Unit: Connecting Routing Devices **Exam Paper No.:** 4	**Guided Learning Hours:** 300 **Number of Credits:** 30
Prerequisites: Knowledge in Windows operating system.	**Corequisites:** A pass or higher in Certificate in Networking or equivalence.
Aim: The unit covers network terminology, network protocols, Local-Area Networks (LANs), Wide-Area Networks (WANs), Open System Interconnection (OSI) model, cabling, routers, router configuration, routing Ethernet Internet Protocol (IP) addressing and network standards. The unit focuses on initial router connectivity and configuration, Cisco IOS management, routing protocol configuration, TCP/IP, and access control lists (ACLs). Learners will develop skills on how to configure router interfaces, manage Cisco IOS, configure routing protocol, and set access lists to control the access to routers. The unit also focuses on advanced IP addressing techniques: Variable Length Subnet Masking (VLSM); Intermediate routing protocols such as RIP v2, single-area OSPF, and EIGRP; command-line interface configuration of switches, ethernet switching, Virtual LANs (VLANs), Spanning Tree Protocol (STP), VLAN Trunking Protocol (VTP). Other topics include Advanced IP addressing techniques, Network Address Translation (NAT), Port Address Translation (PAT), Dynamic Host Configuration Protocol (DHCP), WAN technology and terminology, PPP, ISDN, DDR, Frame Relay, and Network management.	
Required Materials: Cisco routers	**Supplementary Materials:** Lecture notes and tutor extra reading recommendations.
Special Requirements: The unit requires a combination of lectures, demonstrations, discussions, and hands-on labs.	
Intended Learning Outcomes: **Part I Fundamentals of Cisco Networking** 1. The different types of area networks, ways to categorise them and how computers communicate with one another over a shared network medium.	**Assessment Criteria:** **Part I Fundamentals of Cisco Networking** 1.1 Analyse how networks impact our lives 1.2 Outline network architectures 1.3 Describe the OSI seven layer model 1.4 Analyse computer numbering systems (binary, octal, hexadecimal) 1.5 Outline elements of network communication 1.6 Outline the history of the internet 1.7 Identify the application layer functions and protocols 1.8 Describe the services and role of transport layer 1.9 Analyse the protocols and role of network layer 1.10 Outline the IPv4 and IPv6 address structure 1.11 Demonstrate calculating network, host and broadcast addresses 1.12 Outline the TCP/IP protocol suites 1.13 Explain logical topologies and role of data link layer 1.14 Outline the physical layer protocols 1.15 Identify hardware found at physical, data link and transport layers 1.16 Identify Ethernet technologies 1.17 Outline LAN and WAN cabling requirements 1.18 Demonstrate connecting a Cisco router 1.19 Demonstrate configuring Cisco

	interfaces 1.20 Demonstrate using basic show commands
Part II Cisco Routing Concepts 2. Routing protocols, the types of routing protocols, specific characteristics of routing protocols and the difference between routed versus routing protocols.	**Part II Cisco Routing Concepts** 2.1 Identify router components 2.2 Identify router LAN and WAN interfaces 2.3 Outline Cisco IOS features 2.4 Demonstrate configuring a router for basic routing 2.5 Examine neighbour discovery tools, telnet and troubleshooting commands 2.6 Analyse router boot sequence and be able to manage Cisco IOS file system and filenames 2.7 Distinguish routing protocols and ***routed*** protocols 2.8 Demonstrate how to configure static routing 2.9 Demonstrate how to configure and troubleshoot RIP routing protocol 2.10 Demonstrate how to configure and troubleshoot IGRP routing protocol 2.11 Analyse characteristics of Distance Vector (DV) routing protocol 2.12 Demonstrate how to configure and troubleshoot EIGRP routing protocol 2.13 Outline hybrid routing protocol features 2.14 Demonstrate how to configure and troubleshoot OSPF routing protocol 2.15 Describe OSPF routing protocol characteristics 2.16 Analyse TCP/IP error and control messages 2.17 Identify TCP/UDP functions, operation and services 2.18 Outline DHCP, NAT and PAT configuration 2.19 Describe traffic filtering 2.20 Demonstrate how to configure Standard and Extended Access Control Lists
Part III Switching & WAN technologies 3. How the advent of faster computer networks and a far more stable infrastructure has over come the need for a quicker way to "switch" information around, including the best known methods for doing so.	**Part III Switching & WAN technologies** 3.1 Define Layer 2 switching 3.2 Outline LAN switch operation 3.3 Define collision and broadcast domains 3.4 Demonstrate how to configure a switch 3.5 Outline cut-through, fragment free, store and forward LAN 3.6 Describe Spanning Tree Protocol (STP) 3.7 Define Virtual LAN (VLAN) 3.8 Describe VLAN Trunking Protocol (VTP) 3.9 Outline Inter-VLAN routing
4. The various protocols and technologies used in Wide- Area Network (WAN) environments like point-to-point links, circuit switching, packet switching, virtual circuits, dialup services, and WAN devices all linked	4.1 Compare and contrast LAN vs WAN 4.2 Identify WAN terminology 4.3 Discuss WAN standards organisations 4.4 Describe physical layer standards 4.5 Identify WAN connection technologies

together.	4.6 Describe WAN data link protocols 4.7 Outline PPP layered architecture 4.8 Describe PPP authentication protocols 4.9 Describe ISDN standards 4.10 Describe Dial-on-Demand Routing (DDR) 4.11 Define dialer profile elements 4.12 Describe the components of frame relay network 4.13 Explain frame relay topologies
Methods of Evaluation: A 2½-hour written examination paper with five essay questions, each carrying 20 marks. Candidates are required to answer all questions. Candidates also undertake project/coursework in Connecting Routing Devices with a weighting of 100%.	

Recommended Learning Resources: Connecting Routing Devices

Text Books	• Cisco IOS 12.0 Solutions for Network Protocols: IP, IP Routing v. 1 by Cisco Systems Inc. and Technologies Riva ISBN-10: 1578701546 • ICND: Interconnecting Cisco Network Devices by Thomas M. Thomas, Michael Coker, Dan Golding and Andrew G. Mason ISBN-10: 0072125225 • CCNA 1 and 2: Companion Guide by Cisco Systems Inc. ISBN-10: 1587131501
Study Manuals 	BCE produced study packs
CD ROM 	Power-point slides
Software 	Cisco IOS version 12 or above