

ITT Technical Institute
IT371
Advanced Routing and Switching II
Onsite Course

SYLLABUS

Credit hours: 4

Contact/Instructional hours: 50 (30 Theory Hours, 20 Lab Hours)

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

Prerequisite: IT370 Advanced Routing and Switching I

Course Description:

A continuation of IT370. Focus will be on advanced switching with additional discussion on remote access networks, on-demand connectivity, Quality of Service (QoS), troubleshooting and traffic management in a complex IP network.

Syllabus: Advanced Routing and Switching II

Instructor:	_____
Office hours:	_____
Class hours:	_____

Major Instructional Areas

1. Campus network design
2. Switch operation and configuration
3. Virtual local area network (VLAN) trunking
4. Spanning Tree Protocol (STP) and switching
5. STP configuration and protection
6. Layer 3 switching
7. Campus network services
8. Wireless local area networks (WLANs)
9. Multiprotocol Label Switching (MPLS)
10. Provider edge-customer edge (PE-CE) routing protocol

Course Objectives

1. Describe data communication and telecommunication switched network topologies.
2. Implement the STP operation in a hierarchical network.
3. Implement VLAN connectivity on and between connected switches.
4. Describe high-availability technologies and techniques.
5. Implement InterVLAN routing and trunking.
6. Apply QoS for Voice over Internet Protocol (VoIP).
7. Implement security features in a switched network.
8. Explain MPLS.
9. Manage switched network components, communications, users, and recovery.
10. Demonstrate the utilization of troubleshooting resources, tools, and techniques.
11. Describe WLAN architecture.
12. Describe PE-CE routing protocols.

SCANS Objectives

SCANS is an acronym for Secretary's Commission on Achieving Necessary Skills. The committee, created by the National Secretary of Labor in the early 1990s, created a list of skills and competencies that the committee feels are necessary for employees to function in a high-tech job market.

1. Acquire and evaluate information.
2. Understand how technological systems work and operate effectively.
3. Understand how a system's structures relate to goals.
4. Demonstrate competence in selecting technology, including determining desired outcomes and applicable constraints.
5. Demonstrate competence in applying technology to tasks.
6. Work cooperatively with others, contributing to the group with ideas, suggestions, and effort.
7. Use computers to acquire, organize, analyze, and communicate information.
8. Judge which set of procedures, tools, or machines, including computers and their programs, will produce the desired results.
9. Demonstrate competence in maintaining and troubleshooting technology.

Course Outline

Note: All graded activities, except the Course Project, are listed below in the pattern of <Unit Number>.<Assignment Number>. For example, Lab 1.1 refers to the 1st lab activity in Unit 1.

Unit	Activities
1—Campus Network Design	<ul style="list-style-type: none"> • Content Covered: <i>CCNP BCMSN Official Exam Certification Guide:</i> <ul style="list-style-type: none"> ○ Chapter 1, "Campus Network Overview" ○ Chapter 2, "Modular Network Design" • Assignments: 1.1 • Labs: 1.1-1.2 • Course Project: Part 1
2—Switch Operation and Configuration	<ul style="list-style-type: none"> • Read from <i>CCNP BCMSN Official Exam Certification Guide:</i> <ul style="list-style-type: none"> ○ Chapter 3, "Switch Operation" ○ Chapter 4, "Switch Port Configuration" • Assignments: 2.1 • Labs: 2.1-2.2
3—VLAN Trunking	<ul style="list-style-type: none"> • Read from <i>CCNP BCMSN Official Exam Certification Guide:</i> <ul style="list-style-type: none"> ○ Chapter 5, "VLANs and Trunks" ○ Chapter 6, "VLAN Trunking Protocol" • Assignments: 3.1 • Labs: 3.1-3.2
4—STP and Switching	<ul style="list-style-type: none"> • Read from <i>CCNP BCMSN Official Exam Certification Guide:</i> <ul style="list-style-type: none"> ○ Chapter 7, "Aggregating Switch Links" ○ Chapter 8, "Traditional Spanning Tree Protocol" • Assignments: 4.1 • Labs: 4.1 • Quizzes: 4.1 • Course Project: Part 2
5—STP Configuration and Protection	<ul style="list-style-type: none"> • Read from <i>CCNP BCMSN Official Exam Certification Guide:</i> <ul style="list-style-type: none"> ○ Chapter 9, "Spanning Tree Configuration" ○ Chapter 10, "Protecting the Spanning Tree Protocol Topology" ○ Chapter 11, "Advanced Spanning Tree Protocol" • Assignments: 5.1 • Labs: 5.1-5.2
6—Layer 3 Switching	<ul style="list-style-type: none"> • Read from <i>CCNP BCMSN Official Exam Certification Guide:</i> <ul style="list-style-type: none"> ○ Chapter 12, "Multilayer Switching" ○ Chapter 13, "Router, Supervisor, and Power Redundancy" • Assignments: 6.1

