INSTITUTE OF HUMAN RESOURCES DEVELOPMENT

TC 86/1949(2), NH Bypass junction, Chackai, Pettah, Thiruvananthapuram, Kerala, India, Pin : 695024 director@ihrd.ac.in

CERTIFICATE COURSE IN
COMPUTER NETWORK ADMINISTRATION (CCNA)
(6 months)

Scheme & Syllabus

2023

(with effect from August 2023 admission)

INSTITUTE OF HUMAN RESOURCES DEVELOPMENT

CERTIFICATE COURSE ON COMPUTER NETWORK ADMINISTRATION
(CCNA)
(6 months)

1. Objective

The Course objective is to provide an insight into Computer hardware organization, Computer network and switching, routing concepts. It also includes to identify the key issues for the realization of the LAN/WAN/MAN network architectures and the hybridized existing from in the business environment and enterprise. The course will provide a thorough understanding and hand sole experience in installing, monitoring and troubleshooting of the network system by providing real time lab using industrial switches and routers.

2. Duration

 The Duration of the course   shall be six months and it will be conducted   as part time or full time course with

3. Eligibility for Admission

The minimum qualification for admission to the course shall be CO&PA, DCA, Data Entry, Plus Two Computer Science Pass, PGDCA, BSc, BCA, Diploma / B.Tech Pass /course completed in Computer, Electronics & Electrical or Final year BSc, BCA, Diploma / B.Tech students of Computer Hardware, Computer Engineering, Electronics & Communication Engineering, Electronics Engineeringg, Electrical & Electronics Engineering.

4. Medium of Instruction

The medium of instruction for the course will be English.

INSTITUTE OF HUMAN RESOURCES DEVELOPMENT

CERTIFICATE COURSE IN COMPUTER NETWORK ADMINISTRATION
(6 Months)

Subjects of study and Scheme of Assessment

(Scheme-2023)

Subject Code	Subject Name	No. of Hrs/Week		Minimum Marks			Maximum Marks		
		T	P	W/P	CE	T	W/P	CE	T
CNA101	Network Fundamentals	1	-	30	10	40	75	25	100
CNA102	Network Design and Implementation	2	-	30	10	40	75	25	100
CNA103	Network Security and Performance Optimization	2	-	30	10	40	75	25	100
CNA104	Computer Fundamentals & Network(Practical)		1	30	10	40	75	25	100
CNA105	Network Design and Implementation (Practical)		2	30	10	40	75	25	100
CNA106	Network security and performance optimization (Practical)		2	30	10	40	75	25	100
CNA107	Project (30 Hrs)			40	10	50	75	25	100
Total Duration : 240 Hrs		5	5	Total Marks	290		525	175	700

* *T- Theory   P- Practical   W- Written   CE – Continuous Evaluation T –Total*

Course Duration: 6 Month Course Description:

The Comprehensive Network Management course provides a comprehensive understanding of network fundamentals, design and implementation, router and switch configuration, network security, and performance optimization. The course consists of three theory subjects and corresponding lab sessions to ensure a balanced approach between theoretical knowledge and practical skills. Students will develop the expertise necessary to manage and troubleshoot networks effectively.

Course Outline:

Subject 1: Network Fundamentals (CNA 101)

- Introduction to computer networks and the OSI model
- TCP/IP fundamentals and protocols
- Ethernet LANs and wireless networks
- Network devices and their functions
- Network addressing and sub netting

Subject 2: Network Design and Implementation (CNA **102)**

- Network requirements gathering and analysis
- Network topologies and architectures
- IP addressing and subnetting for scalable networks
- Routing protocols: RIP, OSPF, EIGRP
- WAN technologies: leased lines, MPLS, VPNs

Subject 3: Network Security and Performance Optimization (CNA 103)

Theory:

- Network security fundamentals and best practices
- Access control lists (ACLs) and firewalls
- Virtual private networks (VPNs) and remote access
- Network performance monitoring and analysis
- Bandwidth management and traffic shaping

Lab1: Network Fundamentals(CNA **104)**

- Configuring basic network devices (switches, routers)
- Implementing VLANs and trunking
- Configuring IP addressing and sub netting
- Troubleshooting network connectivity issues

Lab2: Network Design and Implementation(CNA 105)

- Designing and implementing a network topology
- Configuring dynamic routing protocols (RIP, OSPF, EIGRP)
- Implementing WAN connectivity using leased lines and VPNs
- Performing network documentation and validation

Lab3 : Network Security and Performance Optimization(CNA 106)

- Configuring ACLs and firewalls for network security
- Implementing VPNs and remote access solutions
- Monitoring network performance using network monitoring tools
- Implementing bandwidth management and traffic shaping techniques

Project(CNA107)

- The Major Project course shall include a problem statement, market study, finalizing the project, Project work implementation and preparation of Project report.

Assessment:

- Theory subjects: Mid-term and final exams
- Lab sessions: Practical exercises and simulations
- Assignments and projects related to theory and lab topics

Resources:

Textbooks:

- "CCCNA Routing and Switching Complete Study Guide" by Todd Lammle
- "Computer Networking: A Top-Down Approach" by James F. Kurose and Keith W. Ross
- Online resources and tutorials
- Network simulation or emulation software (Packet Tracer, GNS3, etc.)
- Access to physical or virtual network equipment for hands-on practice.

