

ITT Technical Institute

IS3120

Network Communications Infrastructure

Onsite Course

SYLLABUS

Credit hours: 4.5

Contact/Instructional hours: 60 (30 Theory Hours, 30 Lab Hours)

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

Prerequisites: NT2640 IP Networking or equivalent, NT2670 Email and Web Services or equivalent

Course Description:

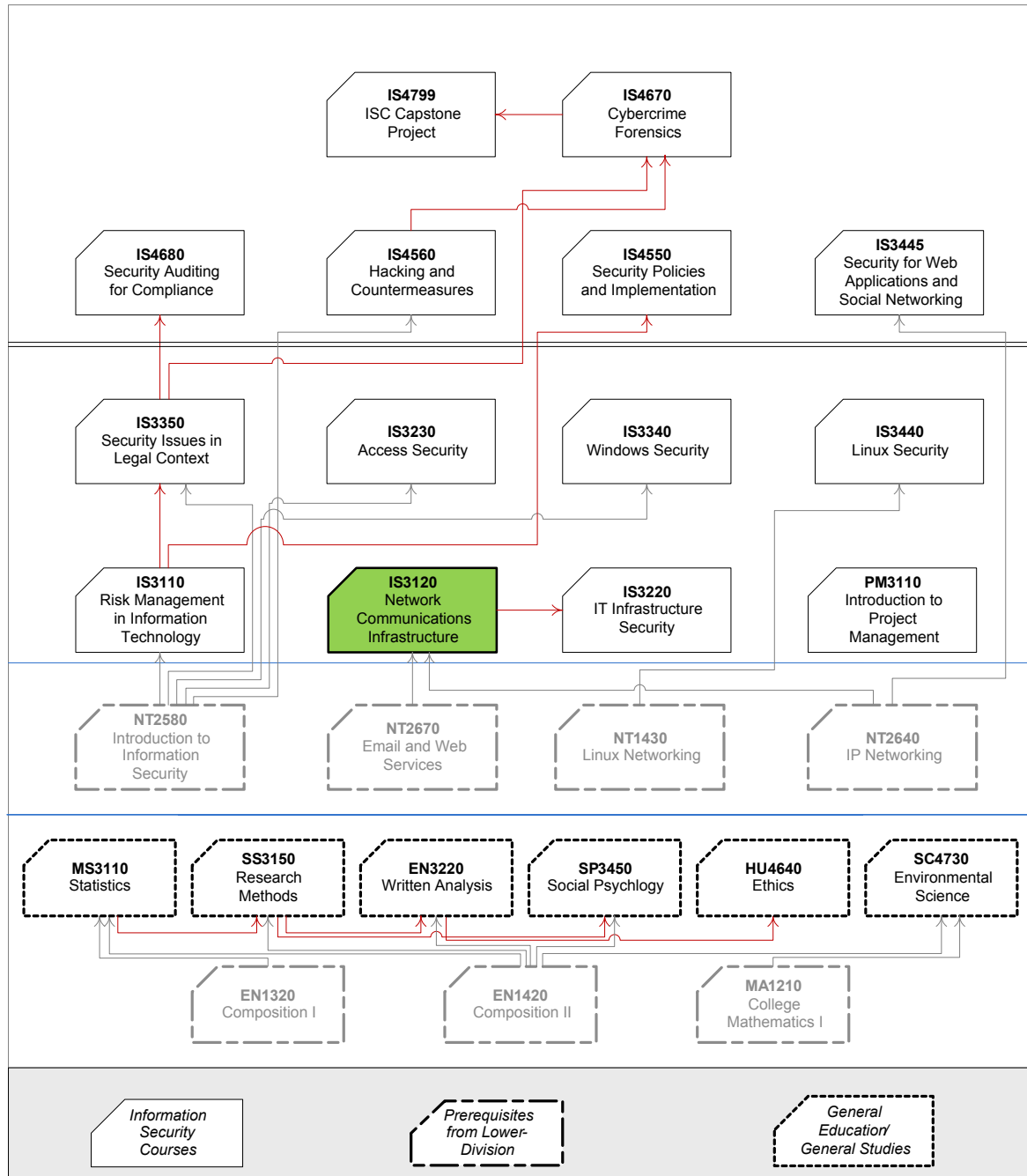
This course explores the convergence of computer networking and telecommunications technologies. Capabilities and limitations of converged networking infrastructure are analyzed through voice, data and video applications in relation to performance, management and security challenges.

