

NEW YORK CITY COLLEGE OF TECHNOLOGY
The City University of New York

DEPARTMENT: Electrical and Telecommunications Engineering Technology

SUBJECT CODE AND TITLE: TCET3242 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, TCET 3142

TEXTBOOK:

1. CCNA Certification Study Guide, First Edition By Todd Lammle
Publisher: Sybex, 2019
ISBN-10: 1119659027
ISBN-13: 978-1119659020
2. CCNA Guide to Cisco Networking, Fourth Edition By Kelly Cannon, Kelly Caudle
Publisher: Thomson Course Technology Inc. (2008).
ISDN: 0-619-21346-9

COURSE OBJECTIVES/ OUTCOMES: (ETAC/ABET Criteria 3, Program Criteria)

Upon completion of this course the student should be able to:

1. Understand layered network model; explain network segmentation using bridges, switches, routers, brouters, and gateways; explain LAN and WAN standards. (ABET Criterion 3a)
2. Describe the functions performed by protocols in the TCP/IP protocol suite, including ICMP, UDP, TCP, ARP, and RARP. (ABET Criterion 3a)
3. Understand advanced routing concepts such as CIDR, summarization, and VLSM; describe the function that network- management tools perform on a network.(ABET Criterion 3a)
4. Describe, configure, analyze and troubleshoot the interior routing protocols RIP and IGRP, RIPv2, EIGRP, and OSPF. (ABET Criterion 3a, 3b, 3f, PCa, PCb)
5. Explain, configure, and analyze ISDN BRI on Cisco routers; understand Frame Relay standards and equipment; understand the purpose of the VLAN trunking protocol (VTP). (ABET Criterion 3a, 3b, 3f, PCa, and PCb)
6. Work in a group and gain hands-on experience in the lab by implementing, testing and analyzing interior routing protocols, Cisco routers, Frame Relay equipment etc. (ABET Criteria 3a, 3b, 3c, 3d, 3e, 3f, PCa, and PCb)
7. Present technical reports in oral and written forms (ABET Criteria 3g, 3i, and 3k)

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

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GRADING POLICY:

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

Letter Grade	Numerical Grade Ranges	Quality
A	93-100	4.0
A-	90-92	3.7
B+	87-89.9	3.3
B	83-86.9	3.0
B-	80.82.9	2.7
C+	77-79.9	2.3
C	70-76.9	2.0
D	60-69.9	1.0
F	59.9 and below	0.0

Description of laboratory work: 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 setup of a test frame relay network. The configurations of Cisco 1900 switches using the command line interface are also included in the experiments.

Course contribution in meeting ETAC/ABET Criterion 5 requirements: TCET 3242 meets criterion 5 by providing students with a strong foundation of principles and laboratory skills needed to implement, configure and analyze telecommunication systems that utilize various equipment (Cisco switches, routers etc.) and protocols (RIP, IGRP, EIGRP, OSPF etc.). Academic benchmarks, course outcomes, and assessment requirements have been established to ascertain student comprehension of concepts and proper usage of test equipment. Additionally, by fostering critical thinking, communications, and team work, students develop the skills needed to solve problems in a classroom and laboratory environment which will later serve them in the work place.

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 Criteria (3a, 3b, 3c, 3d, 3e, 3f, 3g, 3i, 3k PCa, and PCb).