CNA 101 Network Fundamentals(35HRS)

Module 1: Introduction to Computer Networks and the OSI Model(5hr)

- Introduction to computer networks: Definition, types, and benefits.
- Network architecture and components: Nodes, links, and protocols.
- Network topologies: Bus, star, ring, and mesh.
- Network models: OSI model and TCP/IP model.
- Overview of the OSI model: Layers and their functions.
- Layer 1: Physical layer - Data transmission and media types.
- Layer 2: Data link layer - Framing, error detection, and MAC addresses.
- Layer 3: Network layer - IP addressing, routing, and protocols (IPv4 and IPv6).
- Layer 4: Transport layer - Segmentation, flow control, and ports.
- Layer 5: Session layer - Establishing, managing, and terminating sessions.
- Layer 6: Presentation layer - Data representation and encryption.
- Layer 7: Application layer - Network services and protocols (HTTP, FTP, DNS, etc.).
- OSI model summary and review.

Module 2: TCP/IP Fundamentals and Protocols(7hr)

- Introduction to TCP/IP: Overview, history, and TCP/IP vs. OSI model.
- TCP/IP protocol suite: IP, ICMP, ARP, and RARP.
- IP addressing and subnetting: Classful addressing and subnet masks.
- Subnetting techniques: VLSM and CIDR.
- Address Resolution Protocol (ARP): Address resolution and caching.
- Internet Control Message Protocol (ICMP): Error reporting and diagnostics.
- Internet Protocol version 6 (IPv6): Features, addressing, and transition mechanisms.
- IPv6 addressing and sub netting.
- Transmission Control Protocol (TCP): Connection-oriented communication, flow control, and congestion control.
- User Datagram Protocol (UDP): Connectionless communication and applications.
- Common TCP/IP applications: HTTP, FTP, SMTP, DNS, and DHCP.
- TCP/IP troubleshooting techniques.

Module 3: Ethernet LANs and Wireless Networks(7hr)

- Introduction to Ethernet LANs: Basics, evolution, and IEEE 802.3 standards.
- Ethernet frame structure: Preamble, destination/source MAC addresses, type/length, and data.
- Ethernet switching: Switch operation, MAC learning, and frame forwarding.
- VLANs (Virtual LANs): Benefits and configuration.
- Wireless networks: Introduction, standards (Wi-Fi, Bluetooth, etc.), and frequencies.
- Wireless LAN (WLAN): IEEE 802.11 standards, architecture, and modes.
- WLAN security: Authentication, encryption, and common vulnerabilities.
- WLAN configuration and troubleshooting.

Module 4: Network Devices and Their Functions(8hr)

- Network devices overview: Routers, switches, hubs, modems, and gateways.
- Routers: Functions, routing algorithms, and dynamic routing protocols (RIP, OSPF, etc.).
- Switches: Functions, MAC table management, and VLAN configuration.

- Hubs and repeaters: Signal regeneration and limitations.
- Network address translation (NAT): Purpose, types, and implementation.
- Firewalls: Types (packet-filtering, stateful, etc.) and security policies.
- Proxy servers: Functionality and caching.
- Network monitoring and management tools.

Module 5: Network Addressing and Subnetting(8hr)

- IP addressing review: Classes, subnet masks, and default gateways.
- Sub netting basics: Subnet ID, broadcast address, and host ranges.
- Sub netting practice: Calculating subnets and addressing schemes.
- Variable Length Subnet Masking (VLSM) and Classless Inter-Domain Routing (CIDR).
- Network Address Translation (NAT): Purpose, types, and configurations.
- Port Address Translation (PAT): Overloading and port mapping.
- IPv6 addressing: Structure, types, and address allocation.
- IPv6 sub netting and address assignment.

References:
1. "Computer Networking: A Top-Down Approach" by James F. Kurose and Keith W. Ross
   - Year of Publication: 2017
   - Recommended Edition: 7th Edition
2. "TCP/IP Protocol Suite" by Behrouz A. Forouzan
   - Year of Publication: 2016
   - Recommended Edition: 4th Edition
3. "Data Communications and Networking" by Behrouz A. Forouzan
   - Year of Publication: 2013
   - Recommended Edition: 5th Edition

CNA 102Network Design and Implementation (40HRS)

Module 1: Network Requirements Gathering and Analysis(6hr)

- Introduction to network requirements gathering: Importance and process.
- Identifying business requirements: Understanding organizational goals and objectives.
- Gathering user requirements: Assessing user needs and expectations.
- Conducting stakeholder interviews and surveys.
- Analyzing network performance requirements: Bandwidth, latency, and reliability.
- Assessing network scalability and growth requirements.
- Identifying security requirements: Access control, data integrity, and confidentiality.
- Analyzing network management requirements: Monitoring, troubleshooting, and reporting.

Module 2: Network Topologies and Architectures(7hr)

- Overview of network topologies: Bus, star, ring, mesh, and hybrid.
- LAN architectures: Ethernet, Token Ring, and FDDI.
- WAN architectures: Circuit-switched, packet-switched, and MPLS.
- Virtualized network architectures: SDN and NFV.
- Campus network design: Core, distribution, and access layers.
- Data center network design: Spine-leaf architecture and virtualization.
- Branch office network design: Hub-and-spoke vs. full-mesh topologies.
- Remote access network design: VPNs and remote desktop solutions.

