INSTRUCTIONAL GUIDE: INFOTECH 270 Introduction to Routing Concepts

Course Description
Students study routing concepts including common routing protocols, Transmission Control Protocol/Internet Protocol (TCP/IP), route types, and routing architectures. Students use software routers to divide LANs into segments. The complete communication channel from client computer to the Internet is discussed. 3 Units.

Textbook(s)
Internetworking with Cisco and Microsoft Technologies, Chiarella, Thomson, 2004. &
Internetworking with Cisco and Microsoft Technologies Lab Manual, Chiarella, Thomson, 2004. Bundle ISBN 1-4018-4600-9

Course Purpose
In previous courses, students have gained knowledge and skills in installing, configuring, and troubleshooting hardware and software. In this course they acquire knowledge and skills about routing, moving data from one system to another (internetworking).

Grading
A grade of 90 percent or higher earns an A grade; 80 to 89 percent earns a B grade; 70 to 79 percent earns a C grade; 60 to 69 percent earns a D grade. A minimum grade of C is required in major courses or courses that are prerequisites for advanced courses.

Learning Outcomes
Students will be able to:

- Identify and describe the features of routers
- Connect to a router through the console port and/or telnet
- Perform basic router configuration
- Use a TFTP Server to download a configuration file to a router
- Configure a RIP-based network
- Create appropriate subnets given an IP network address and network design requirements
- Install and configure a multihomed Windows 2000 Server as a router

Grading Values:

Exams and Quizzes	**40%**	
Quizzes (drop lowest 2)	25%	
Exams (x 2)		15%
Projects and Assignments	**50%**	
Labs		20%
Homework (drop lowest 2)		15%
In class activities/Presentations		15%
Participation	**10%**	
Peer Review		5%
Discussions, Group Participation		5%

Instructor Biography:

Adrianna E. Frick worked in several positions relating to Network Engineering, including: Network Operations and Provisioning for a Tier 1 provider; Network Engineer III and System Administrator for a statewide ISP; QA Engineer and Systems Test Lab Manager for a DSL router manufacturer. Ms. Frick left her career in IT to fulfill her dream of becoming an educator. While pursuing first a BA and then an MA in Comparative Literature at San Francisco State, she taught preschool and an elementary school program in chess; TA'd in an Alternative Education high school; and tutored high school students. Her major is Comparative Literature, specializing in Latin, and has a minor in British and American Literature. She has presented papers at the National American and Popular Culture Associations Joint Conference and at the T. S. Eliot Society's Annual Meeting, and has had essays chosen for publication on both U.S. coasts and in Turkey. She is passionate about teaching, as she believes that the way to create opportunities for personal and societal improvement is through education, and she looks forward to working with Heald students because of their dedication and personal motivation.

INFOTECH 270 Introduction to Routing Concepts Course Overview

The textbook used is *Internetworking with Cisco and Microsoft Technologies*, 2004.

Chapters covered are out of sequence—Chapters 3, 6, 7, 8, 9, 10, 11, 14, 15, 17, and 18.

Week 1	
Topics Covered	Course Overview Review of OSI Model Heald Course Information Sheet ANGEL Course Requirements
Objectives Covered	Review the following material to determine all students are prepared for the course: ● Demonstrate an understanding of hardware necessary for a network ● Explain the features of multiple network topologies, the differences, and common uses of each New Objectives: ● Use ANGEL to retrieve course information and participate in online activities as assigned by the instructor ● Use the Internet effectively as appropriate to the task
Materials	Heald Course Information Sheet, Student Syllabus ANGEL
Activities	● Review Heald Course Information Sheet ● Review course content in ANGEL ● Discuss Course Requirements ● Review basic networking concepts needed for this course (Icebreaker activity)
Notes	
Week 2	
Topics Covered	OSI Model, Cisco three-layer model

Objectives Covered	● Discuss the seven layers of the OSI Model ● Identify common networking components and explain at which layer of the OSI Model each one functions ● Identify common networking protocols, and explain at which layer of the OSI
Materials	Chapter 3
Activities	● Cover Chapter 3, pages 45-84 ● Begin the group paper and presentation project (See below).
Assessment	● Quiz
Notes	
Week 3	
Topics Covered	Internetworking Standards, Routed protocols
Objectives Covered	● Identify common networking protocols, and explain at which layer of the OSI Model each one functions ● Distinguish Routed protocols from Routing protocols, and identify the purpose of each
Materials	Chapters 6 and 7
Activities	● Cover Chapter 6, pages 217-243 – Internetworking Standards ● Cover Chapter 7, pages 245-268 – Routed protocols should be discussed during this chapter. ● Complete Lab 7-2 (Install and Monitor IPX/SPX, NetBUI, and TCP/IP) ● Begin group presentations
Assessment	Quiz
Notes	
Week 4	
Topics Covered	TCP/IP addressing and subnetting
Objectives Covered	● Create subnets from Class A, B, and C network numbers
Materials	Chapter 8
Activities	● Cover Chapter 8, pages 269-292 – This chapter lays the foundation of TCP/IP addressing and subnetting. ● Complete Lab 8-1 (Subnetting an IP Address) ● Complete Lab 8-2 (Configuring an IP Address on Network Nodes) ● Complete additional handouts on Binary to Decimal conversion and IP subnetting ● Group presentations (continued)
Assessment	Quiz
Notes	
Week 5	
Topics Covered	Routing Protocols
Objectives Covered	● Identify common networking protocols, and explain at which layer of the OSI Model each one functions ● Distinguish Routed protocols from Routing protocols, and identify the purpose of each
Materials	Chapter 9
Activities	● Cover Chapter 9, pages 293-320 – Types of and examples of Routing Protocols ● Complete Lab 9-1 (Designing a Wide Area Network)

