ITT Technical Institute

NT2640T

IP Networking

Onsite Course

SYLLABUS

Credit hours: 4.5

Contact/Instructional hours: 67 (41 Theory Hours, 26 Lab Hours)

Prerequisite(s) and/or Corequisite(s):

Prerequisites: NT1210T Introduction to Networking or equivalent

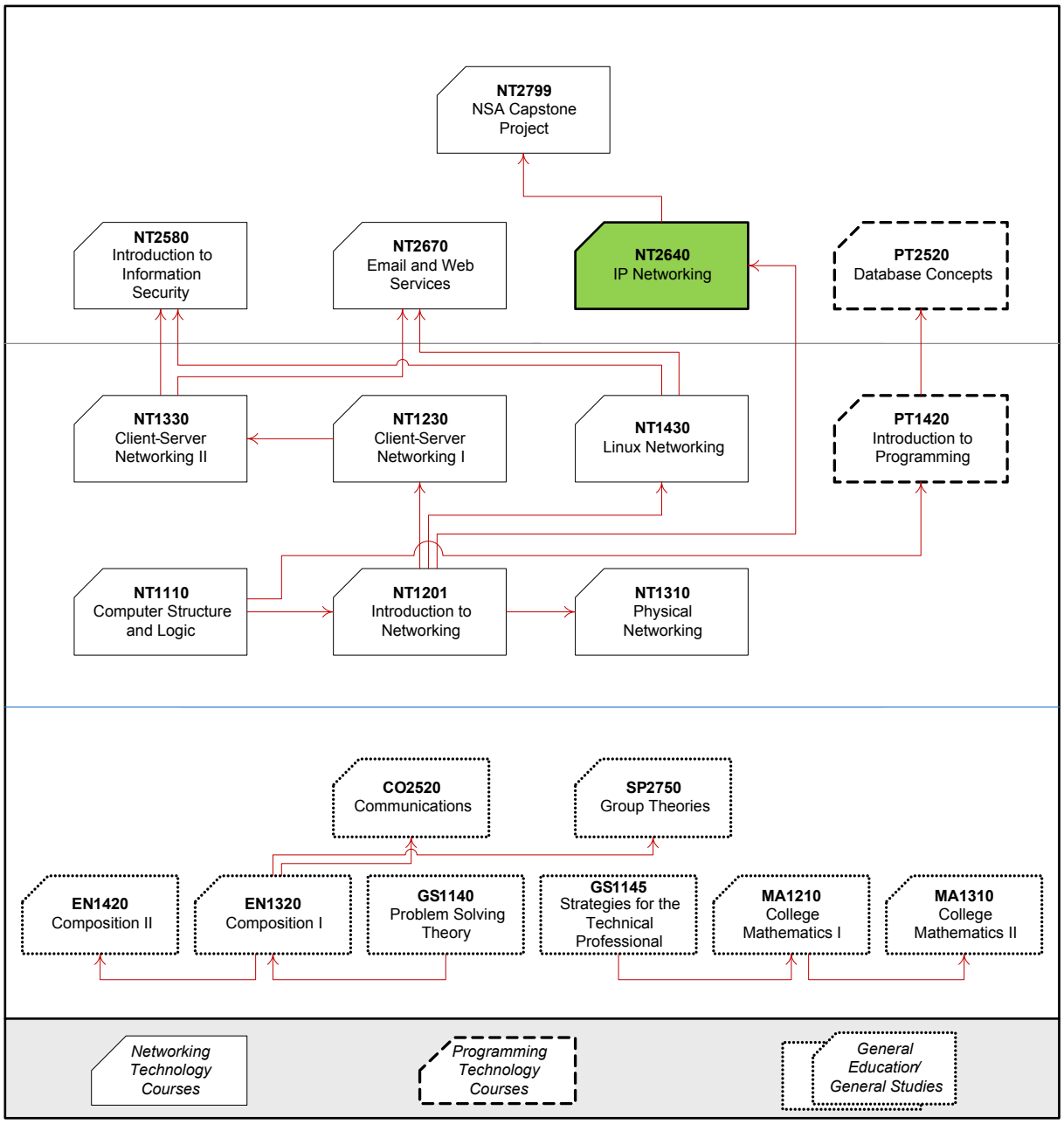
Course Description:

This course explores network design and implementation by applying the TCP/IP protocols to provide connectivity and associated services. Planning and deployment of network addressing structures, as well as router and switch configurations, are also examined.