Module 3: IP Addressing and Subnetting for Scalable Networks(10hr)

- IP addressing review: Classes, subnet masks, and default gateways.
- Subnetting basics: Subnet ID, broadcast address, and host ranges.
- Variable Length Subnet Masking (VLSM) and Classless Inter-Domain Routing (CIDR).
- Subnetting practice: Calculating subnets and addressing schemes.
- IP address allocation for scalable networks: Efficient IP address utilization.
- Private IP addressing: NAT and private address ranges.
- Public IP addressing: Obtaining public IP addresses and IP allocation policies.
- IPv6 addressing: Structure, types, and transition mechanisms.

Module 4: Routing Protocols: RIP, OSPF, EIGRP(7hr)

- Introduction to routing protocols: Purpose and functions.
- Distance Vector Routing Protocol: Routing Information Protocol (RIP).
- RIP operation and configuration: Metrics, convergence, and loop prevention.
- RIP troubleshooting and best practices.

- Link-State Routing Protocol: Open Shortest Path First (OSPF).
- OSPF operation and configuration: Areas, LSAs, and convergence.
- OSPF troubleshooting and best practices.
- Enhanced Interior Gateway Routing Protocol (EIGRP): Features and operation.

Module 5: WAN Technologies: Leased Lines, MPLS, VPNs(10hr)

- Introduction to Wide Area Networks (WANs): Purpose and characteristics.
- Leased line connections: Point-to-Point Protocol (PPP) and High-Level Data Link Control (HDLC).
- Circuit-switched networks: Integrated Services Digital Network (ISDN).
- Frame Relay: Virtual circuits and DLCIs.
- Multiprotocol Label Switching (MPLS): Architecture and benefits.
- MPLS operation and configuration: Label distribution, LSPs, and MPLS VPNs.
- Virtual Private Networks (VPNs): IPsec and SSL/TLS-based VPNs.
- VPN configuration and troubleshooting.

Reference:

1. "Network Warrior: Everything You Need to Know That Wasn't on the CCCNA Exam" by Gary A. Donahue
   - Year of Release: 2011
   - Recommended Edition: 2nd Edition
2. "CCNP Routing and Switching ROUTE 300-101 Official Cert Guide" by Kevin Wallace
   - Year of Release: 2014
   - Recommended Edition: 1st Edition
3. "MPLS Fundamentals" by Luc De Ghein
   - Year of Release: 2006
   - Recommended Edition: 1st Edition

CNA 103 Network Security and Performance Optimization (45HRS)

Module 1: Network Security Fundamentals and Best Practices(5hr)

- Introduction to network security: Importance, threats, and vulnerabilities.
- Security goals: Confidentiality, integrity, availability, and accountability.
- Network security layers: Physical, network, host, application, and data layers.
- Security policies and procedures: Risk assessment, incident response, and disaster recovery.
- Network security threats: Malware, social engineering, phishing, and DoS attacks.
- Cryptography fundamentals: Symmetric and asymmetric encryption, hashing, and digital signatures.
- Public key infrastructure (PKI): Certificates, CAs, and trust models.
- Network security best practices: Strong passwords, patch management, and user awareness.

Module 2: Access Control Lists (ACLs) and Firewalls(10hr)

- Access Control Lists (ACLs): Purpose, types (standard and extended), and syntax.
- ACL configuration: Matching criteria, wildcard masks, and implicit deny.
- Implementing ACLs on routers and switches: Inbound and outbound filtering.
- ACL troubleshooting and best practices.
- Firewalls: Types (packet-filtering, stateful, and application-aware) and architectures.
- Firewall technologies: Network Address Translation (NAT), VPN passthrough, and intrusion prevention.
- Firewall configuration: Rule-based filtering, DMZ setup, and logging.
- Firewall troubleshooting and best practices.

Module 3: Virtual Private Networks (VPNs) and Remote Access(10hr)

- Introduction to Virtual Private Networks (VPNs): Benefits and components.
- VPN technologies: IPsec, SSL/TLS, and PPTP.
- VPN configurations: Site-to-Site VPNs and Remote Access VPNs.
- VPN deployment considerations: Authentication, encryption, and key management.
- Remote access protocols: PPP, L2TP, and SSTP.
- Remote access security: Two-factor authentication and client security policies.
- VPN troubleshooting and best practices.
- Implementing remote access policies and procedures.

Module 4: Network Performance Monitoring and Analysis(10hr)

- Introduction to network performance monitoring: Metrics and tools.
- Network performance monitoring techniques: SNMP, NetFlow, and packet capturing.
- Performance baseline establishment: Measurement, analysis, and trending.
- Monitoring network availability and response time.
- Performance analysis and optimization: Identifying bottlenecks and optimizing network devices.
- Quality of Service (QoS): Traffic prioritization, classification, and queuing mechanisms.
- Network performance troubleshooting and best practices.
- Analysing network performance data and generating reports.

Module 5: Bandwidth Management and Traffic Shaping(10hr)

- Bandwidth management fundamentals: Understanding network traffic and congestion.
- Bandwidth measurement and control techniques: Traffic shaping and policing.
- Traffic classification and prioritization: DiffServ and MPLS QoS.
- Implementing bandwidth management policies and techniques.
- Network traffic analysis: Identifying and managing bandwidth-intensive applications.
- Content filtering and application control: URL filtering and deep packet inspection.
- Bandwidth management troubleshooting and best practices.
- Monitoring and optimizing network bandwidth usage.

