
75. The student will be able to describe Enterprise Topologies
76. The student will be able to describe Static and Dynamic Routing
77. The student will be able to demonstrate Configuring Static Routes
78. The student will be able to describe Default Routes
79. The student will be able to describe Routing Using the RIP Protocol
80. The student will be able to describe Distance Vector Routing Protocols
81. The student will be able to describe Routing Information Protocol (RIP)
82. The student will be able to demonstrate Configuring RIPv2
83. The student will be able to describe Problems with RIP
84. The student will be able to describe Verifying RIP
85. The student will be able to describe Routing Using the EIGRP Protocol
86. The student will be able to describe Limitations of RIP
87. The student will be able to describe Enhanced Interior Gateway Routing Protocol (EIGRP)
88. The student will be able to describe EIGRP Terminology and Tables
89. The student will be able to describe EIGRP Neighbors and Adjacency
90. The student will be able to describe EIGRP Metrics and Convergence
91. The student will be able to demonstrate Implementing EIGRP
92. The student will be able to demonstrate Configuring EIGRP
93. The student will be able to describe EIGRP Route Summary
94. The student will be able to describe Verifying EIGRP Operation
95. The student will be able to describe Issues and Limitations of EIGRP

The student will be able to describe Routing With a Link-State Protocol

96. The student will be able to describe Routing Using the OSPF Protocol
97. The student will be able to describe Link-State Protocol Operation
98. The student will be able to describe OSPF Metrics and Convergence
99. The student will be able to describe OSPF Neighbors and Adjacencies
100. The student will be able to describe OSPF Areas
101. The student will be able to demonstrate Implementing Single-Area OSPF
102. The student will be able to demonstrate Configuring Basic OSPF in a Single Area
103. The student will be able to demonstrate Configuring OSPF Authentication
104. The student will be able to describe Tuning OSPF Parameters
105. The student will be able to describe Verifying OSPF Operation
The student will be able to describe Using Multiple Routing Protocols.

The student will be able to describe Configuring and Propagating a Default Route.

The student will be able to describe Configuring OSPF Summarization.

The student will be able to describe OSPF Issues and Limitations.

The student will be able to describe Using Multiple Protocols in the Enterprise.

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The student will be able to describe Traffic Filtering.

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The student will be able to describe Types and Usage of ACLs.

The student will be able to describe ACL Processing.

The student will be able to describe Using a Wildcard Mask.

The student will be able to describe ACL Wildcard Mask Purpose and Structure.

The student will be able to describe Analyzing the Effects of the Wildcard Mask.

The student will be able to demonstrate Configuring Access Control Lists.

The student will be able to demonstrate Placing Standard and Extended ACLs.

The student will be able to describe Basic ACL Configuration Process.

The student will be able to demonstrate Configuring Numbered Standard ACLs.

The student will be able to demonstrate Configuring Numbered Extended ACLs.

The student will be able to demonstrate Configuring Named ACLs.

The student will be able to describe Configure Router VTY Access.

The student will be able to demonstrate Permitting and Denying Specific Types of Traffic.

The student will be able to demonstrate Configuring ACLs for Application and Port Filtering.
142. The student will be able to demonstrate Configuring ACLs to Support Established Traffic
143. The student will be able to describe Effects of NAT and PAT on ACL Placement
144. The student will be able to describe Analyzing Network ACLs and Placement
145. The student will be able to demonstrate Configuring ACLs with Inter-VLAN Routing
146. The student will be able to describe Filtering Traffic Using Access Control Lists
147. The student will be able to demonstrate Using Logging to Verify ACL Functionality
148. The student will be able to describe Analyzing Router Logs
149. The student will be able to describe ACL Best Practices

The student will be able to describe Troubleshooting an Enterprise Network
150. The student will be able to describe the Impact of Network Failure
151. The student will be able to describe Enterprise Network Requirements
152. The student will be able to describe Monitoring and Proactive Maintenance
153. The student will be able to describe Troubleshooting and the Failure Domain
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156. The student will be able to describe Troubleshooting Basic Switching
157. The student will be able to describe Troubleshooting VLAN Configuration Issues
158. The student will be able to describe Troubleshooting VTP
159. The student will be able to describe Troubleshooting Routing Issues
160. The student will be able to describe RIP Issues
161. The student will be able to describe EIGRP Issues
162. The student will be able to describe OSPF Issues
163. The student will be able to describe Route Redistribution Issues
164. The student will be able to describe Troubleshooting WAN Configurations
165. The student will be able to describe Troubleshooting WAN Connectivity
166. The student will be able to describe Troubleshooting WAN Authentication
167. The student will be able to describe Troubleshooting ACL Issues
168. The student will be able to describe Determining if an ACL is the Issue
169. The student will be able to describe ACL Configuration and Placement Issues

ASSESSMENT OF LEARNER OUTCOMES:
Student progress is evaluated by means that include, but are not limited to, exams, written assignments, and class participation.

SPECIAL NOTES:
This syllabus is subject to change at the discretion of the instructor. Material included is intended to provide an outline of the course and rules that the instructor will adhere to in evaluating the student’s progress. However, this syllabus is not intended to be a legal contract. Questions regarding the syllabus are welcome any time.

Kansas City Kansas Community College is committed to an appreciation of diversity with respect for the differences among the diverse groups comprising our students, faculty, and staff.
that is free of bigotry and discrimination. Kansas City Kansas Community College is committed
to providing a multicultural education and environment that reflects and respects diversity and
that seeks to increase understanding.

Kansas City Kansas Community College offers equal educational opportunity to all students as
well as serving as an equal opportunity employer for all personnel. Various laws, including Title
IX of the Educational Amendments of 1972, require the college’s policy on non-discrimination
be administered without regard to race, color, age, sex, religion, national origin, physical
handicap, or veteran status and that such policy be made known.

Kansas City Kansas Community College complies with the Americans with Disabilities Act. If
you need accommodations due to a documented disability, please contact the Director of the
Academic Resource Center at (913) 288-7670 V/TDD.