

معاونت پژوهش، برنامه‌ریزی و سنجش مهارت

دفتر پژوهش، طرح و برنامه‌ریزی درسی

استاندارد آموزش شغل

Cisco Certified Entry Networking Technician(CCENT)Routing And Switching

گروه شغلی

فناوری اطلاعات

کد ملی آموزش شغل

| | | | | | | | | | | | | | | |
|---------|---|---|---|--------------|------------|---|---|-----------|---|---|------------------|---|---|------|
| ۲ | ۵ | ۲ | ۳ | ۴ | ۰ | ۵ | ۳ | ۱ | ۹ | ۱ | ۰ | ۰ | ۰ | ۱ |
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Ministry of cooperatives
Labour and Social Welfare



Iran Technical and Vocational
Training Organization

Deputy of training
Plan and curriculums office

Job Training standard

Title

**Cisco Certified Entry Networking Technician (CCENT)
Routing And Switching**

Occupational group

Information Technology (IT)

International code

2523-53-140-1

Date of standard compilation: : 2015/10/13

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National code: 2523-53-140-1

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Revision Process:

- Scientific content
- According to market
- Equipment
- Tools

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| | Name & Family name | Academic document | field | Job & post | Relevant experiences | Add & Tel & Email |
|---|--------------------|-------------------|----------------------|---------------------------------------|--|---|
| 1 | Ashkan Eghdami | B. SC | Computer engineer | Technical Manager | Instaling and Configuring Window Server 2012 R2 Installing and Configuring Cisco Equipments | Post Box NO : 7917765814 , Bandarabbass , Iran |
| 2 | Amir BalAfkan | B.SC | Electronics Engineer | Trainer | 12 Years | Post Box NO : 7916853689, Bandarabbass , Iran |
| 3 | Eisa Naderi | B.S | Computer Engineer | Trainer | 11 Years | Post Box NO : 7916853689 , Bandarabbass , Iran |
| 4 | Mahyar TajDini | B.SC | Network Engineer | Network Security Consultant / Auditor | Hormozgan Petro Gas Co / Satrap Net Rasha / Hormozgan TVTO | Post Box NO : 791454334 , Bandarabbass , Iran |
| 5 | Asma Karimi | B.S | Electronics Engineer | Trainer | 9 Years | Post Box NO : 7916853689, Bandarabbass , Iran |

Definitions:

Job standard:

The characteristics ' required competencies and abilities for Efficient Performance in work environment is called "the Job standard", and sometimes “The Occupational standard”

Training standard:

The Training Map for achieving the Job’s subset Competencies.

Job title:

Is a set of Tasks and Abilities which is expected from an employed person in the defined level

Job description:

A statement covering the most important elements of a job, namely the position or title of the job, the duties, job’s relation with other jobs in a occupational field, the responsibilities, workplace conditions and required performance standards.

Course duration:

The minimum of time which is required to achieve the training objects.

Admission requirements:

The minimum of competencies and abilities which are obligatory for a potential admission.

Evaluation:

The process of collecting evidence and judgment about whether a competency is achieved or not. Include: written examination, practical examination

Required Qualifications for Trainers:

The minimum of Trainer’s technical and vocational abilities which the trainer is required to have.

Competency:

The ability of efficiently performing a duty in a variety of workplaces conditions

Knowledge:

The minimum set of facts and mental capacities which is necessary for achieving a competency. This can include science, (Mathematics, physics, chemistry or biology), technology or technical.

Skill:

The minimum coordination between mind and body for achieving an ability or competency. It normally applied to practical skills.

Attitude:

A set of emotional behaviors required for achieving a competency and can have non-technical skills and occupational ethics.

Safety:

The cases which doing or not doing something can cause harm or accident

Environmental Consideration:

A set of consideration about the act which should be done to minimize the environmental damage or pollution.