Reference:

1. "Network Security Essentials: Applications and Standards" by William Stallings
   - Year of Release: 2017
   - Recommended Edition: 6th Edition
2. "Cisco ASA: All-in-One Next-Generation Firewall, IPS, and VPN Services" by Jazib Frahim, Omar Santos, Andrew Ossipov
   - Year of Release: 2014
   - Recommended Edition: 3rd Edition
3. "Network Performance and Security: Testing and Analyzing Using Open Source and Low-Cost Tools" by Chris Chapman
   - Year of Release: 2018
   - Recommended Edition: 1st Edition.

CNA 104NETWORK FUNDAMENTALS LAB(30HRS)

Experiment 1: Introduction to Network Device Configuration(3hr)

- Lab setup and device familiarization
- Console connection and initial device configuration
- Basic device configurations: Hostname, passwords, and banners
- Verifying connectivity and accessing device interfaces

Experiment 2: Configuring Basic Switching(3hr)

- Configuring VLANs on switches
- Assigning switch ports to VLANs
- Configuring port security and MAC address restrictions
- Verifying VLAN configurations and port status

Experiment 3: Implementing VLANs and Trunking(3hr)

- Creating and configuring VLANs
- Configuring inter-VLAN routing using a router-on-a-stick approach
- Implementing VLAN trunking with 802.1Q protocol
- Verifying VLAN and trunking configurations

Experiment 4: Configuring IP Addressing and Subnetting(3hr)

- IP addressing and sub netting review
- Assigning IP addresses to switch and router interfaces
- Configuring static routing between interconnected networks
- Verifying IP addressing and routing configurations

Experiment 5: Troubleshooting Network Connectivity Issues(3hr)

- Troubleshooting network connectivity problems using the OSI model
- Using common network troubleshooting commands (ping, traceroute, etc.)
- Diagnosing and resolving issues with connectivity, routing, and VLANs
- Documenting troubleshooting steps and outcomes

Experiment 6: Configuring VLAN Access Control Lists (ACLs)(3hr)

- Introduction to VLAN Access Control Lists (ACLs)
- Creating and applying VLAN ACLs for traffic filtering and security
- Implementing VLAN ACLs for inbound and outbound traffic control
- Verifying VLAN ACL configurations and evaluating their impact.

Experiment 7: Implementing Port Security(3hr)

- Configuring port security on switches to restrict MAC addresses
- Configuring port security violation modes and actions.
- Testing port security by introducing unauthorized devices
- Verifying port security configurations and actions

Experiment 8: Configuring DHCP Services(3hr)

- Configuring DHCP services on a router or switch
- Configuring DHCP pools and lease times
- Verifying DHCP address assignments and lease renewals
- Troubleshooting DHCP configuration and client connectivity

Experiment 9: Implementing Spanning Tree Protocol (STP)(3hr)

- Introduction to Spanning Tree Protocol (STP) and its purpose
- Configuring STP on switches to prevent loops
- Verifying STP operation and root bridge election
- Simulating network changes and observing STP convergence

Experiment 10: Implementing Ether Channel(3hr)

- Configuring Ether Channel for link aggregation and load balancing
- Configuring Ether Channel modes and protocols (LACP, PAgP)
- Verifying Ether Channel operation and load balancing
- Troubleshooting Ether Channel configuration and connectivity

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Reference:

1. "CCCNA Routing and Switching Portable Command Guide" by Scott Empson
2. "CCCNA Routing and Switching Complete Study Guide" by Todd Lammle
3. "Cisco Networking All-in-One For Dummies" by Edward Tetz

CNA 105NETWORK DESIGN AND IMPLEMENTATION LAB (40HRS)

Experiment 1: Network Topology Design(4hr)

- Analysing network requirements and constraints
- Designing a network topology using appropriate devices
- Creating a network diagram using network design software
- Justifying the network design decisions

Experiment 2: Basic Network Device Configuration(4hr)

- Configuring IP addresses and hostnames on network devices
- Enabling basic services such as SSH and SNMP
- Verifying connectivity between network devices
- Documenting the initial device configurations

Experiment 3: Configuring Dynamic Routing Protocols (RIP)(4hr)

- Configuring RIP routing protocol on network devices
- Verifying routing tables and neighbour relationships
- Testing network reachability using RIP
- Troubleshooting common issues with RIP configurations

Experiment 4: Configuring Dynamic Routing Protocols (OSPF)(4hr)

- Configuring OSPF routing protocol on network devices
- Configuring OSPF areas and link-state advertisements
- Verifying OSPF neighbor relationships and routing tables
- Troubleshooting OSPF configuration and issues

Experiment 5: Configuring Dynamic Routing Protocols (EIGRP)(4hr)

- Configuring EIGRP routing protocol on network devices
- Configuring EIGRP autonomous system and metric settings
- Verifying EIGRP neighbour relationships and routing tables
- Troubleshooting EIGRP configuration and issues

Experiment 6: Implementing WAN Connectivity using Leased Lines(4hr)

- Configuring serial interfaces for leased line connectivity
- Establishing point-to-point connections between routers
- Configuring serial interface encapsulation and clock rate
- Verifying WAN connectivity and troubleshooting issues

Experiment 7: Implementing WAN Connectivity using VPNs(4hr)

- Configuring VPN tunnels using IPsec protocols
- Setting up VPN concentrators and remote access clients
- Verifying VPN connectivity and secure communication
- Troubleshooting VPN configuration and connectivity