Where Does This Course Belong?

This course is required for the Bachelor of Science in Information Systems and Cybersecurity (BSISC) program. This program covers the following core areas:

- Foundational Courses
- Technical Courses
- BSISC Project

The following diagram demonstrates how this course fits in the program:



Course Summary

Major Instructional Areas

1. Evolution of Communications and Business Communication Challenges
2. Fundamentals of Networking, Protocols, and Addressing
3. Layer 2 and Layer 3 Networking, Resiliency, and Routing Protocols

4. Voice, Video, and Unified Communications Solutions
5. Network Management

Course Objectives

1. Evaluate how the evolution of communications and networking technologies produced new business solutions.
2. Differentiate between the standards, specifications, and technologies that drive current LAN connectivity.
3. Examine the TCP/IP protocol family and how IP is used to support voice, video, data, and Internet communications.
4. Translate Network Layer addressing schemas and perform logical addressing schema designs.
5. Align the wireless standards and security methodologies used to increase business productivity.
6. Analyze how Layer 2 networking technology is used for end-point connectivity and developing VLAN resiliency to meet business requirements.
7. Contrast current Layer 3 networking protocols, resiliency, and VoIP/SIP solutions to meet business requirements.
8. Design and configure distance vector routing protocols to meet LAN/WAN business requirements.
9. Formulate and plan the implementation of link-state routing protocols to meet LAN/WAN business requirements.
10. Apply network management and security techniques using the FCAPS process.

Learning Materials and References

Required Resources

Textbook Package	New to this Course	Carried over from Previous Course(s)	Required for Subsequent Course(s)
Solomon, M. <i>Fundamentals of Communications and Networking</i> . 1st ed. Sudbury, MA: Jones & Bartlett, 2011	■		
Printed IS3120 Student Lab Manual	■		
ISS Mock IT Infrastructure (1) – Cisco Core Backbone Network consisting of Cisco 2811 routers, 2950/2960 catalyst switches, ASA 5505s for classroom hands-on labs that require a live, IP network. (For onsite only)	■	■	■
ISS Mock IT Infrastructure (2) – VM Server Farm (2 Microsoft Windows Servers and 2 Ubuntu Linux Servers) for classroom hands-on VM labs. (For both onsite and online)	■	■	■
ISS Mock IT Infrastructure (2) – VM Workstation (Microsoft Windows XP Professional Workstation with Core ISS Apps and Tools) for classroom hands-on VM labs. (For both onsite and online)	■	■	■

(1) The following presents the core ISS Cisco core backbone network components needed for some of the equipment-based labs for onsite delivery only. (Note: video labs will be used for online delivery):

- Cisco 2811 Routers
- Cisco 2950/2960 Catalyst Switches
- Cisco ASA 5505 Security Appliances
- Simulated WAN Infrastructure
- EGP using BGP4 or IGP using EIGRP
- Layer 2 Switching with VLAN Configurations
- Telnet and SSH version 2 for Remote Access
- Inside and Outside VLANs
- DMZ VLAN