	● Complete Lab 9-2 (Exploring and Identifying the Features of Cisco Routers) ● Begin the Network Design Group Project. See Handouts section of this course plan.
Assessment	● Quiz
Notes	
Week 6	
Topics Covered	Router Basics
Objectives Covered	● Explain the differences between User mode, Privileged mode, and Configuration mode ● Identify the physical interfaces on a Cisco router, and explain the uses of each ● Demonstrate the ability to make physical connections to the router ● Demonstrate the ability to connect to the router through the use of software ● Identify common User mode commands ● Identify common Privileged mode commands ● Identify common Configuration mode commands ● Demonstrate the ability to configure a router without any existing configuration present
Materials	Chapter 10
Activities	● Review for Midterm Exam ● Cover Chapter 10, pages 323-357 – Supplemented by in-class introduction to router interfaces and router basics. ● Complete Lab 10-1 (Basic Router Configuration) ● Lab covering the creation of a banner message. ● Complete Lab 10-2 (Using a TFTP Server)
Assessment	● Hands-On Midterm Assessment ● Written Midterm Exam
Notes	
Week 7	
Topics Covered	Router configuration
Objectives Covered	● Demonstrate the ability to configure a router without any existing configuration present ● Apply critical thinking skills to routing lab assignments ● Discuss the use of TFTP for router configuration storage
Materials	Chapter 11
Activities	● Cover Chapter 11, pages 359-392 – Pros and cons of common routing protocols ● Complete Lab 11-1 (Download a Router Configuration from a TFTP Server) ● Complete Lab 11-2 (Configure a RIP-Based Network) ● Lab covering configuration of static routes ● Lab covering configuration of default route ● Static versus Dynamic routing lab ● Lab configuring broadband routers / wireless routers
Assessment	Quiz
Notes	
Week 8	
Topics Covered	Windows 2000 Server as a Router

Objectives Covered	● Install and configure a Windows 2000 Server ● Configure Windows 2000 Server as a router
Materials	Chapter 14
Activities	● Cover Chapter 14, pages 455-497 – Windows 2000 Core Network Support Services. ● Complete Lab 14-1 (Set up an Active Directory Integrated DNS Zone) ● Complete Lab 14-2 (Configure Windows 2000 DHCP) ● Complete Lab 14-3 (Configure Dynamic DNS) ● Install and configure multihomed Windows Server 2000 as routers. (See Installing and Configuring Multihomed Windows Server 2000 as a Router in the Handouts section of this course plan.)
Assessment	Quiz
Notes	
Week 9	
Topics Covered	Network security, Cisco, and Microsoft security features
Objectives Covered	● Demonstrate knowledge of Cisco Configmaker as a tool for designing, testing, and implementing a network ● Create Access Lists to limit traffic through a router ● Apply critical thinking skills to troubleshooting a routed network
Materials	Chapter 15
Activities	● Cover Chapter 15, pages 499-532 – Network security, Cisco, and Microsoft security features ● Lab – Recovering Cisco passwords ● Complete Lab 15-1 (Configure Domain-Based Security Policies) ● Complete Lab 15-2 (Testing Domain-Based Security Policies)
Notes	Quiz
Week 10	
Topics Covered	WAN Services, Troubleshooting
Objectives Covered	● Troubleshoot routing hardware ● Troubleshoot routing software (configurations) ● Demonstrate knowledge of tools used to troubleshoot a routed network ● Apply critical thinking skills to troubleshooting a routed network
Materials	Chapters 17 and 18
Activities	● Cover Chapter 17, pages 563-589 – WAN Services ● Complete Lab 17-1 (Configuring Telnet Access) ● Complete Lab 17-2 (Configuring Banners) ● Cover Chapter 18, pages 591-618 – WAN Services ● Complete Lab 18-1 (Setup the Network) ● Complete Lab 18-2 (Troubleshoot the Network) ● Complete additional network troubleshooting labs
Assessment	Quiz
Notes	
Week 11	
Topics Covered	Final Exam
Activities	● Review for Final Exam

Assessment	● Final Exam

Icebreaker activity

"Welcome to the Network"

Supplies: Index cards, small A4 envelopes, large A10 envelopes.
Prepare: Paper strips with all students' names (adjusted for attendance) and a handout with icebreaker questions (Do you have siblings? Where did you grow up? What are your hobbies? etc.)

