

**NEW YORK CITY COLLEGE OF TECHNOLOGY  
THE CITY UNIVERSITY OF NEW YORK**

**DEPARTMENT:**       **ELECTRICAL and TELECOMMUNICATION  
ENGINEERING TECHNOLOGY**

**SUBJECT CODE AND TITLE:**   **TCET3242/TC670   ADVANCED COMMUNICATION  
NETWORK**

**COURSE DESCRIPTION:**       The primary objective of this course is to help students to master the Local Area Networks (LANs) and Wide Area Networks (WANs). The proliferation of networks in the workplace and the popularity of the Internet have contributed to an increasing need for networking professionals with both LAN and WAN configuration skills. Employers are looking for qualified people to fill the demand these networking jobs. This course will cover IP addressing, routing, switching, network troubleshooting, and network management skills to interconnect LANs and WANs.

**PREREQUISITES:**   **MAT 1575/MA575, and TCET 3142/TC 570**

**TEXTBOOK:**       **CCNA Guide to Cisco Networking**, Third Edition  
By Kelly Cannon, Kelly Caudle  
Publisher: Thomson Course Technology Inc (2004).  
ISDN: 0-619-21346-9

**REFERENCE:**       **Guide to TCP/IP**, Second Edition  
By Laura A. Chappell, Ed Tittel  
Publisher: Thomson Course Technology Inc (2004).  
ISDN: 0-619-21242-X

**COURSE OBJECTIVES/  
COURSE  
OUTCOMES:**       Upon completion of this course, students will possess the ability to:

1. Understand the reasons why the networking industry uses a layered model; Explain network segmentation using bridges, switches, routers, brouters, and gateways; Explain LAN and WAN standards;  
(ABET Criterion 2a, 2b, 2d, 2f)
2. Describe the functions performed by protocols in the TCP/IP protocol suite, including ICMP, UDP, TCP, ARP, and RARP.  
(ABET Criterion 2a, 2b, 2c, 2d, 2f)
3. Understand advanced routing concepts such as CIDR, summarization, and VLSM; Describe the function that network-management tools perform on a network.  
(ABET Criterion 2a, 2b, 2c, 2d, 2e, 2f, 2g, 2k)
4. Describe, configure, and monitor the interior routing protocols RIP and IGRP; describe and configure RIPv2, EIGRP, and OSPF.

(ABET Criterion 2a, 2b, 2c, 2d, 2e, 2f, 2k)

5. Explain how to implement ISDN BRI on Cisco routers; understand Frame Relay standards and equipment; understand the purpose of the VLAN trunking protocol (VTP).

(ABET Criterion 2a, 2b, 2c, 2d, 2e, 2f, 2g, 2k)

**TOPICS:**

The topics of this course include:

Common Types of Networks, Network Media (The Physical Layer), Layer 2 Switching Fundamentals (The Data Link Layer), TCP/IP (The Transport and Internetworking Layer Protocol), IP Addressing and Routing (The Internetworking Layer), Using WAN Technologies, Operating and Configuring Cisco IOS Devices, Managing the Network Environment.

**CLASS HOURS:**

2

**LAB HOURS:**

3

**CREDITS:**

3

**PREPARED BY:**

Professor X. Wei, Fall 2006

**COURSE**

Prof. Xinzhou Wei

**COORDINATOR:**

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**DESCRIPTIVE DETAILS FOR LABORATORY COURSEWORK:**

The laboratory exercises include determine IP and MAC header information in an ARP request and RARP request; Use the system configuration dialog to configure a Cisco router; Install, configure, and use a TFTP server; Use boot system commands and configuration register; Configure RIP, IGRP, EIGRP, and OSPF. Student will also learn the configuration of PPP with CHAP and PAP; and the set up of a test frame relay network. The configurations of Cisco 1900 switches using the command line interface are also included in the experiments.

**GRADING POLICY:**

Exam 1	20%
Exam 2	20%
Labs and Projects	30%
Final Exam	30%

<b><u>Letter Grade</u></b>	<b><u>Numerical Grade Range</u></b>	<b><u>Quality Points</u></b>
A	93-100	4.0
A <sup>-</sup>	90-92.9	3.7
B <sup>+</sup>	87-89.9	3.3
B	83-86.9	3.0
B <sup>-</sup>	80-82.9	2.7
C <sup>+</sup>	77-79.9	2.3
C	70-76.9	2.0
D	60-69.9	1.0
F	59.9 and below	0.0

**ATTENDANCE REQUIREMENT:**

- A student is allowed to be absent not more than twice during the semester.
- A student is late if he/she appears after attendance is taken. Three lateness are equal to one absence.