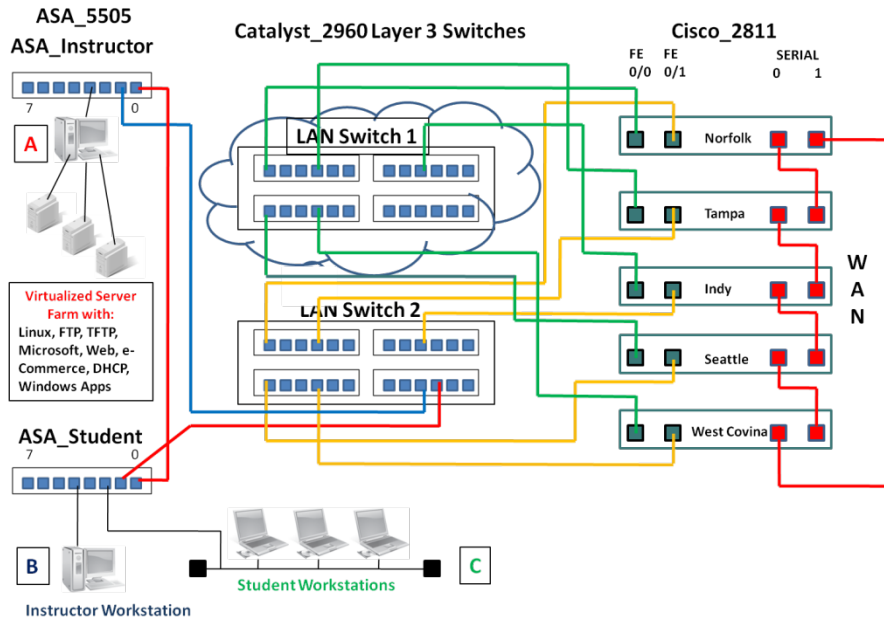


Figure 1 – ISS Cisco Core Backbone Network

- (2) The following lists the core ISS VM server farm and VM workstation OS, applications, and tools required for this course for both onsite and online course deliveries:

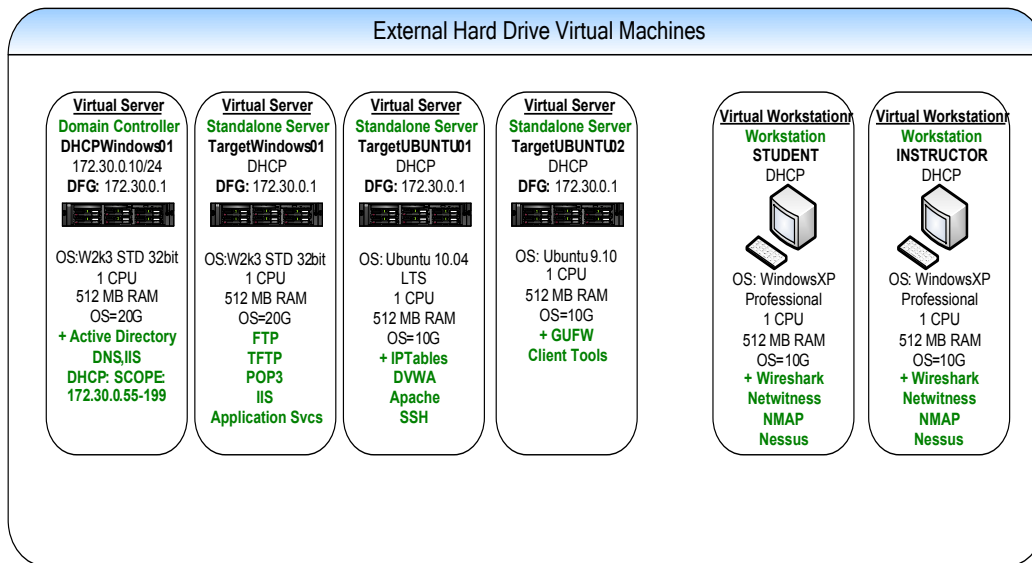


Figure 2 – ISS Core VM Server Farm & VM Workstations

Note #1: ISS onsite students can obtain their removable hard drive directly from their ITT campus. ISS online students will be required to download the core ISS VM server farm and VM workstations directly to their personal computer for installation. The ITT Onsite or Online Instructor will provide students with the specific instructions and procedures for how to obtain the core ISS VM server farm and workstation image files during the first week of class.

(3) The following lists the new VMs, applications, and tools required to perform the equipment-based labs for this course for both onsite and online deliveries:

1. New VM for server farm: "VulnerableXP01". This VM is a vulnerable Microsoft Windows Server 2003 Standard Edition used for performing attacks.
2. New VM for server farm: "Backtrack01". A Backtrack 4 Ubuntu Server pre-loaded with the following applications and tools:
 - a. Metasploit with required plug-ins
 - b. Kismet
 - c. Aircrack-ng
 - d. Aircsnort
 - e. Snort
 - f. MySQL
 - g. BASE
3. New VM that Replaces the Old "TargetUbuntu01" VM on the VM server farm. An Ubuntu Server 10.4 VM pre-loaded with the following applications and tools:
 - a. Damn Vulnerable Web App (DVWA)
 - b. ClamAV Installed
 - c. Rootkit Hunter: http://www.rootkit.nl/projects/rootkit_hunter.html
 - d. Chrootkit: <http://www.chkrootkit.org/>
 - e. Appropriate rootkit tools can be found at:
<http://www.packetstormsecurity.org/UNIX/penetration/rootkits/indexdate.html>
 - f. Infected with EICAR
 - g. tcpdump
 - h. Common Linux tools such as strings, sed and grep
4. Tools Directory: A directory called "tools" which contains the binary installation files for each tool covered in the course, including:
 - a. Infected with EICAR
 - b. ClamAV Installed
 - c. Rootkit Hunter: http://www.rootkit.nl/projects/rootkit_hunter.html
 - d. Chrootkit: <http://www.chkrootkit.org/>
 - e. Appropriate rootkit tools can be found at:
<http://www.packetstormsecurity.org/UNIX/penetration/rootkits/indexdate.html>
 - f. Wireshark
 - g. NetWitness Investigator
 - h. FileZilla FTP client/Server
 - i. Putty SSH client
 - j. Nessus^{®1}

