ITT Technical Institute

IT320P

WAN Technology and Application

Onsite Course

SYLLABUS

Credit hours: 4

Contact/Instructional hours: 66 (46 Theory Hours, 20 Lab Hours)

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

Prerequisites: IT220P Network Standards and Protocols

Course Description:

This course discusses typical Wide Area Network (WAN) technologies along with survey on existing services and applications. Introductory router configuration skills will be included.

Syllabus: WAN Technology and Application

Instructor:	_____
Office hours:	_____
Class hours:	_____

Major Instructional Areas

1. Telecommunication fundamentals
2. Cisco routers
3. WAN protocols
4. Basic router configuration
5. Routing protocols
6. Configuring distance vector routing protocols
7. The OSI model
8. The TCP/IP suite
9. TCP/IP error and control messages
10. Access control lists

Course Objectives

1. Describe common WAN protocols and interfaces.
2. Analyze the boot process of a Cisco router and steps required for a HyperTerminal connection.
3. Perform initial configurations on a Cisco router.
4. Demonstrate the use of CDP commands to identify the directly connected neighbors.
5. Describe Cisco IOS management.
6. Describe routing and routed protocols.
7. Configure static routing, Routing Information Protocol (RIP), and Interior Gateway Routing Protocol (IGRP) on a router.
8. Describe the basic TCP/IP Suite error and control messages.
9. Demonstrate basic routing and network troubleshooting.
10. Describe TCP/IP functions.
11. Demonstrate the use of Access Control Lists (ACLs) on the Cisco router.
12. Describe the transmission of data.
13. Describe the manipulation of data for transmission.
14. Describe Layer 2 protocols.
15. Explain Layer 1 protocols
16. Apply mathematical theories and operations to network design and implementation

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 includes determining desired outcomes and applicable constraints.
2. Demonstrate competence in how to apply technology to 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. Demonstrate competence in how to apply technology to task.
7. Prevent, identify, or solve problems in machines, computers, and other technologies.
8. 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— Introduction to WANs and Telecommunications	• Content Covered: *Routers and Routing Basics*: o Chapter 1, "WANs and Routers" ▪ *Introduction to Telecommunications:* o Chapter 1, "The Basics—Sound, Electrical Signal, Electromagnetic Spectrum" ▪ OSI Model Handout ▪ Subnetting Handout • Labs: 1.1-1.4 • Assignments: 1.1, 1.2
2— Introduction to Routers and the Telephone	• Read from *Routers and Routing Basics:* o Chapter 2, "Introduction to Routers" • Read from *Introduction to Telecommunications*: o Chapter 2, "The Telephone and the Telephone Line" • Labs: 2.1-2.5 • Assignments: 2.1, 2.2
3— Configuring Routers and Transmitting Data	• Read from *Routers and Routing Basics*: o Chapter 3, "Configuring a Router" • Read from *Introduction to Telecommunications*: o Chapter 3, "Connecting the Dots—Transporting Information Across the Superhighway" • Labs: 3.1-3.11 • Assignments: 3.1, 3.2
4— Learning About Your Network and Manipulating Data for Transmission	• Read from *Routers and Routing Basics*: o Chapter 4, "Learning About Other Devices" • Read from *Introduction to Telecommunications*: o Chapter 4, "Manipulating Information for Transmission" • Labs: 4.1-4.10 • Assignments: 4.1, 4.2 • Quiz 1
5— Managing Cisco IOS and the OSI Model	• Read from *Routers and Routing Basics*: o Chapter 5, "Managing Cisco IOS Software" • Read from *Introduction to Telecommunications*: o Chapter 5, "Open System Interconnection" • Labs: 5.1-5.6 • Assignments: 5.1, 5.2
6— Routing and Layers 3 and 4 Protocols	• Read from *Routers and Routing Basics*: o Chapter 6, "Routing and Routing Protocols" • Read from *Introduction to Telecommunications*: o Chapter 6, "Layer 3 and Layer 4 Networking and Transport Protocols: TCP/IP, UDP/IP, RTP/UDP/IP,