Experiment 8: Network Documentation and Validation(4hr)

- Creating comprehensive network documentation
- Documenting network configurations, IP addressing, and VLANs
- Conducting network validation tests, such as ping and trace route
- Identifying and documenting potential network vulnerabilities

Experiment 9: Network Security Assessment(4hr)

- Performing a security assessment of the network
- Identifying potential security vulnerabilities and risks
- Implementing security measures, such as access control lists and firewalls
- Verifying the effectiveness of security measures

Experiment 10: Network Performance Optimization(4hr)

- Analysing network performance using monitoring tools
- Identifying performance bottlenecks and optimizing network resources
- Implementing Quality of Service (QoS) mechanisms for traffic prioritization
- Validating network performance improvements

Reference:

1. "Implementing Cisco IP Routing (ROUTE) Foundation Learning Guide" by Diane Teare
2. "Network Warrior" by Gary A. Donahue
3. "CCNP Routing and Switching ROUTE 300-101 Official Cert Guide" by Kevin Wallace

CNA 106 NETWORK SECURITY AND PERFORMANCE OPTIMIZATION LAB(50HRS)

Experiment 1: Introduction to ACLs and Firewall Configuration (5hr)

- Configuring standard and extended ACLs on routers and switches
- Applying ACLs to control network traffic based on source/destination IP, port numbers, and protocols
- Testing ACL configurations and verifying traffic filtering
- Documenting ACL configurations and their impact on network security

Experiment 2: Advanced ACL Configuration and Network Segmentation(5hr)

- Configuring named ACLs and object groups for easier management
- Implementing ACLs for network segmentation and isolation
- Verifying access control between different network segments
- Troubleshooting ACL configuration and connectivity issues

Experiment 3: Implementing Firewall Technologies(5hr)

- Configuring stateful firewalls on network devices
- Enabling application-aware firewall features for enhanced security
- Testing firewall rules and verifying traffic filtering
- Troubleshooting firewall configuration and connectivity issues

Experiment 4: Implementing Site-to-Site VPNs(5hr)

- Configuring IPsec VPN tunnels between network sites
- Establishing secure communication between networks using VPNs
- Verifying VPN connectivity and traffic encryption
- Troubleshooting VPN configuration and connectivity issues

Experiment 5: Implementing Remote Access VPNs(5hr)

- Configuring remote access VPNs for secure remote connectivity
- Enabling VPN clients and configuring authentication mechanisms
- Verifying remote access VPN connectivity and security
- Troubleshooting remote access VPN configuration and connectivity issues

Experiment 6: Network Performance Monitoring with SNMP(5hr)

- Configuring Simple Network Management Protocol (SNMP) on devices
- Monitoring network performance using SNMP management software
- Collecting and analysing network performance data (bandwidth, CPU, memory usage)
- Troubleshooting performance issues using SNMP monitoring tools.

Experiment 7: Network Traffic Analysis with Packet Capturing(5hr)

- Capturing network traffic using packet capturing tools (Wire shark)
- Analysing captured packets for troubleshooting and security purposes
- Identifying network bottlenecks and abnormal traffic patterns

- Documenting and reporting network traffic analysis findings

Experiment 8: Implementing Quality of Service (QoS)(5hr)

- Configuring QoS mechanisms to prioritize network traffic
- Implementing traffic classification and marking using Differentiated Services Code Point (DSCP)
- Configuring queuing mechanisms (FIFO, WFQ, CBWFQ) for bandwidth management
- Verifying QoS implementation and measuring its impact on network performance

Experiment 9: Traffic Shaping and Policing(5hr)

- Configuring traffic shaping to control network bandwidth usage
- Implementing traffic policing to enforce traffic rate limits
- Testing traffic shaping and policing configurations
- Troubleshooting traffic shaping and policing issues

Experiment 10: Bandwidth Management with Application Control(5hr)

- Implementing application control mechanisms (URL filtering, application-aware firewalls)
- Managing network bandwidth by prioritizing or blocking specific applications
- Verifying application control configurations and their impact on network performance
- Documenting bandwidth management policies and their effectiveness

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Reference:

1. "CCCNA Security (210-260) Portable Command Guide" by Bob Vachon
2. "Cisco ASA Firewall Fundamentals" by Harris Andrea
3. "CCCNA Security 210-260 Official Cert Guide" by Omar Santos and John Stuppi.

CNA 107 Project (30hrs)

The Major Project course shall include a problem statement, market study, finalizing the project, Project work implementation and preparation of Project report.

CERTIFICATE COURSE ON COMPUTER NETWORK ADMINISTRATION (CCNA)

Scheme 2023
1. Question Paper Pattern

Duration of exam : 3 Hrs Maximum Marks.75
Section A : Multiple choice/Fill in the blanks/One Word Type Questions
Section B : Short answer type questions with answer size up to ¼ pages per
            questions
Section C : Descriptive type questions with answer size up to ½ page per question
Section D : Descriptive type questions with answer size up to 1 page per question.