**Assessment**

**The following assessment techniques are correlated to the course objectives as follows: In addition, each assessment technique incorporates one or more of the following ABET Criterion 2 outcomes (2a, 2b, 2c, 2d, 2e, 2f, and 2k).**

**INSTRUCTIONAL OBJECTIVES**

For the successful completion of this course, the students should be able to:

1. Understand the reasons why the networking industry uses a layered model; Explain network segmentation using bridges, switches, routers, brouters, and gateways; Explain LAN and WAN standards;
2. Describe the functions performed by protocols in the TCP/IP protocol suite, including ICMP, UDP, TCP, ARP, and RARP.
3. Understand advanced routing concepts such as CIDR, summarization, and VLSM; Describe the function that network-management tools perform on a network.
4. Describe, configure, and monitor the interior routing protocols RIP and IGRP; describe and configure RIPv2, EIGRP, and OSPF.
5. Explain how to implement ISDN BRI on Cisco routers; understand Frame Relay standards and equipment; understand the purpose of the VLAN trunking protocol (VTP).

**ASSESSMENT**

Evaluation Methods and Criteria:  
Students will exhibit skills in class discussion, homework assignments, laboratory exercises, quizzes, exams, and course projects.

1. Students will explain the functionalities of bridge, switch, router, brouter, and gateway in a network in class participation and on written assignments.
2. Students will display competency for using these protocols in LAN and WAN. Students also will show the ability to do simple network troubleshooting during laboratory assignments.
3. Students will illustrate skills in network configuration and new work design primarily in lab exercises.
4. Students will demonstrate the correct steps for the network configuration. Students also need to show analytical skills from the simulation software.
5. Students will illustrate skills in operating network equipment when implementing these protocols; Students will develop the ability to design and maintain a middle scale network. Term paper will be assigned on topic VLAN.

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Week	Subject	Reading Assignment /Homework	Lab
1	<p><b>1. Introduction to Internetworking.</b>                      Network Computing Basics. Internetworking Fundamentals. Principles of Data Communications. Data Communications Process. Encapsulation. De-Encapsulation. Principles of Data.</p>	<p><b>Chapter 1</b>  <b>Pp.1-16</b>  <b>HWK:</b>  <b>Review Questions 1 - 30</b></p>	<p><b>Lab 1</b>                      (Pp.527-P538)  <b>Introducing Networks</b>  <b>Lab1.1</b>  <b>Lab1.2</b>  <b>Lab1.3</b>  <b>Lab1.4</b></p>
2	<p><b>2. Internetworking Devices.</b>                      Physical Network Versus Logical Network. Functions of Internetworking Devices. Collision and Broadcast Domains. Layer 1 Devices. LLC Sublayer Frames. Layer 2 Class of Services. Data Link Layer Devices. Layer 3 Quality of Service Marking. Router Operation at the Network Layer.</p>	<p><b>Chapter 2</b>  <b>Pp.29-44</b>  <b>HWK:</b>  <b>Review Questions 1 -26</b></p>	<p><b>Lab 2</b>                      (Pp.539-P549)  <b>Network Devices</b>  <b>Lab2.1</b>  <b>Lab2.2</b>  <b>Lab2.3</b></p>
3	<p><b>Common Types of Networks.</b>                      LANs Overview. Ethernet. Fast Ethernet. Gigabit Ethernet. WANs Overview. Services Networks</p>	<p><b>Chapter 3</b>  <b>Pp.53-101</b>  <b>HWK:</b>  <b>Review Questions 1 -30</b></p>	<p><b>Lab 3</b>                      (Pp.551-573)  <b>IP Addressing</b>  <b>Lab3.1 – Lab3.8</b></p>
4	<p><b>Network Media (The Physical Layer).</b>                      Cabling and Infrastructure                      Choosing LAN Cabling Options                      Understanding WAN Cabling.</p>	<p><b>Chapter 4</b>  <b>Pp.115-161</b>  <b>HWK:</b>  <b>Review Questions 1 -30</b></p>	<p><b>Lab 4</b>                      (Pp.575-Pp.587)  <b>Network Topology and Design</b>  <b>Lab4.1-Lab4.5</b></p>
5	<p><b>Layer 2 Switching Fundamentals (The Data Link Layer).</b>                      Understanding Shared Ethernet Technologies. Consuming Bandwidth. Bridged and Switched Ethernet. Categorizing Switches by Bandwidth. Categorizing Switches by Layer Functionality. Switching Frames.</p>	<p><b>Chapter 5</b>  <b>Pp.175-190</b>  <b>HWK:</b>  <b>Review Questions 1 -22</b></p>	<p><b>Lab 5</b>                      (Pp.589-Pp.596)  <b>WAN Concepts</b>  <b>Lab5.1</b>  <b>Lab5.2</b>  <b>Lab5.3</b></p>
6	<p><b>TCP/IP (The Transport and Internetworking Layer Protocol).</b>                      IP Internet Layer Overview. The Transport Layer. How TCP and UDP Use Port Numbers. Establishing a TCP Connection: The Three-Way Handshake. Flow Control for TCP/UDP</p>	<p><b>Chapter 6</b>  <b>Pp.201-225</b>  <b>HWK:</b>  <b>Review Questions 1 -25</b></p>	<p><b>Lab 6</b>                      (Pp.597-Pp.614)  <b>Routers and IOS Basics</b>  <b>Lab6.1-Lab6.5</b></p>
7	<p><b>Review and Midterm</b></p>		
8	<p><b>IP Addressing and Routing (The Internetworking Layer).</b>                      IP Network Addressing. IP Subnetting. Routing Basics. Routing Protocols. Link-State Routing Protocols. Hybrid Routing Protocols</p>	<p><b>Chapter 7</b>  <b>Pp.235-255</b>  <b>HWK:</b>  <b>Review Questions 1 -25</b></p>	<p><b>Lab 7</b>                      (Pp.615-Pp.637)  <b>Router Startup and Configuration</b>  <b>Lab7.1-Lab7.6</b></p>
9	<p><b>Using WAN Technologies.</b>                      WAN Technology Basics. Multiplexing.</p>	<p><b>Chapter 8</b>  <b>Pp.263-296</b></p>	<p><b>Lab 8</b>                      (Pp.639-Pp.651)</p>

