

**ITT Technical Institute**  
**IT321**  
**Network Technology and Service**  
**Integration**  
**Onsite Course**

**SYLLABUS**

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**Credit hours:** 4

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

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

Prerequisite: IT320 WAN Technology and Application

**Course Description:**

Discussions on areas where computer networking and telecommunication technologies converge in today's networking and internetworking industry. Concepts and case studies of how voice, data and video can be integrated on to one network will be discussed. Extended coverage on router configuration will be included.

# Syllabus: Network Technology and Service Integration

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Instructor:	_____
Office hours:	_____
Class hours:	_____

## Major Instructional Areas

1. Classless routing
2. Routing protocols
3. Switch configuration
4. LAN design
5. Spanning Tree Protocol (STP)
6. Virtual local area networks (VLANs)
7. VLAN trunking protocols
8. Call routing and switching
9. Telecommunication networks
10. Communications service providers

## Course Objectives

1. Implement classless routing in a network:
2. Use the Single-Area Open Shortest Path First (OSPF) protocol to configure a router.
3. Use Enhanced Interior Gateway Routing Protocol (EIGRP) to configure a router.
4. Explain the use of switching in Ethernet (LANs).
5. Explain how to design a basic local area network (LAN).
6. Explain how to configure a Cisco catalyst switch.
7. Describe the operation of the Spanning Tree Protocol (STP).
8. Describe the function of virtual local area networks (VLANs).
9. Implement common VLAN trunking protocols.
10. Explain telecommunications switching and routing.
11. Explain telecommunications networks.
12. Explain the basics of communication service provider networks.

## 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. Demonstrate competence in selecting technology, including determining desired outcomes and applicable constraints.

2. Demonstrate competence in how to apply technology to a task.
3. Employ computers to acquire, organize, analyze, and communicate information.
4. Judge which set of procedures, tools, or machines, including computers and their programs, will produce the desired results.
5. Understand the overall intent and the proper procedures for setting up and operating machines.
6. Prevent, identify, or solve problems in machines, computers, and other technologies.
7. Demonstrate competence in maintaining and troubleshooting technology.

## Course Outline

Note: All graded activities, except the Project, are listed below in the pattern of <Unit Number>.<Assignment Number>. For example, Lab 1.5 refers to the 5th lab activity in Unit 1.

Unit	Activities
1— Classless Routing and the Digital Circuit Switch	<ul style="list-style-type: none"> <li>• Content Covered:               <ul style="list-style-type: none"> <li><i>Switching Basics and Intermediate Routing:</i> <ul style="list-style-type: none"> <li>○ Chapter 1, “Introduction to Classless Routing”</li> </ul> </li> <li><i>Introduction to Telecommunications:</i> <ul style="list-style-type: none"> <li>○ Chapter 9, “The Digital Circuit Switch”</li> </ul> </li> </ul> </li> <li>• Labs: 1.1-1.5</li> <li>• Assignments: 1.1, 1.2</li> </ul>
2— Single-Area OSPF and Signaling	<ul style="list-style-type: none"> <li>• Read from <i>Switching Basics and Intermediate Routing:</i> <ul style="list-style-type: none"> <li>○ Chapter 2, “Single-Area OSPF”</li> </ul> </li> <li>• Read from <i>Introduction to Telecommunications:</i> <ul style="list-style-type: none"> <li>○ Chapter 10, “Signaling”</li> </ul> </li> <li>• Labs: 2.1-2.5</li> <li>• Assignments: 2.1, 2.2</li> </ul>
3— EIGRP, Troubleshooting, and VoIP	<ul style="list-style-type: none"> <li>• Read from <i>Switching Basics and Intermediate Routing:</i> <ul style="list-style-type: none"> <li>○ Chapter 3, “EIGRP and Troubleshooting Routing Protocols”</li> </ul> </li> <li>• Read from <i>Introduction to Telecommunications:</i> <ul style="list-style-type: none"> <li>○ Chapter 11, “Distributed Switching Architecture—Voice Over IP”</li> </ul> </li> <li>• Labs: 3.1, 3.2</li> <li>• Assignments: 3.1, 3.2</li> </ul>
4— Switching Concepts and Transmission Media	<ul style="list-style-type: none"> <li>• Read from <i>Switching Basics and Intermediate Routing:</i> <ul style="list-style-type: none"> <li>○ Chapter 4, “Switching Concepts”</li> </ul> </li> <li>• Read from <i>Introduction to Telecommunications:</i> <ul style="list-style-type: none"> <li>○ Chapter 13, “Transmission Media: Copper, Fiber, Wireless”</li> </ul> </li> <li>• Projects: (Project 1—Tasks 1 and 2 Submitted)</li> <li>• Assignments: 4.1, 4.2</li> <li>• Quizzes: 4.1</li> </ul>
5— LAN Design and Telecommunication Networks’ Physical Infrastructure	<ul style="list-style-type: none"> <li>• Read from <i>Switching Basics and Intermediate Routing:</i> <ul style="list-style-type: none"> <li>○ Chapter 5, “LAN Design and Switches”</li> </ul> </li> <li>• Read from <i>Introduction to Telecommunications:</i> <ul style="list-style-type: none"> <li>○ Chapter 14, “Telecommunications Networks’ Physical Infrastructure”</li> </ul> </li> <li>• Projects: (Project 1—Tasks 3 and 4 Submitted)</li> <li>• Assignments: 5.1, 5.2</li> </ul>
6— Configuring Catalyst Switches and Core Networks	<ul style="list-style-type: none"> <li>• Read from <i>Switching Basics and Intermediate Routing:</i> <ul style="list-style-type: none"> <li>○ Chapter 6, “Catalyst Switch Configuration”</li> </ul> </li> <li>• Read from <i>Introduction to Telecommunications:</i> <ul style="list-style-type: none"> <li>○ Chapter 15, “Core Networks”</li> </ul> </li> </ul>