Marks Distribution

Section	No of questions	Need to be answered	Marks/Question	Total
A	10	10	1	10
B	12	10	3	30
C	7	5	5	25
D	2	1	10	10
Total				75

Remarks:

1. Each part should cover questions from each module in the syllabus
2. The level of difficulty shall be i) Challenging Questions: 20%   ii)Easy Questions: 80%.
3. The question paper setters must prepare and submit the question papers as per the following guidelines.

i) Question paper must be designed and prepared to fit in an A4 size paper with one inch margin on all four sides
ii) Prepare the question in MS-Word/Open Libre office-Writer document format. Use only ”Times New   Roman” font size 10 point. Align text to both left and right margins.
iii) Please leave 5cm.free area at the top of the front page of each question paper to place examination details/Question paper header by the examination department.
iv) Avoid placing 1 or 2 questions in the last part in a fresh page, unless it is absolutely necessary. In such case ,try to accommodate above questions in the previous page(s) by adjusting   top/bottom margins and   line spacing, if possible. This will reduce printing expenses.
v) Specify marks for each question/part clearly.
vi) Clearly specify the number of questions to be answered for each part.
vii) Confirm that no questions in Section B is repeated in Section C also
viii) Avoid repeating questions in Section C from the immediate previous examination
ix) Key for evaluation must be prepared and enclosed in a separate cover and should be submitted   along with the question paper set on a separate envelope .Key for evaluation must specify   evaluation guidelines for each part in the question paper, otherwise the key prepared will be treated as Incomplete and will be rejected.
x) Submit Question paper in Laser print out format only. Hand written and printed in poor quality printers is not acceptable.

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CERTIFICATE COURSE ON COMPUTER NETWORK ADMINISTRATION (CCNA)

2. Scheme for Continuous Evaluation.

1.   For Theory Papers :   Weightage

          a)Average of minimum Two test papers   :   30%

          b)Average of minimum Two Assignments: 30%

          c) Score for Class Attendance.   :   20%

          d)Overall performance in the class. :   20%

2.   For Practical Papers :   Weightage

          Average of minimum Two Lab tests :   30%

          Average of minimum Two Lab Assignments   30%

          Score for Lab Attendance.   :   20%

          Overall performance in the Lab.   20%
:

3. Teachers shall submit Mark list for Continuous Evaluation to the Head of Institution in the following format. Subject:

Sl no.	Reg no.	Name	Test	Assignment	Attendance	Performance	Total

4. Head of Institution/Co-ordinator shall forward Continuous evaluation marks to the Examination Department in the following format only.

Centre:

Sl no.	Reg no.	Name	CNA101 25	CNA102 25	CNA 103 25	CNA104 25	CNA105 25	CNA106 25	CNA107 25

5. Continuous evaluation(CE) marks must be published in the notice board at least one week before the commencement of theory examinations after getting approval from the Head of Institution/Co-ordinator.

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Thiruvananthapuram   *Sd/-*
01.09.2023   Director

INSTITUTE OF HUMAN RESOURCES DEVELOPMENT

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RULES AND REGULATIONS FOR THE CERTIFICATE COURSE IN COMPUTER NETWORK ADMINISTRATION (CCNA)
(with effect from Auust 2023)

1. Eligibility for Admission.

The minimum qualification for admission to the course shall be CO&PA, DCA, Data Entry, Plus Two Computer Science Pass, PGDCA, BSc, BCA, Diploma / B.Tech Pass /course completed in Computer, Electronics & Electrical or Final year BSc, BCA, Diploma / B.Tech students of Computer Hardware, Computer Engineering, Electronics & Communication Engineering, Electronics Engineering, Electrical & Electronics Engineering

The candidate should have sufficient computer background. The candidate belongs to SC/ST category and claims educational concession, the upper age limit will be as specified by the Scheduled Caste/ Scheduled Tribes Development Department for awarding educational concession.

1.1 Each training centre will be treated as a separate unit and any request for transfer of training centre will not be normally considered.

2. Duration.

2.1 The **CCNA** course comprises of one semester and shall have maximum 5 months (18 to 20 weeks, including intervening holidays) of academic activities and 1 month for examination (including study leave period of one week). However, the Head of Institutions shall decide the training schedule (ie. No. of days/week, course timing etc.) Suitable for each Training centre, so that academic activities can be completed as per the scheme, within the 5 months period from the date of commencement of semester classes.

2.2 The course will follow semester pattern, with an terminal examination conducted by IHRD. The medium of instruction in all the theory and practical subjects shall be in English.

3. For Terminal Examination.

3.1 The Terminal Examinations will be conducted by the IHRD, immediately after the completion of course. The candidates have to appear for the Terminal examination at the training centre itself and the request for change of exam centre will not be considered. In case, any exam centre is cancelled due to insufficient no. of candidates, candidates of that centre will be re-allotted to the nearest examination centre.

3.2 Candidates who have secured a minimum of 75% of the attendance during the course only are eligible for the registration for Terminal examination. The Head of Institutions are authorized to grant the eligibility to appear for the examination, at his/her discretion, by condonation of the shortage of

attendance up to 10% on valid reasons, on payment of the prescribed condonation fee. Students who have secured less than 65% attendance are not eligible to apply for "Condonation", and will not be allowed to appear for the examination under any circumstances.

3.3 The student, who has secured the minimum required attendance in course and has registered for the regular terminal examination, will be treated as "completed the course". Students who have shortage of attendance, but not condoned, are not eligible for registration to Terminal Examinations. In such case they may seek re-admission to the course.

3.4 The registration of candidates for Terminal examinations will be conducted around mid-semester. The students have to apply for exam. Registration though the Head of Institution in the prescribed format. Photo copies of the application forms can also be used. For Terminal exam registration, a copy of the SSLC certificate also should be attached along with the application for registration.