¹ Nessus[®] is a Registered Trademark of Tenable Network Security, Inc.

- k. Zenmap
- l. MD5sum
- m. SHA1sum
- n. GnuPG (Gnu Privacy Guard)
- o. OpenSSL
- p. VMware Player

Note #2: Installation instructions for installing these new VMs, applications and tools will be provided by the ISS onsite or online Instructor during day 1/ week 1 of the course.

Recommended Resources

Books, Professional Journals

Please use the following author's names, book/article titles and/or keywords to search in the ITT Tech Virtual Library for supplementary information to augment your learning in this subject:

Books

Periodicals

EbscoHost

Books24X7

Richard Grigonis

Disaster Survival Guide for Business Communications Networks (Chapters 3, 6,10)

Richard Froom, et al.

Implementing Cisco IP Switched Networks (SWITCH) Foundation Learning Guide: Foundation Learning for SWITCH 642-813 (Chapters 2, 4, 5, 6)

Yezid Donoso

Network Design for IP Convergence (Chapters 1, 2, 3, 4)

Antonio Nucci and Konstantina Papagiannaki

Design, Measurement and Management of Large-Scale IP Networks: Bridging the Gap between Theory and Practice (Chapters 3, 5, 7, 8)

Rich Seifert and James Edwards

The All-New Switch Book: The Complete Guide to LAN Switching Technology, Second Edition (Chapters 4, 8, 12, 15)

Joseph Davies

Understanding IPv6, Second Edition (Chapters 10, 15, and Appendix A)

Praphul Chandra, et al.

Wireless Networking: Know It All (Chapters 2, 6, 10, 11)

Javier Lopez, et al.

Securing Information and Communications Systems: Principles, Technologies, and Applications (Chapters 2, 3, 5)

Walter Goralski

The Illustrated Network: How TCP/IP Works in a Modern Network (Chapter 2)

Keywords:

Bridging

Business Communications

Circuit Switching

Congestion Management

Distance Vector Protocol

Ethernet Standards

Exterior Routing Protocol

FCAPS

Framing Protocol

Hierarchical Routing

IEEE 802.3

Interior Routing Protocol

IPv4

IPv6

Layer 2 Network

Layer 3 Network

Link-State Protocol

Local Area Network (LAN)

Metropolitan Area Network (MAN)

Network Performance

OSI Reference Model

Packet Switching

Security Policies

Session Initiation Protocol (SIP)

Subnetting

TCP/IP Reference Model

Unified Communications

Virtual LAN (VLAN)

VoIP Protocols

Wide Area Network (WAN)

Wireless Networks

Course Plan

Instructional Methods

This course is designed to promote learner-centered activities and support the development of cognitive strategies and competencies necessary for effective task performance and critical problem solving. The course utilizes individual and group learning activities, performance-driven assignments, problem-based cases, projects, and discussions. These methods focus on building engaging learning experiences conducive to development of critical knowledge and skills that can be effectively applied in professional contexts.