Unit	Activities
	<ul style="list-style-type: none"> <li>• Labs: 6.1-6.7</li> <li>• Assignments: 6.1, 6.2</li> </ul>
7— Spanning Tree Protocol and Metropolitan Networks	<ul style="list-style-type: none"> <li>• Read from <i>Switching Basics and Intermediate Routing</i>: <ul style="list-style-type: none"> <li>◦ Chapter 7, “Spanning Tree Protocol”</li> </ul> </li> <li>• Read from <i>Introduction to Telecommunications</i>: <ul style="list-style-type: none"> <li>◦ Chapter 16, “Metropolitan Networks”</li> </ul> </li> <li>• Labs: 7.1, 7.2</li> <li>• Assignments: 7.1, 7.2</li> </ul>
8— Virtual LANs and Access Networks	<ul style="list-style-type: none"> <li>• Read from <i>Switching Basics and Intermediate Routing</i>: <ul style="list-style-type: none"> <li>◦ Chapter 8, “Virtual LANs”</li> <li>◦ Chapter 17, “Access Networks”</li> </ul> </li> <li>• Labs: 8.1-8.3</li> <li>• Assignments: 8.1, 8.2</li> <li>• Quizzes: 8.1</li> </ul>
9— VLAN Trunking Protocols and the PSTN Central Office	<ul style="list-style-type: none"> <li>• Read from <i>Switching Basics and Intermediate Routing</i>: <ul style="list-style-type: none"> <li>◦ Chapter 9, “VLAN Trunking Protocol”</li> </ul> </li> <li>• Read from <i>Introduction to Telecommunications</i>: <ul style="list-style-type: none"> <li>◦ Chapter 18, “The Public Switched Telephone Network Central Office”</li> </ul> </li> <li>• Labs: 9.1-9.4</li> <li>• Projects: (Project 2—Tasks 1-4 Submitted)</li> <li>• Assignments: 9.1, 9.2</li> </ul>
10— PSTN Topology and the Customer Premises	<ul style="list-style-type: none"> <li>• Read from <i>Introduction to Telecommunications</i>: <ul style="list-style-type: none"> <li>◦ Chapter 19, “The Public Switched Telephone Network Topology”</li> <li>◦ Chapter 20, “The Customer Premises”</li> </ul> </li> <li>• Assignments: 10.1, 10.2</li> <li>• Projects: (Project 2—Tasks 5-7 Submitted)</li> </ul>
11— Course Review and Final Exam	<ul style="list-style-type: none"> <li>• Final Exam</li> </ul>

## Instructional Methods

The Network Technology and Service Integration course incorporates various learning strategies such as quizzes, homework assignments, lab exercises, projects, and a final exam to help you learn and assess your understanding of concepts. Each unit includes homework assignments based on the concepts covered in that unit. Each unit also has a lab exercise or project in which you perform hands-on exercises and assignments using a network simulation. Two quizzes are designed to help you analyze your learning and recall the previously taught concepts. The project is in 2 parts and helps you to demonstrate your learned skills and abilities from the coursework.