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	WAN Access Technologies	<b>HWK:</b> <b>Review Questions 1 -28</b>	<b>Routing Protocols and Network Address Translation</b> <b>Lab8.1-Lab8.4</b>
<b>10</b>	<b>Using WAN Technologies (ctd).</b> Modems: Advantages and Disadvantages of Cable Modems. Introduction of different types of modems.	<b>Chapter 9</b> <b>Pp.307-341</b> <b>HWK:</b> <b>Review Questions 1 -20</b>	<b>Lab 9</b> <b>(Pp.653-Pp.664)</b> <b>Advanced Routing Protocols</b> <b>Lab9.1-Lab9.4</b>
<b>11</b>	<b>Operating and Configuring Cisco IOS Devices.</b> Basic Operation of the Cisco IOS Software. Console Error Messages for Cisco IOS Devices. Command History Buffer for Cisco IOS Devices.	<b>Chapter 10</b> <b>Pp.347-373</b> <b>HWK:</b> <b>Review Questions 1 -22</b>	<b>Lab 10</b> <b>(Pp.665-Pp.677)</b> <b>Access Lists</b> <b>Lab10.1-Lab10.3</b>
<b>12</b>	<b>Operating and Configuring Cisco IOS Devices(ctd).</b> Booting a Cisco IOS Device. Configuring a Switch from the Command Line. Configuring a Router from the Command Line. Managing Configuration Changes	<b>Chapter 11</b> <b>Pp.379-400</b> <b>HWK:</b> <b>Review Questions 1 -26</b>	<b>Lab 11</b> <b>(Pp.679-Pp.686)</b> <b>PPP and ISDN</b> <b>Lab11.1</b> <b>Lab11.2</b>
<b>13</b>	<b>Managing Your Network Environment.</b> Getting Information About Neighboring Devices. Getting Information About Neighboring Devices.	<b>Chapter 12</b> <b>Pp.411-433</b> <b>HWK:</b> <b>Review Questions 1 -25</b>	<b>Lab 12</b> <b>(Pp.687-Pp.696)</b> <b>Frame Relay</b> <b>Lab12.1-Lab12.3</b>
<b>14</b>	<b>Managing Your Network Environment (ctd).</b> Router Booting Sequence and Verification Commands Cisco IOS File System and Devices	<b>Chapter 13</b> <b>Pp.439-475</b> <b>HWK:</b> <b>Review Questions 1 -25</b>	<b>Lab 13</b> <b>(Pp.697-Pp.730)</b> <b>Switching and VLANs</b> <b>Lab13.1-Lab13.6</b>
<b>15</b>	<b>Final Exam</b>		