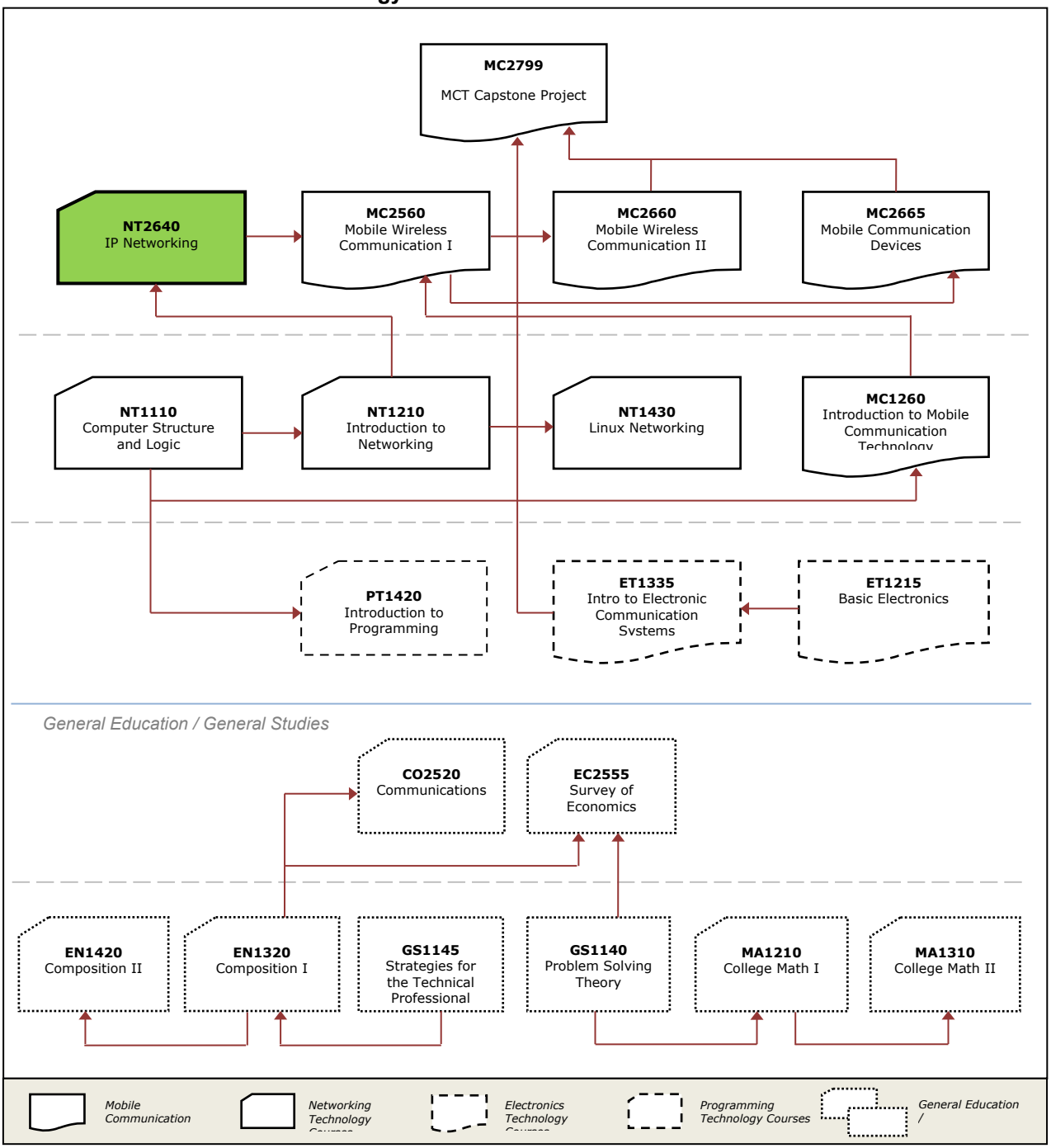
Where Does This Course Belong?