## Instructional Materials and References

### Student Textbook Package

- Lewis, W. (2006). *Switching basics and intermediate routing CCNA 3 companion guide* (Cisco Networking Academy). Boston, MA: Cisco Press..
- Johnson, A. (2007). *Switching basics and intermediate routing CCNA 3 labs and study guide* (Cisco Networking Academy Program). Boston, MA: Cisco Press.

### Other Required Resources

In addition to the student textbook package, the following are also required in this course:

- Ghilani, Charles D. *CCNA 640-802 CCNA Simulator*. Indianapolis, IN: Cisco Press, 2009. (**The simulation CD is part of the student textbook package for the prerequisite course, WAN Technology and Application.**)
- Removable hard drive
- The following software (including operating systems and tools), which will be provided by the instructor for in-lab installation:
  - Windows XP Professional with SP2 or Microsoft Windows Server 2003 Standard Edition
  - HyperTerminal
  - Device drivers (drivers for the lab computer model)

### Equipment and Tools

- Computer with a minimum of Microsoft Windows XP with HyperTerminal installed for each student
- Five Cisco 2600 series (or 2800 series) routers with:
  - One Ethernet and two serial interfaces on each router with standard IP
  - IOS software
  - Two WIC interface cards per router
- Two Cisco switches (catalyst), 2900 XL series
- Five RJ-45 to RJ-45 rollover console cables
- Five RJ-45 to DB-9 serial connectors
- Three pairs of V.35 male and female adapter cables (DTE and DCE)
- Four straight-through cables
- One Windows XP computer with 128-MB RAM and at least 1 GB of free hard disk space to be used as a TFTP server
- One CCNA Network Simulator (CCNA router configuration simulation software) package per student
- Cisco TFTP server software for the TFTP server 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.

- ITT Tech Virtual Library> Main Menu> Books> Books 24x7
  - Lammle, Todd. *CCNA: Cisco Certified Network Associate Study Guide, Sixth Edition, (Exam 640-802)*. Indianapolis, IN: Wiley Publishing, Inc., 2007.
- ITT Tech Virtual Library> Main Menu> Books> NetLibrary

- Clayton, Jade. *McGraw-Hill Illustrated Telecom Dictionary*. New York: McGraw-Hill Professional, 2000.

**Other References**

The following resources may be found **outside** of the ITT Tech Virtual Library, whether online or in hard copy.

Books

- McQuerry, Stephen. *CCNA Preparation Library, 7th Edition*. Indianapolis, IN: Cisco Press, 2008.
- Odom, Wendell. *CCNA Official Exam Certification Library (CCNA Exam 640-802), 3rd Edition*. Indianapolis, IN: Cisco Press, 2008.

Web sites

- Cisco Systems, Inc.  
www.cisco.com

Company site for Cisco Systems, a leading supplier of networking equipment and network management for the Internet

- Juniper Networks, Inc.  
www.juniper.net

Company site for Juniper Networks, which designs and sells Internet Protocol network products and services

- IP/MPLS Forum

<http://www.frforum.com>

The IP/MPLS Forum is an international, non-profit association of service providers, equipment vendors, testing centers, and enterprise users. Its mission is to drive the global success of IP/MPLS-based technology, networks, and services while focusing on application and deployment solutions:

- SONET

<http://www.sonet.com>

This Web site is a reference for optical networking professions, including FAQs, tutorials, and glossary.

- RAD Data Communications

<http://www.rad.com/Home/0,6583,5847,00.html>

Owned by a vendor of voice and data access solutions, this site provides tutorials for telecommunications, data communications, and computer networking.

- International Engineering Consortium

<http://www.iec.org/tutorials/>

The International Engineering Consortium Web ProForum white paper tutorials feature technical and business issues of concern to engineers, salespersons, managers, and executives.

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%

<b>CATEGORY</b>	<b>WEIGHT</b>
Labs	20%
Quizzes	10%
Projects	30%
Final Exam	20%
<b>Total</b>	<b>100%</b>

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
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)*