Unit	Activities
	<ul style="list-style-type: none"> • Labs: 6.1-6.2
7—Campus Network Services	<ul style="list-style-type: none"> • Read from <i>CCNP BCMSN Official Exam Certification Guide</i>: <ul style="list-style-type: none"> ○ Chapter 14, “IP Telephony” ○ Chapter 15, “Securing Switch Access” ○ Chapter 16, “Securing with VLANs” • Assignments: 7.1 • Labs: 7.1-7.2
8—WLANs	<ul style="list-style-type: none"> • Read from <i>CCNP BCMSN Official Exam Certification Guide</i>: <ul style="list-style-type: none"> ○ Chapter 17, “Wireless LAN Overview” ○ Chapter 18, “Wireless Architecture and Design” ○ Chapter 19, “Cisco Unified Wireless Network” • Assignments: 8.1 • Labs: 8.1 • Quizzes: 8.1 • Course Project: Part 3
9—MPLS	<ul style="list-style-type: none"> • Read from <i>MPLS Configuration on Cisco IOS Software</i>: <ul style="list-style-type: none"> ○ Chapter 1, “MPLS Overview” ○ Chapter 2, “Basic MPLS Configuration” ○ Chapter 3, “Basic MPLS VPN Overview and Configuration” • Assignments: 9.1 • Labs: 9.1-9.2
10—PE-CE	<ul style="list-style-type: none"> • Read from <i>MPLS Configuration on Cisco IOS Software</i>: <ul style="list-style-type: none"> ○ Chapter 4, “PE-CE Routing Protocol—Static and RIP” ○ Chapter 5, “PE-CE Routing Protocol—OSPF and EIGRP” • Assignments: 10.1 • Labs: 10.1 • Course Project: Part 4
11—Review and Final Exam	<ul style="list-style-type: none"> • Final Exam

Instructional Methods

This course introduces knowledge and competencies that map to the objectives of the Cisco Certified Networking Professional (CCNP) Building Converged Cisco Multilayer Switched Networks (BCMSN) exam. The course is designed to promote a variety of teaching strategies that support the outcomes described in the course objectives and foster higher cognitive skills.

The course employs learning and evaluation strategies such as assignments, labs, quizzes, a course project, and a final exam. Units 1-10 will have homework assignments and lab exercises to provide hands-on knowledge about the concepts covered. A quiz each in Units 4 and 8 will help reinforce learning. The final exam in Unit 11 will evaluate the understanding of all the concepts covered in the course.

Instructional Materials and References

Student Textbook Package

- Hucaby, D. Lakshman, U, & Lobo, L. (2009). *Advanced routing and switching II w/CD* (Custom 2nd ed.). Boston, MA: Pearson Custom..

Other Required Resources

- Boson™ NetSim for CCNP 7.12 software (issued in prerequisite course, Advanced Routing and Switching I) MPLS Configuration on Cisco IOS software is included as the CD in the back of the textbook for this course.

