



## I. COURSE DESCRIPTION:

This course builds on the CCNA curriculum by covering advanced routing concepts and protocols. Instruction includes advanced concepts in networking, network terminology, and routing protocols, including the Border Gateway Protocol (BGP), the Enhanced Interior Gateway Routing Protocol (EIGRP), the multi-area Open Shortest Path First (OSPF) protocol, Multicasting and the Intermediate System-to-Intermediate System (IS-IS) protocol. Topics also include IP Internet Protocol Version 6, hierarchical design principles for building scalable internetworks, advanced routing concepts in building scalable internetworks, and key characteristics for building a secure, responsive, and adaptable internetwork using access control lists (ACLs), route redistribution, and policy-based routing.. Students will install, configure, and operate complex routed LAN and WAN networks.

## II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

Upon successful completion of this course, the student will demonstrate the ability to:

### 1. Build Scalable IP Internetworks

#### Potential Elements of the Performance:

- List and describe the layers of the 3 layer hierarchical design model.
- List and describe the characteristics of scalable internetworks
- Select appropriate routing protocols
- Implement advanced routing techniques such as priority queuing, equal & unequal cost load balancing.

*This learning outcome will constitute approximately 20% of the course.*

Reference: Module 1

### 2. Utilize Interior routing protocols at an advanced level.

#### Potential Elements of the Performance:

- Describe various routing processes including default routing, floating static routes, convergence and route calculations.
- Describe EIGRP characteristics such as packet types, various EIGRP tables and route summarization with EIGRP
- Describe the characteristics of multiple area OSPF networks.
- Describe the characteristics of OSPF network types including

stub, totally stubby and not so stubby (NSSA) areas.

- Compare IS-IS with other Link State routing protocols.
- Develop a vocabulary for the IS-IS routing protocol and be able to describe terms such as End devices and Intermediate (IS) devices.
- Configure IS-IS routed networks

*This learning outcome will constitute approximately 35% of the course.*

Reference: Module 2-5

3. Improve network performance through advanced control of interior routing protocols

Potential Elements of the Performance:

- Control routing update traffic
- Implement policy routing
- Control route redistribution
- Complete a routing optimisation challenge lab

*This learning outcome will constitute approximately 10% of the course.*

Reference: Module 8

4. Describe the characteristics of and configure the BGP Border Gateway Routing Protocol

Potential Elements of the Performance:

- Describe the characteristics of autonomous systems from a Border Gateway Routing Protocol perspective
- Compare and contrast multihomed non transit and multihomed transit autonomous systems.
- Describe and configure the various attributes of BGP for example: next hop, AS\_PATH, Multi Exit Discriminator (MED) attribute
- Configure Redundancy symmetry and load balancing in BGP networks
- Complete a BGP challenge lab in preparation for the course practical test

*This learning outcome will constitute approximately 15% of the course.*

Reference: Module 6

5. Describe Multicasting at the Layer 3 and Layer 2 level and implement multicast networks.

Potential Elements of the Performance:

- Describe multicasting in general
- Utilize IGMP and describe layer 2 multicasting issues
- Describe and select the appropriate Layer 3 Multicasting routing protocol.
- Configure and verify a multicast network.

*This learning outcome will constitute approximately 10% of the course.*

Reference: Module 7

6. Describe IP Version 6 and implement it in a routed OSPF environment.

Potential Elements of the Performance:

- Explain the addressing format for IPv6
- Compare and contrast ipv6 unicast, multicast and anycast
- Describe and implement IPv6 routing
- Describe the IPv6 transition mechanisms
- Implement IPv6 tunneling through IPv4 networks

*This learning outcome will constitute approximately 10% of the course.*

Reference: Module 8

### III. TOPICS:

1. Scalable Internetworks
2. Routing with IGPs
3. Route optimisation
4. Exterior Gateway Protocols
5. Multicasting
6. IPv6

**IV. REQUIRED RESOURCES/TEXTS/MATERIALS:**

None. All curriculum is online.

**V. EVALUATION PROCESS/GRADING SYSTEM:**

Theory:

Online Cisco Module exams	30%
Online Final Cisco Exam	25%

Lab:

Practical Test	20%
Lab Activities	25%

**Special Note:**

**Online Cisco exams must be written in class during class time. It is unacceptable to print or otherwise copy any of the online Cisco exams.**

The following semester grades will be assigned to students:

<b>Grade</b>	<b>Definition</b>	<i>Grade Point Equivalent</i>
A+	90 – 100%	
A	80 – 89%	4.00
B	70 - 79%	3.00
C	60 - 69%	2.00
D	50 – 59%	1.00
F (Fail)	49% and below	0.00
CR (Credit)	Credit for diploma requirements has been awarded.	
S	Satisfactory achievement in field /clinical placement or non-graded subject area.	
U	Unsatisfactory achievement in field/clinical placement or non-graded subject area.	
X	A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.	
NR	Grade not reported to Registrar's office.	
W	Student has withdrawn from the course without academic penalty.	

## VI. SPECIAL NOTES:

### Special Needs:

If you are a student with special needs (e.g. physical limitations, visual impairments, hearing impairments, or learning disabilities), you are encouraged to discuss required accommodations with your professor and/or the Special Needs office. Visit Room E1101 or call Extension 2703 so that support services can be arranged for you.

### Retention of Course Outlines:

It is the responsibility of the student to retain all course outlines for possible future use in acquiring advanced standing at other postsecondary institutions.

### Communication:

The College considers **WebCT/LMS** as the primary channel of communication for each course. Regularly checking this software platform is critical as it will keep you directly connected with faculty and current course information. Success in this course may be directly related to your willingness to take advantage of the **Learning Management System** communication tool.

### Plagiarism:

Students should refer to the definition of “academic dishonesty” in *Student Code of Conduct*. Students who engage in academic dishonesty will receive an automatic failure for that submission and/or such other penalty, up to and including expulsion from the course/program, as may be decided by the professor/dean. In order to protect students from inadvertent plagiarism, to protect the copyright of the material referenced, and to credit the author of the material, it is the policy of the department to employ a documentation format for referencing source material.

### Course Outline Amendments:

The professor reserves the right to change the information contained in this course outline depending on the needs of the learner and the availability of resources.

Substitute course information is available in the Registrar's office.

**VII. PRIOR LEARNING ASSESSMENT:**

Students who wish to apply for advanced credit in the course should consult the professor. Credit for prior learning will be given upon successful completion of a challenge exam or portfolio.

**VIII. ADVANCE CREDIT TRANSFER:**

Students who wish to apply for advance credit transfer (advanced standing) should obtain an Application for Advance Credit from the program coordinator (or the course coordinator regarding a general education transfer request) or academic assistant. Students will be required to provide an unofficial transcript and course outline related to the course in question.