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
<ul style="list-style-type: none"> ▪ 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 	<ul style="list-style-type: none"> ▪ 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 towards 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 #	Unit Title	Assigned Readings	Graded Activities			
			Grading Category	#	Activity Title	Grade Allocation (% of all graded work)
1	Alignment of Business Communication Requirements to Networking Solutions	Fundamentals of Communications and Networking Chapter 1, "Today's Personal and Business Communication Requirements" Chapter 2, "Solving Today's Business Communication Challenges"	Discussion	1.1	Business Communication Challenges for Multiple Entities	1
			Lab	1.2	Cisco Router / Switch Hardware & Software Discovery	2
			Assignment	1.3	Effects of Routing on Current Communication Methods Used by Organizations	2
2	IEEE 802.3 CSMA/CD and the Evolution of Ethernet Networking	Fundamentals of Communications and Networking Chapter 3, "Circuit-Switched, Packet-Switched, and IP-Based Communications" Chapter 4, "The Evolution of Ethernet"	Quiz	2.1	Quiz 1	1
			Lab	2.2	IEEE 802.3 CSMA/CD & Ethernet II Networking	2
			Assignment	2.3	Evolution of Ethernet	2
3	TCP/IP Communication Protocols	Fundamentals of Communications and Networking Chapter 5, "TCP/IP and Networking"	Discussion	3.1	Connectionless versus Connection-Oriented Communications	1
			Lab	3.2	TCP/IP Communication Protocols	2
			Assignment	3.3	Convergence of IP-Based Networks	2
4	IP Addressing Schema Designs for a Layer 2/Layer 3 IP Network Infrastructure	Fundamentals of Communications and Networking Chapter 5, "TCP/IP and Networking"	Quiz	4.1	Quiz 2	1
			Lab	4.2	Designing IP Addressing Schema for Networking Infrastructure	2
			Assignment	4.3	IP Address Schema Design for a Medium-Sized Business	2

Unit #	Unit Title	Assigned Readings	Graded Activities			
			Grading Category	#	Activity Title	Grade Allocation (% of all graded work)
			5	IEEE 802.11a/b/g/h/i/n Wireless LANs	Fundamentals of Communications and Networking Chapter 6, "Wireless LAN Standards"	Discussion
			Lab	5.2	IEEE 802.11a/b/g/h/i/n Wireless LAN	2
			Assignment	5.3	A WLAN Solution	2
6	Layer 2 Networking, VLANs, and Resiliency	Fundamentals of Communications and Networking Chapter 7, "Layer 2 Networking" Chapter 8, "Layer 2 Networking VLANs"	Quiz	6.1	Quiz 3	1
			Lab	6.2	Layer 2 Networking, Virtual LANs & Resiliency	2
			Assignment	6.3	Cisco's Layer 2 Resiliency Compared to HP's IRF Layer 2 Resiliency	2
7	Layer 3 Networking, Campus Backbones, WANs, and Resiliency	Fundamentals of Communications and Networking Chapter 9, "Voice Over Internet Protocol (VoIP)" Chapter 10, "Unified Communications and Session Initiation Protocol" Chapter 11, "Layer 3 Networking"	Discussion	7.1	Cisco's Layer 3 Resiliency Compared to the Resiliency Solutions of Other Vendors	1
			Lab	7.2	Layer 3 Networking, Campus Backbones, WANs & Resiliency	2
			Assignment	7.3	Solving a Business Challenge Using SIP Technology	2
8	Distance Vector IP Routing, Building and Campus Backbones, WANs, and Classful IP Routing	Fundamentals of Communications and Networking Chapter 11, "Layer 3 Networking"	Quiz	8.1	Quiz 4	1
			Lab	8.2	Distance Vector IP Routing, Building & Campus Backbones, WANs & Classful IP Routing	2
			Assignment	8.3	Solving a Business Challenge Using Distance Vector IP Routing	2
9	Link-State IP Routing.	Fundamentals of Communications and	Discussion	9.1	OSPF in Multi-access Networks	1

Unit #	Unit Title	Assigned Readings	Graded Activities			
			Grading Category	#	Activity Title	Grade Allocation (% of all graded work)
	Campus Backbones, WANs, and Classless Inter-Domain Routing (CIDR)	Networking Chapter 11, "Layer 3 Networking"	Lab	9.2	Link State IP Routing, Campus Backbones, WANs, & CIDR	2
			Assignment	9.3	VLSM Redesign for a Medium-Sized Business	2
10	Network Management—FCAPS	Fundamentals of Communications and Networking Chapter 12, "Network Management—Fault, Configuration, Accounting, Performance, Security (FCAPS)" Chapter 13, "Configuration Management and Accounting" Chapter 14, "Performance Management" Chapter 15, "Security Management"	Discussion	10.1	FCAPS and Network Management	1
			Lab	10.2	Network Management - FCAPS	2
			Assignment	10.3	Network Management Plan	2
11	Network Design Project Submittal and Final Exam	N/A	Project	11.1	Network Design Proposal	25
			Exam	11.2	Final Exam	25

Evaluation and Grading

Evaluation Criteria

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

Category	Weight
Discussion	6
Quiz	4
Lab	20
Assignment	20
Project	25
Exam	25
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.

(End of Syllabus)