Equipment and Tools

- A computer for each student, with Microsoft Windows XP with HyperTerminal
- Six Cisco 2600 (or 2800) series routers with:
 - Router 1—top: 1 Ethernet and 2 serial interfaces
 - Router 2: 1 Ethernet and 1 serial interface
 - Router 3: 1 Ethernet and 1 serial interface
 - Router 4: 1 Ethernet and 8 serial interfaces
 - Router 5: 1 Ethernet and 1 serial interface
 - Router 6—bottom: 1 Ethernet and 2 serial interfaces
- Two Cisco switches, 3550 series
- Five RJ-45 to RJ-45 rollover console cables
- Five RJ-45 to DB-9 serial connectors
- Five pairs of V.35 male and female adapter cables—Data Terminal Equipment (DTE) and Data Communications Equipment (DCE)
- Eight straight-through cables
- A Windows XP computer with 128 megabytes (MB) of RAM and at least 1 gigabyte (GB) of free hard disk space to be used as a Trivial File Transfer Protocol (TFTP) server
- A long straight-through patch cable to connect the TFTP server to one of the switches
- CCNA Network Simulator 7.12—CCNA router configuration simulation software—for each student
- Cisco TFTP server software for the TFTP server personal computer (PC)

References

ITT Tech Virtual Library

Log on to the ITT Tech Virtual Library at <http://www.library.itt-tech.edu/> to access online books, journals, and other reference resources selected to support ITT Tech curricula.

Books

You may click “Books” or use the “Search” function on the home page to find the following books.

- Books 24x7>
 - Brenton, Chris, and Bob Abuhoff. *Mastering Cisco Routers. 2nd ed.* Alameda, CA: Sybex, Inc., 2002.
- Ebrary>
 - Pasricha, Harpreet, and Dattakiran Jagu. *Designing Networks with Cisco.* Hingham, MA: Charles River Media, Inc., 2004.

Other References

The following online resources may be found **outside** of the ITT Tech Virtual Library.

Web sites

- Broadcasts in Switched LAN Internetworks
<http://www.cisco.com/univercd/cc/td/doc/cisintwk/idg4/nd20e.pdf> (accessed October 16, 2008)
This document describes how desktop protocols—Internet Protocol (IP), Novell, and AppleTalk—use broadcast and multicast packets to locate hosts and advertise

services and how broadcast and multicast traffic affects the central processing unit (CPU) performance of hosts on the network.

- Cisco Express Forwarding (CEF)
http://www.cisco.com/en/US/tech/tk827/tk831/tk102/tsd_technology_support_sub-protocol_home.html (accessed October 16, 2008)
 This Web link provides information on CEF technology for IP. CEF technology is a scalable, distributed, layer 3 switching solution designed to meet the future performance requirements of Internet and Enterprise networks.
- Gigabit Campus Network Design—Principles and Architecture
http://www.cisco.com/warp/public/cc/so/neso/lnso/cpsoc/gcnd_wp.pdf (accessed October 16, 2008)
 This document describes the multilayer model, along with two main scalability options appropriate for building-sized networks to large campus networks. It also presents five different backbone designs with different performance and scalability.
- IBM Networking Design Guides
http://www.cisco.com/en/US/tech/tk331/tk336/tech_design_guides_list.html (accessed October 16, 2008)
 This Web link provides a reference to documents and links that describe the features of Data-Link Switching Plus (DLSw+) and SNA Switching Services (SNASw).
- Resilient Services Solution for Campus Network: Introduction
http://www.cisco.com/en/US/netsol/ns340/ns394/ns147/ns17/networking_solutions_package.html (accessed October 16, 2008)
 This Web link provides information on resilient services solutions for campus networks. The solutions form the new baseline requirements for the enterprise wiring closet by enabling support for business-critical applications.

All links to Web references outside of the ITT Tech Virtual Library are always subject to change without prior notice.

Course Evaluation and Grading

Evaluation Criteria Table

The final grades will be based on the following categories:

CATEGORY	WEIGHT
Assignments	20%
Quizzes	15%
Labs	35%
Course Project	15%
Final Exam	15%
Total	100%

Note: Students are responsible for abiding by the Plagiarism Policy.

Grade Conversion Table

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

A	90–100%	4.0
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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

(End of Syllabus)