3.5 A candidate will be allotted a temporary registration for examination on receipt of his application for registration to the Terminal examination during the mid of semester. However, he/she will be eligible for appearing the examination only if he/she secures required minimum attendance at the end of semester. The registration of the candidates who have not secured the minimum attendance stands cancelled automatically and the candidate will have no claim for appearing the examination on the basis of earlier temporary registration.

3.6 A candidate will have up to four consecutive chances for appearing a Terminal examination from their registration to the regular examination. All supplementary exams conducted subsequent to a regular examination will be treated as a chance, irrelevant of the candidate has registered for those exams or not.

3.7 If a candidate wish to register for a supplementary examination beyond permitted maximum chance, they have to obtain a written sanction for a special chance, from the Director, IHRD. The application for sanction of special chance shall be forwarded through the Head of training centre, at least one month before the registration period of next supplementary examination or within the schedule announced. A special sanction for appearing an exam will be granted only if,

a scheduled exam on the same scheme is proposed to conduct in the next exam season and the candidate satisfies all other eligibility conditions. The candidates who gets special sanction to appear for a supplementary exam. Should enter the sanction order details in the application form for registration. They have to remit prescribed fee for special sanction along with the normal exam fees. The special sanction will be issued to students to pass the remaining failed papers in the semester altogether and piece meal appearance will not be permitted. The special sanction once granted is valid only for the supplementary examination mentioned in the order and cannot be utilized for any other subsequent exams.

3.8 The candidates for registration to supplementary examination shall apply through the Head of Training centre in the prescribed form along with the payment of required examination fee. A supplementary candidate is eligible for a valid registration, only if he/she is within the allowed maximum chance for appearing the Terminal examination or a special chance for appearing the Terminal examination is sanctioned by the Director of IHRD.

3.9 If it is later found that, any candidate who is not eligible for registration to

a supplementary examination as per rules, has applied for registration by mistake or covering facts, his/her request for registration will be treated as void and the exam fee remitted shall be refunded by the Head of Training centre subsequently. The candidate has to apply for a refund within two months from the date of remittance; otherwise the amount will be treated as non-refundable. A candidate will have no claim for an exam registration on the basis of exam fee remittance, unless he/she satisfies all eligibility criteria as per rules.

4. Examination rules.

4.1 Candidates who have not secured the minimum attendance during the semester or those who have failed for continuous evaluation marks even for one subject have to repeat the course by paying the prescribed fees.

4.2 The minimum marks required for a pass in each subject will be 50% of maximum marks.(ie, for theory/practical(End Semester Assessment) and continuous evaluation(CE) put together.) However

individual minimum of 40% is required for theory/practical(ESA) and continuous evaluation(CE) of each

4.3 subject, separately. There is no provision for improvement of continuous evaluation (CE) marks, unless the candidate repeats the semester study.

4.4 The students who had failed for Terminal examinations are permitted to register in compartmental or piece meal appearance during supplementary examinations within the permitted maximum chance.

4.5 A candidates is required to complete the course and register for Terminal examination within 24 months from the date of admission. Candidates who are unable to register for terminal regular examination within 24 months from the

date of admission have to repeat the entire course.

4.6 There will be no cancellation or improvement possible for the Terminal examinations.

4.7 A candidate can apply for the revaluation of answer scripts on the following conditions.

i) The application for revaluation of answer scripts shall be submitted in the prescribed format through the head of institution along with the required fee, within 10 days of receipt of mark lists or within 15 days of date of publication of result, whichever is earlier.
ii) The revaluation fee once remitted will not be refunded under any circumstances.
iii) For revaluation, the revised marks will be awarded only if there is a minimum of 10% increase in marks awarded during first valuation.

4.8 The students have the opportunity to point out the mistakes in Name, sex, date of birth etc. given in the hall ticket by making necessary correction in the copy of A-list, at the time of receiving hall tickets. They can also submit a request for correction through the head of training centre, with a copy of the SSLC certificate any time, before the publication of results. These corrections will be made in the examination records free of cost. But, once the mark list/diploma certificate is prepared and forwarded to the training centre for issue, the correction of above details will be made on the following conditions.

a) A request shall be submitted along with the mark list/diploma issued and a copy of the SSLC certificate.

b) Correction fee for Mark list/Diploma certificate should be remitted.

c) Any other mistakes in marks entered in the mark list will be corrected at free of cost.

4.9 i) Those who pass the Terminal examination in the first chance securing an aggregate of 75% or more marksputtogetherwillbedeclaredtohavepassedthecoursein"FirstClasswith Distinction".

ii) Those who pass the Terminal examination in the first chance securing an aggregate of 60% or more marks put together will be declared to have passed the course in " First Class".

iii) All other successful candidates will be placed in the "Second Class".

4.10 All successful candidates will be awarded a Diploma by the IHRD.

4.11A provisional certificate will be issued to successful students, if applied within 6 months from the date of publication of results. Application in the prescribed format duly recommended by the head of training centre should be submitted to the Director IHRD, along with the prescribed fees and proof of Identity. The provisional certificate once issued, will be valid for 6 months from the date of issue or till the Original certificates are issued, whichever is earlier.

5. Other rules :

5.1 The Fees once paid is non-refundable under any circumstances, unless stated otherwise.

5.2 Any request to the Director, IHRD, related to the course/exam matters shall be submitted through the head of training centre only.