This course is required in the associate degree program in Network Systems Administration and associate degree in Mobile Communications Technology. The following diagrams indicate how this course relates to other courses in respective programs:

Network Systems Administration



Mobile Communications Technology



Course Summary

Major Instructional Areas

- TCP/IP and OSI network reference models
- IP and associated protocols including TCP, UDP, ICMP, and ARP
- IP addressing and subnet design including variable-length subnet mask (VLSM)
- Routing principals and dynamic routing protocols including basic configuration
- Ethernet switching principals and concepts including basic configuration
- Local area network (LAN) and wide area network (WAN) concepts and basic implementation tasks
- Cisco router hardware and software (IOS) overview including basic configuration
- Introduction to IP network troubleshooting including routing, switching, and WAN

Course Objectives

This course has the following instructional objectives:

1. Apply TCP/IP and OSI network reference model concepts and IP protocols (TCP/UDP/ICMP) in implementation and support of networks.
2. Apply procedures of the Cisco IOS CLI environment to support and configure Cisco internetworking devices.
3. Apply networking concepts and theories to provide IP networking troubleshooting tasks.
4. Apply principles of IP address subnetting design including the use of variable-length subnet masks (VSLM).
5. Apply foundational concepts of IP routing including dynamic routing protocols (RIP, EIGRP, and OSPF).
6. Apply foundational concepts of bridging and switching and other relevant local area network (LAN) technologies.
7. Describe the concepts of collision and broadcast domains, and address resolution protocols.
8. Apply the fundamental concepts of wide area networks (WANs), including point-to-point links and virtual private network WAN technologies such as Frame Relay.

Learning Outcomes

Upon completion of this course the student will be able to:

1. Demonstrate the ability to design and implement an IP address scheme including subnet design with VLSM.

2. Demonstrate basic competencies in Cisco IOS CLI environment including operational and configuration commands.
3. Demonstrate basic competencies in IP routing configuration including the configuration of dynamic routing protocols (RIP, OSPF, and EIGRP).
4. Demonstrate basic competencies in LAN configuration including Ethernet switching and VLANs.
5. Demonstrate basic competencies in WAN configuration including point-to-point links and Frame Relay.
6. Demonstrate the ability to configure and troubleshoot IP routing including dynamic routing protocols OSPF and EIRGP.

Learning Materials and References

Required Resources

Textbook Package	New to this Course	Carried over from Previous Course(s)	Required for Subsequent Course(s)
Odom, W. (2012). *IP networking* (1st ed.). Boston, MA: Cisco Press.	■		
Odom, W. (2012). *Lab manual for IP networking* (2nd ed,). Boston, MA: Cisco Press.	■		
Odom, W., & Beasley, J. S. (2011). CCNA 640-802 *Network simulator* (Academic ed.). Boston, MA: Pearson IT Certification*	■		

*The CCNA 640-802 Network Simulator (Academic Edition) is preinstalled on the virtual machine named Intro_to_Networking VM located on C:\Virtual Machines of the lab computer on campus. The password for the admin login is P@$$w0rd, where 0 is numerical zero. Students need to copy that virtual machine to their own USB hard drive and launch it from there. The new simulation is installed as Network_Simulator (to distinguish from IT320 CCNA_Simulator also installed on the same virtual machine).

Recommended Resources

Professional Associations

- American Registry of Internet Numbers: https://www.arin.net/
- American National Standards Institute: http://www.ansi.org/
- Defense Advanced Research Projects Agency: http://www.darpa.mil/
- Institute of Electrical and Electronic Engineers: http://www.ieee.org
- International Standards Institute: http://www.iso.org
- Internet Assigned Numbers Authority: http://www.iana.org/

ITT Tech Virtual Library (accessed via Student Portal)

- Blank, Andrew G. (2002). *TCP/IP jumpstart: Internet protocol basics*. San Francisco: Sybex.
- Craft, Melissa. (2003). *Faster smarter Network+ certification*. Redmond, WA: Microsoft Press.

- Dyson, Peter. (1999). *Dictionary of networking*. San Francisco: Network Press.
- Gallo, Michael A., & Hancock, William M. (2002). *Networking explained* (2nd ed.). Woburn, MA: Butterworth-Heinemann.
- Groth, D. (2002). *Network+ study guide* (3rd ed.). San Francisco: Sybex.

Course Plan

Suggested Learning Approach

In this course, you will be studying individually and within a group of your peers. As you work on the course deliverables, you are encouraged to share ideas with your peers and instructor, work collaboratively on projects and team assignments, raise critical questions, and provide constructive feedback.