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

Course Objectives	Assessment
1. Understand layered network model; Explain network segmentation using bridges, switches, routers, brouters, and gateways; Explain LAN and WAN standards.	1.1 Students will explain the functionalities of bridge, switch, router, brouter, and gateway in a network in class participation and on written assignments.
2. Describe the functions performed by protocols in the TCP/IP protocol suite, including ICMP, UDP, TCP, ARP, and RARP.	2.1 Students will display competency in using these protocols in LAN and WAN. 2.2 Students also will show the ability to do simple network troubleshooting during laboratory assignments.
3. Understand advanced routing concepts such as CIDR, summarization, and VLSM; describe the function that network-management tools perform on a network.	3.1 Students will demonstrate skills in network configuration and new work design primarily in lab exercises.
4. Describe, configure, and troubleshoot the interior routing protocols RIP and IGRP, RIPv2, EIGRP, and OSPF.	4.1 Students will follow the correct steps while configuring and troubleshooting network.
5. Explain, configure, and analyze ISDN BRI on Cisco routers; understand Frame Relay standards and equipment; understand the purpose of the VLAN trunking protocol (VTP)	5.1 Students will demonstrate skills in operating network equipment when implementing various protocols; 5.2 Students will be able to design and maintain a middle scale network.
6. Work in a group and gain hands-on experience in the lab by implementing, testing and analyzing various switching and routing equipment and protocols.	6.1 Able to work in a team efficiently. 6.2 Achieve familiarity with equipment used in professional laboratories. 6.3 Know how to apply knowledge to real world problems. 6.4 Understand how to configure and implement various protocols (TCP/IP, RIP, OSPF etc.) along with relevant routing and switching equipment (Cisco routers) in a practical setting.
7. Present technical report in oral and written form.	7.1 Demonstrate written communication competence. 7.2 Demonstrate oral communication competence. 7.3 Meet project/ report deadline.

Weekly Schedule

Week	Subject	Reading Assignment /Homework	Lab
1	1. Introduction to Internetworking. Network Computing Basics. Internetworking Fundamentals. Principles of Data Communications. Data Communications Process. Encapsulation. De-Encapsulation. Principles of Data.	Chapter 1 Pp.1-16 HWK: Review Questions 1 - 30	Lab 1 (Pp.527-P538) Introducing Networks Lab1.1 Lab1.2 Lab1.3 Lab1.4
2-3	2. Internetworking Devices. 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.	Chapter 2 Pp.29-44 HWK: Review Questions 1 -26	Lab 2 (Pp.539-P549) Network Devices Lab2.1 Lab2.2 Lab2.3
4	Common Types of Networks. LANs Overview. Ethernet. Fast Ethernet. Gigabit Ethernet. WANs Overview. Services Networks	Chapter 3 Pp.53-101 HWK: Review Questions 1 -30	Lab 3 (Pp.551-573) IP Addressing Lab3.1 – Lab3.8
5-6	Network Media (The Physical Layer). Cabling and Infrastructure Choosing LAN Cabling Options Understanding WAN Cabling.	Chapter 4 Pp.115-161 HWK: Review Questions 1 -30	Lab 4 (Pp.575-Pp.587) Network Topology and Design Lab4.1-Lab4.5
7	Review and Midterm		
8-9	Layer 2 Switching Fundamentals (The Data Link Layer). Understanding Shared Ethernet Technologies. Consuming Bandwidth. Bridged and Switched Ethernet. Categorizing Switches by Bandwidth. Categorizing Switches by Layer Functionality. Switching Frames.	Chapter 5 Pp.175-190 HWK: Review Questions 1 -22	Lab 5 (Pp.589-Pp.596) WAN Concepts Lab5.1 Lab5.2 Lab5.3
10-11	TCP/IP (The Transport and Internetworking Layer Protocol). 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	Chapter 6 Pp.201-225 HWK: Review Questions 1 -25	Lab 6 (Pp.597-Pp.614) Routers and IOS Basics Lab6.1-Lab6.5

12-13	IP Addressing and Routing (The Internetworking Layer). IP Network Addressing. IP Subnetting. Routing Basics. Routing Protocols. Link-State Routing Protocols. Hybrid Routing Protocols	Chapter 7 Pp.235-255 HWK: Review Questions 1 -25	Lab 7 (Pp.615-Pp.637) Router Startup and Configuration Lab7.1-Lab7.6
14	Using WAN Technologies. WAN Technology Basics. Multiplexing.	Chapter 8 Pp.263-296	Lab 8 (Pp.639-Pp.651)
15	Final Exam		

New York City College of Technology Policy on Academic Integrity

Students and all others who work with information, ideas, texts, images, music, inventions, and other intellectual property owe their audience and sources accuracy and honesty in using, crediting, and citing sources. As a community of intellectual and professional workers, the College recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City University of New York and at New York City College of Technology and is punishable by penalties, including failing grades, suspension, and expulsion. The complete text of the College policy on Academic Integrity may be found in the catalog.