5.3 The original mark lists will be issued to the candidates on production of relevant hall tickets only.

5.4 If hall ticket is lost, candidates have to produce SSLC certificate and any photo identity card issued by a Govt. agency/Aadhaar card, as a proof of identity. Mark lists for semester examinations can also be collected though authorized person by producing documents mentioned above and an authorization letter duly signed by the candidate.

5.5 Diploma certificates should be collected directly by the candidate only, by surrendering the ID card issued during admission. If ID card is lost, a candidate has to submit an application for issue of Diploma Certificate along with any Photo ID card issued by a Govt. agency (or Aadhaar card). In case, the candidate is unable to collect the Diploma certificate in person, he/she can request to the head of training Institution to issue it through registered post. For this purpose, candidate has to submit an application to the head of training centre, along with the ID card, necessary clothed envelope and sufficient postage stamps.   The head of training centre or IHRD will not be responsible for any loss or damage of certificate send through the Post as per the request of the candidate.

5.6 If the original mark list/Diploma certificate is lost or damaged due to unfortunate reasons, the candidate can apply for the duplicate mark list/Diploma certificate on the following conditions.

i) Application for duplicate certificate must be in the prescribed form and should be routed through the head of the training Institution, along with the prescribed fee.

ii) If the certificate/mark list is lost due to fire/flood or accident, the remnants, if any, should be produced along with the application.
iii) If remnants is not available, a certificate showing that the original mark list/certificate has been irrecoverably lost due to fire/flood/natural calamities from a judicial officer, not below the rank of a stipendiary Magistrate/ notary public, should be produced along with the application.
iv) If the certificate/mark list was lost due to theft/burglary the date and time of such incident and certificate as stated (iii) above should be produced along with the application.

v) If the certificate/mark list was lost under any other circumstances, a report showing the circumstances and a certificate as mentioned in (iii) above should be produced along with the application.

5.7 If a candidate submits an application for not-joining the course within 7 days of admission and has not attended any of the theory/practical classes, is eligible for a refund of 75% of the tuition fee paid at the time of admission. All other fees paid at the time of admission other than caution deposit is non-refundable.

5.8 A mercy chance examination shall be conducted for old scheme at appropriate time, if sufficient candidates have requested for the same and also as per the discretion of the Director, IHRD.

5.9 The request for forwarding official transcript should be directly send to the Director, IHRD with the following details.
vi) Copies of all mark lists & Diploma certificate.
vii) Prescribed fee by way of Demand Draft drawn in favour of Director, IHRD, Thiruvananthapuram, Kerala, payable at Thiruvananthapuram.
viii) The complete postal address with PIN/ZIP code, state, country etc. of the addressee to whom the transcript & documents to be sent.
   The fee for official transcript is non-refundable and the Director, IHRD will not be responsible for any loss/ damage of transcript/documents sent through the post.
   5.10   The Director, IHRD, is vested with the power to amend/interpret the above rules at any time and his decision shall be final.

Thiruvananthapuram   *Sd/-*
                                                                       Director

<div align="center">

Annexure-I

**Fee details for Certificate Course in
Computer Network Administration(CNA) Course**
(with effect from July 2023)

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The rate of fee details mentioned in the Rules and Regulations for the CNA course is as follows.

The fee once paid is non-refundable unless stated otherwise.

Sl.	Particulars	Fees (Rs.)

1	Fee to be paid at the time of admission to first semester.
	     a. Admission fee
	     b Tuition fee
	     c. Exam. Fee
	     d. Caution Deposit (*refundable*)
		Rs.300/- +GST
		 Rs.12,000/-+GST
		 Rs.750/-+GST
		 Rs.500/-

2	Fee to be paid a) at the time of admission b) During 3rd month of admission	Rs.7,550/-+GST applicable Rs.6,000/-+GST
3	Fee for issuing duplicate ID-cards	Rs.50/-+GST
4	Fee for condonation of shortage of attendance	Rs.1000/-+GST
5	a) Exam. Fee for all papers of Regular/Supplementary examination. b) Exam.Fee for supplementary examination	Rs.750/-+GST Rs.200/-+GST per paper subject to a maximum of Rs.750/- +GST for all subjects.
6	Re-registration fee for the candidate re-admitted to second semester	Rs.300/-+GST
7	a) Special sanction Fee for first time b) Special sanction Fee for subsequent chance c) Fee for mercy chance exam., if conducted	Rs.750/- +GST (+ normal exam. fee.) Rs.1,500/-+GST(+normal exam.fee.) Rs.1,500/-+GST (+normal exam.fee.)
8	Fee for re-valuation of answer scripts	Rs.300/-+GST per script
9	Fee for issuing Provisional Diploma certificate	Rs.300/-+GST
10	Fee for issuing duplicate MarkList/ Diploma Certificate	Rs.300/-+GST per document.
11	Fee for issuing corrected MarkList/Diploma certificate	Rs.300/-+GST per document.
12	Fee for issuing official transcript	Rs.750/-+GST for delivery within India Rs. 2,000/-+GST for delivery outside India

Note: A copy of the rules & regulations shall be displayed in the notice board at the time of admission to the course and a copy of the same duly signed by all the students admitted shall be kept at the training centres.

Thiruvananthapuram   *Sd/-*

         01.09.2023   Director