Use the following advice to receive maximum learning benefits from your participation in this course:

DO	DON'T
▪ Do take a proactive learning approach. ▪ Do share your thoughts on critical issues and potential problem solutions. ▪ Do plan your course work in advance. ▪ Do explore a variety of learning resources in addition to the textbook. ▪ Do offer relevant examples from your experience. ▪ Do make an effort to understand different points of view. ▪ Do connect concepts explored in this course to real-life professional situations and your own experiences.	▪ Don't assume there is only one correct answer to a question. ▪ Don't be afraid to share your perspective on the issues analyzed in the course. ▪ Don't be negative about the points of view that are different from yours. ▪ Don't underestimate the impact of collaboration on your learning. ▪ Don't limit your course experience to reading the textbook. ▪ Don't postpone your work on the course deliverables – work on small assignment components every day.

Course Outline

Unit 1: THE TCP/IP MODEL, LANS, WANS, AND IP NETWORKS ***Unit Duration:*** *Onsite: 1 week*

Upon completion of this unit, students are expected to:

- Demonstrate basic competencies in LAN configuration including Ethernet switching and VLANs.
- Demonstrate basic competencies in WAN configuration including point-to-point links and Frame Relay.

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
• Chapter 1: The TCP/IP and OSI Networking Models • Chapter 2: Fundamentals of LANs • Chapter 3: Fundamentals of WANs • Chapter 4: Class A, B, and C Networks	Assignments	Assignment 1.1:IP Addresses Classes and Special Use IP Address Space	2.5%
	Discussions	Discussion 1.1: OSI Networking Mode and LAN & WAN Terminology	1%
	Labs†	Lab1.1: ICND1 Switch CLI Exec Mode	2.5%

Unit 2: TCP/IP NETWORK, TRANSPORT, AND APPLICATION LAYERS ***Unit Duration:*** *Onsite: 1 week*

Upon completion of this unit, students are expected to:

- Demonstrate basic competencies in LAN configuration including Ethernet switching and VLANs.
- Demonstrate basic competencies in WAN configuration including point-to-point links and Frame Relay.

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
• Chapter 5: Fundamentals of IP Addressing and Routing • Chapter 6: Fundamentals of	Assignments	Assignment 2.1:Networking Protocol Numbers	2.5%
	Discussions	Discussion 2.1: IP Addressing and Routing -Exercise	1%

	Labs†	Lab 2.1: • Switch CLI Exec Mode • Switch CLI Configuration Process I • Switch CLI Configuration Process II • Router CLI Exec Mode I • Router CLI Exec Mode II • Route CLI Configuration Process • Setting Switch Passwords • Setting Router Passwords • Configuring Hostnames • Subnetting Lab 1 • Subnetting Lab 2	2.5%

Unit 3: IP SUBNETTING AND BASIC ROUTER CONFIGURATION ***Unit Duration:***
Upon completion of this unit, students are expected to: *Onsite: 1 week*

- Demonstrate basic competencies in LAN configuration including Ethernet switching and VLANs.
- Demonstrate basic competencies in WAN configuration including point-to-point links and Frame Relay.

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
• Chapter 8: Perspectives on IPv4 Subnetting • Chapter 9: Subnet Mask Conversion • Chapter 10: Analyzing Existing Subnet Masks • Chapter 11: Operating Cisco Routers	Assignments	Assignment 3.1: IP Subnetting	0.83%
		Assignment 3.2: Router Configuration	0.83%
		Assignment 3.3: Router/NAT Configuration	0.83%
	Discussion	Discussion 3.1IP Subnetting - Exercise	1%
	Labs†	Lab 3.1 • Setting Router passwords • Configuring Router IP settings • Configuring SSH • Terminal History I • Rebuild a Configuration • SSH and Telnet • Basic Router Configuration and Command Line Interface • Switch and Router Security • Subnetting Lab 3	2.5%

Unit 4: IP ROUTING WITH CONNECTED, STATIC, AND RIP-2 ROUTES ***Unit Duration:***
Upon completion of this unit, students are expected to: *Onsite: 1 week*

- Demonstrate the ability to design and implement an IP address scheme

including subnet design with VLSM.
- Demonstrate basic competencies in IP routing configuration including the configuration of dynamic routing protocols (RIP, OSPF, and EIGRP).