Unit	Activities
	IPX/SPX, DDP/ATP” • Labs: 6.1-6.3 • Assignments: 6.1, 6.2
7— Routing—Distance Vector Protocols	• Read from *Routers and Routing Basics*: o Chapter 7, “Distance Vector Routing Protocols” • Read from *Introduction to Telecommunication*s: o Chapter 12, “IP Routing Fundamentals” • Labs: 7.1-7.7 • Assignments: 7.1, 7.2
8— TCP/IP Control Messages and Router Troubleshooting	• Read from *Routers and Routing Basics*: o Chapter 8, “TCP/IP Suite Error and Control Messages” o Chapter 9, “Basic Router Troubleshooting” • Labs: 8.1-8.7 • Assignments: 8.1, 8.2 • Quiz 2
9— Intermediate TCP/IP and Layer 2 Protocols	• Read from *Routers and Routing Basics*: o Chapter 10, “Intermediate TCP/IP” • Read from *Introduction to Telecommunications*: o Chapter 7, “Layer 2 Protocols: Ethernet, Frame Relay, ATM” • Labs: 9.1, 9.2 • Assignments: 9.1, 9.2
10— Access Control Lists and Layer 1 Protocols	• Read from *Routers and Routing Basics*: o Chapter 11, “Access Control Lists” • Read from *Introduction to Telecommunications*: o Chapter 8, “Layer 1 Networking Protocols: TDM Protocols—DS-1, DS-3, SONET” • Labs: 10.1-10.8 • Assignments: 10.1, 10.2
11— Course Review and Final Exam	• Final Exam • Challenge Project

Instructional Methods

The WAN Technology and Application course incorporates various learning strategies such as quizzes, homework assignments, lab exercises, a project, 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 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. Unit 11 includes a final exam and project.

Instructional Materials and References

Student Textbook Package

- Rosengrant, M. (2009). *Introduction to telecommunications* (Custom 2nd ed.). Boston, MA: Pearson CustomOdom, W., & McDonald, R. (2007). *Routers and routing basics CCNA 2 companion guide* (Cisco Networking Academy) (1st ed.) Upper Saddle River, NJ: Cisco Press.
- Johnson, A. (2007). *Routers and routing basics CCNA 2 labs and study guide* (Cisco Networking Academy) (1st ed.). Upper Saddle River, NJ: Cisco Press. Odom, W. (2012). *CCNA 640-802 network simulator* (2nd ed.). Boston, MA: Pearson IT Certification.

Other Required Resources

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

- 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
- 5 Cisco 2600 series (or 2800 series) routers with:
    - 1 Ethernet and 2 serial interfaces on each router with standard IP
    - IOS software
    - 2 WIC interface cards per router
- 2 Cisco switches (catalyst), 2900 XL series
- 5 RJ-45 to RJ-45 rollover console cables
- 5 RJ-45 to DB-9 serial connectors
- 3 pairs of V.35 male and female adapter cables (DTE and DCE)
- 4 straight-through cables
- 1 Windows XP computer with 128 MB RAM and at least 1 GB of free hard disk space to be used as a TFTP server
- 1 long straight-through patch cable to connect the TFTP server to the Los Angeles switch
- Standard ITT Tech computer lab software environment (Windows XP with HyperTerminal installed)
- 1 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, Inc., 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.

- Rad Data Communications

http://www.rad.com/Home/0,6583,5847,00.html
This Web site provides tutorials for telecommunications, data communications and computer networking.

- International Engineering Consortium

http://www.iec.org/tutorials/
The IEC Web ProForum tutorials feature the latest technical and business issues of vital 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	25%
Labs	30%
Quizzes	10%
Project	15%
Final Exam	20%
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
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)