Each student begins with an index card, both envelopes, a name, and a basic "icebreaker" style question (assigned or chosen off a handout.)

Instructions to give students:
Write the question on one side of an index card. Put the card and the smaller envelope into the larger envelope and address to the person whose name you've been given.

The object of the game is to successfully get the card to the person and receive an answer back to your question within the time allotted for the exercise.

Instructions and timeline for instructor:
15 minutes: Allow students time to think of a question and address cards. Then observe their attempts to communicate and transport their cards. Observe any conditions for post-exercise discussion.

15 minutes: Have the students read the answers they received

20 minutes: Discuss the different methods students employed to get the envelopes out and back. Examine how room noise, other people talking over them, envelopes getting lost or misrouted relates to networking concepts and discuss layers of the OSI model responsible for managing those aspects of communication.

IT 270 OSI Paper and Presentation

The Paper:

- A paper is to be written detailing the assigned layers of the OSI model, including:
  - Characteristics of the chosen layer(s).
  - Services provided by other layers.
  - Services provided to other layers.
  - Relationship to adjacent layers.
  - Examples of protocols that communicate on a given layer
  - Examples of equipment that operate at a given layer
  - Examples of addressing schemes (if applicable) for layer(s)
- Each student should contribute between 1-2 pages (depending on complexity of area of expertise), yielding a paper of approx 5-10 pp.

- Papers MUST include a Table of Contents itemizing which group member was primarily responsible for which section.
- Papers MUST include a works cited page and any and all sources must be cited and quotations clearly marked. Plagiarism will result in an automatic failing grade.
- NOTE: While an outline is not required, it is HIGHLY recommended. This will aid your group in dividing up data as well as providing a template for your PowerPoint.

The Presentation:

- The presentation should *summarize* the paper, covering all main topics.
- Each group presentation should be approximately 3-4 minutes per member. A group of five students would be expected to present between fifteen and twenty minutes, plus 5-10 minutes for Q&A.
- The students are responsible for creating a PowerPoint presentation to accompany their presentation.
- NOTE: Don't just read the PowerPoint. Use the visual aid to supplement your verbal presentation, and vice versa.

Grading:

- You will be graded both as a group and as an individual for each portion of the assignment: Paper, Presentation, Participation.
- Your participation grade will be calculated based on both peer review and observations made by your instructor.

Rubric for Group Presentation

Speakers:_____ Topic: _____

Time: _____

E = Excellent; S = Satisfactory; N = Needs Improvement; O = Omitted

Area	Criteria	Assessment
Content	Goal / thesis of speech is clear – supporting details reinforce thesis and speech goal.	**E S N O**
Organization	Introduction gained attention and goodwill, set the tone, built credibility and lead into the speech. Conclusion tied speech together.	**E S N O**
	Transitions between topics make for a cohesive speech. Organization pattern chosen for maximum persuasive impact.	**E S N O**
	Transitions between speakers were smooth.	**E S N O**
Language	Language was professional and appropriate to topic.	**E S N O**
Delivery	Nonverbal: Speakers looked at audience, had good posture, and used appropriate body language and/or gestures.	**E S N O**
	Verbal: Presentation was fluent and articulate; speakers spoke at appropriate volume. Speakers establish credibility with audience.	**E S N O**
Preparation	Speaker responded well and appeared knowledgeable during Q&A session.	**E S N O**
Total Points		

Comments:

Assessment Rubric for Essay

(One for paper as a whole, one each per member)
E = Excellent; S = Satisfactory; N = Needs Improvement; O = Omitted

Area	Criteria	Evaluation	Points
Content	Point of the essay is clear.	**E S N O**	
	Details and specifics are included in writing.	**E S N O**	
	Content is appropriate.	**E S N O**	
Organization	Introduction gains attention and goodwill, sets the tone, builds credibility.	**E S N O**	
	Transitions lead smoothly from one detail to another.	**E S N O**	
	Ending (conclusion) ties the essay together.	**E S N O**	
Grammar and Word Use	Grammar use is correct. Word use is formal and appropriate to topic.	**E S N O**	
Capitalization and Punctuation	Capitalization and punctuation are correctly used.	**E S N O**	
Citations	Appropriate in-text citations using MLA style are used.	**E S N O**	
	Works Cited page (MLA style) is included	**E S N O**	