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
• Chapter 12: IP Routing: Static and Connected Routes • Chapter 13: Analyzing Existing Subnets • Chapter 14: Routing Protocol Concepts and Configuration	Assignments	Assignment 4.1/ IOS Admin Distance & JUNOS Route Preference	1.25%
		Assignment 4.2: Configuring RIPv2 Routing	1.25%
	Discussion	Discussion 4.1: Analyzing IP Subnets - Exercise	1%
	Labs†	Lab 4.1 • Connected Routes • Configuring IP Addresses I • Configuring IP Addresses II • Static Routes I • RIP Configuration I • RIP Configuration II • RIP Verification I • RIP-2 Configuration I • RIP Auto-Summary • Configuring Static Routes • Subnetting Lab 4	2.5%

Unit 5: IP TROUBLESHOOTING AND EIGRP ***Unit Duration:*** *Onsite: 1 week*

Upon completion of this unit, students are expected to:

- Demonstrate basic competencies in IP routing configuration including the configuration of dynamic routing protocols (RIP, OSPF, and EIGRP).
- Demonstrate the ability to configure and troubleshoot IP routing including dynamic routing protocols OSPF and EIRGP.

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
• Chapter 15: Troubleshooting IP Routing • Chapter 16: EIGRP	Assignments	Assignment 5.1: Cisco Networks: EIGRP versus OSPF	1.25%
		Assignment 5.2: Routing Protocols	1.25%
	Discussion	Discussion 5.1: Troubleshooting IP Exercise	1%

	Labs†	Lab 5.1: • IP Addressing and Routing • EIGRP Serial Configuration I • EIGRP Serial Configuration II • EIGRP Route Tuning I • EIGRP Neighbors I • EIGRP Serial Configuration I • Configuring EIGRP Routing • Subnetting Lab 5	2.5%

Unit 6: SUBNET DESIGN ***Unit Duration:***
Upon completion of this unit, students are expected to: *Onsite: 1 week*

- Demonstrate the ability to design and implement an IP address scheme including subnet design with VLSM.
- Demonstrate basic competencies in Cisco IOS CLI environment including operational and configuration commands.
- Demonstrate basic competencies in IP routing configuration including the configuration of dynamic routing protocols (RIP, OSPF, and EIGRP).

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
• Chapter 17: Subnet Mask Design • Chapter 18: Finding All Subnets of One Classful Network	Exams	Midterm Exam	20%
	Assignments	Assignment 6.1: IP Subnet Breakdown	2.5%
	Discussions	Discussion 6.1: IP Subnet Design - Exercise	1%
	Labs†	Lab 6.1 • Subnetting and Addressing I • Subnetting and Addressing II • Subnetting and Addressing III • Router Configuration Challenge I • Subnetting Lab 6	2.5%

Unit 7: ADVANCED IP ROUTING TOPICS AND OSPF ***Unit Duration:***
Upon completion of this unit, students are expected to: *Onsite: 1 week*

- Demonstrate the ability to design and implement an IP address scheme including subnet design with VLSM.
- Demonstrate basic competencies in Cisco IOS CLI environment including operational and configuration commands.

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
• Chapter 19: VLSM and Route Summarization • Chapter 20: IP Troubleshooting II	Assignments	Assignment 7.1: IP Troubleshooting Procedures	1.25%
		Assignment 7.2: Access Lists	1.25%

• Chapter 21: OSPF	Discussions	Discussion 7.1: VLSM and Route Summarization	1%
	Labs†	Lab 7.1 • IP Addressing and Configuration I • OSPF Serial Configuration I • OSPF Router ID I • OSPF Metric Tuning I • OSPF Neighbors I • Routing Analysis III • IP Routing II • Configuring OSPF Routing • Configuring Access Lists 1 • NAT/PAT Configuration Lab • Subnetting Lab 7	2.5%

Unit 8: ADVANCED IP TOPICS ***Unit Duration:***
Onsite: 1 week

Upon completion of this unit, students are expected to:

- Demonstrate basic competencies in Cisco IOS CLI environment including operational and configuration commands.
- Demonstrate basic competencies in IP routing configuration including the configuration of dynamic routing protocols (RIP, OSPF, and EIGRP).
- Demonstrate the ability to configure and troubleshoot IP routing including dynamic routing protocols OSPF and EIRGP.

READING ASSIGNMENT	**GRADED ACTIVITIES / DELIVERABLES**		
	Grading Category	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
• Chapter 22: Troubleshooting Routing Protocols • Chapter 23: IP Version 6	Assignments	Assignment 8.1: IPv6 Address Type - Multicast	1.25%
		Assignment 8.2: IPv6 Configuration Problems	1.25%
	Discussions	Discussion 8.1:IPv6 Lab Exercise and Discussion	1%
	Labs†	Lab 8.1: • IP Addressing and Configuration I • OSPF Troubleshooting I • Path Troubleshooting IV • IPv6 Address Configuration I • IPv6 Address Configuration II • IPv6 Address Configuration III • Configuring Dynamic NAT • IPv6 Router Configuration • Subnetting Lab 8	2.5%

Unit 9: LANS ***Unit Duration:***
Upon completion of this unit, students are expected to: *Onsite: 1 week*

- Demonstrate basic competencies in Cisco IOS CLI environment including operational and configuration commands.
- Demonstrate basic competencies in LAN configuration including Ethernet switching and VLANs.

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
• Chapter 24: Ethernet LAN Switching Concepts • Chapter 25: Ethernet Switch Configuration • Chapter 26: Virtual LANs	Assignments	Assignment 9.1: STP Convergence Outcomes	0.625%
		Assignment 9.2: Switch and VLAN Problems I	0.625%
		Assignment 9.3: VLAN and Routing Problems	0.625%
		Assignment 9.4: Switch and VLAN Problems II	0.625%
	Discussions	Discussion 9.1: Bridge/Switch Forwarding Logic	1%
	Labs†	Lab 9.1: • Interface settings I • Switch Forwarding • Switch IP Connectivity I • VLANs 1 • VLAN Configuration II • VLAN Configuration III • Trunking Configuration I • Switch Interfaces and Forwarding • VLAN Trunking I • Path Analysis • Basic Switch Configuration and Command Line Interface • Static VLAN Configuration and Trunking • Switch Configuration Challenge • Configuring Switch Port Security • VLAN Configuration Final Exam • Configuring Access Lists • Final Switch Configuration Challenge • Subnetting Lab 9	2.5

Unit 10: WANS ***Unit Duration:***

Upon completion of this unit, students are expected to: *Onsite: 1 week*

- Demonstrate basic competencies in Cisco IOS CLI environment including operational and configuration commands.
- Demonstrate basic competencies in WAN configuration including point-to-point links and Frame Relay.

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
• Chapter 27: Point-to-Point WANs • Chapter 28: Frame Relay Concepts • Chapter 29: Frame Relay Configuration and Troubleshooting	Assignments	Assignment 10.1: Frame Relay Migration to MPLS	1.25%
		Assignment 10.2: Final Router Configuration Challenge	1.25%
	Discussions	Discussion 10.1: Frame Relay Debug Walk-Through	1%
	Labs†	Lab 10.1: • Serial Link Configuration I • Serial Link Configuration II • Serial Authentication I • Frame Relay Configuration I • Frame Relay Configuration III • Frame Relay Verification I • Frame Relay Configuration I • Frame Relay Inverse ARP • Frame Relay	2.5%

Unit 11: EXAM ***Unit Duration:***
Upon completion of this unit, students are expected to: *Onsite: 1 week*

- Have achieved all course objectives

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
• N/A	Exams	Final Exam	20%

†Please retain the results of these labs as the candidate for the ePortfolio.

Evaluation and Grading

Evaluation Criteria

The graded assignments will be evaluated using the following weighted categories:

Category	Weight
Discussions	10%
Assignments	25%
Labs	25%
Exams (Midterm and Final)	40%
TOTAL	**100%**

Grade Conversion

The final grades will be calculated from the percentages earned in the course, as follows:

Grade	Percentage	Credit
A	90–100%	4.0
B+	85–89%	3.5
B	80–84%	3.0
C+	75–79%	2.5
C	70–74%	2.0
D+	65–69%	1.5
D	60–64%	1.0
F	<60%	0.0

Academic Integrity

All students must comply with the policies that regulate all forms of academic dishonesty, or academic misconduct, including plagiarism, self-plagiarism, fabrication, deception, cheating, and sabotage. For more information on the academic honesty policies, refer to the Student Handbook and the Course Catalog.

(End of Syllabus)