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| job/competency title: |
| Cisco Certified Entry Networking Technician (ICND1 Routing And Switching) |
| Job/competency description: |
| Cisco Certified Entry Networking Technician (CCENT) validates the ability to install, operate and troubleshoot a small enterprise branch network, including basic network security. With a CCENT, a network professional demonstrates the skills required for entry-level network support positions - the starting point for many successful careers in networking. The curriculum covers networking fundamentals, WAN technologies, basic security and wireless concepts, routing and switching fundamentals, and configuring simple networks. CCENT is the first step toward achieving CCNA, which covers medium-size enterprise branch networks with more complex connections. |
| admission requirements: |
| minimum degree of education: Post first year of high school |
| minimum physical and mental ability: |
| prerequisite skills: CompTIA network+ certification |
| Course duration: |
| <i>Course duration : 180 hours</i> <i>-Theoretical: 60 Hours</i> <i>-Practical: 120 Hours</i> <i>-Apprenticeship: ... Hours</i> <i>-Project: ... Hours</i> |
| Evaluation : (%) |
| Written:25% Practical:65% Work ethics:10% |
| Required Qualifications for Trainers: |
| CISCO CCNA degree holders with 2 years experiences |

job/competency training standard
competencies /tasks

| | Title |
|----|---|
| 1 | The TCP/IP and OSI Networking Models |
| 2 | Fundamentals of Ethernet LANs |
| 3 | Fundamentals of WANs |
| 4 | Fundamentals of IPv4 Addressing and Routing |
| 5 | Fundamentals of TCP/IP Transport and Applications |
| 6 | Building Ethernet LANs with Switches |
| 7 | Installing and Operating Cisco LAN Switches |
| 8 | Configuring Ethernet Switching |
| 9 | Implementing Ethernet Virtual LANs |
| 10 | Troubleshooting Ethernet LANs |
| 11 | Perspectives on IPv4 Subnetting |
| 12 | Analyzing Classful IPv4 Networks |
| 13 | Analyzing Subnet Masks |
| 14 | Analyzing Existing Subnets |
| 15 | Operating Cisco Routers |
| 16 | Configuring IPv4 Addresses and Routes |
| 17 | Learning IPv4 Routes with OSPFv2 |
| 18 | Configuring and Verifying Host Connectivity |
| 19 | Subnet Design |
| 20 | Variable-Length Subnet Masks |
| 21 | Route Summarization |
| 22 | Basic IPv4 Access Control Lists |
| 23 | Advanced IPv4 ACLs and Device Security |
| 24 | Network Address Translation |
| 25 | Fundamentals of IP Version 6 |
| 26 | IPv6 Addressing and Subnetting |
| 27 | Implementing IPv6 Addressing on Routers |
| 28 | Implementing IPv6 Addressing on Hosts |
| 29 | Implementing IPv6 Routing |

| Title: The TCP/IP and OSI Networking Models | time | | | |
|---|------------------------------|-----------|-------|-------------------------------------|
| | theoretical | practical | total | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Knowledge and Skill : | Determined by the instructor | | | From Cisco |
| TCP/IP Networking Model | | | | |
| TCP/IP Application Layer | | | | |
| HTTP Protocol Mechanisms | | | | |
| TCP/IP Transport Layer | | | | |
| TCP Error Recovery Basics | | | | |
| Same-Layer and Adjacent-Layer Interactions | | | | |
| TCP/IP Network Layer | | | | |
| Internet Protocol | | | | |
| Internet Protocol Addressing Basics | | | | |
| IP Routing Basics | | | | |
| TCP/IP Link Layer (Data Link Plus Physical) | | | | |
| TCP/IP Model and Terminology | | | | |
| Comparing the Original and Modern TCP/IP | | | | |
| Data Encapsulation Terminology | | | | |
| Names of TCP/IP Messages | | | | |
| OSI Networking Model | | | | |
| Comparing OSI and TCP/IP | | | | |
| Describing Protocols by Referencing the OSI Layers | | | | |
| OSI Layers and Their Functions | | | | |
| OSI Layering Concepts and Benefits | | | | |
| OSI Encapsulation Terminology | | | | |
| Attitude: Speed and accuracy in doing the right thing | | | | |
| Health & Safety: Compliance with safety protection in the workplace | | | | |
| Environmental Consideration: Compliance with environmental protection | | | | |

| Title: Fundamentals of Ethernet LANs | time | | | |
|--|------------------------------|-----------|-------|-------------------------------------|
| | theoretical | practical | total | |
| | | | | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Knowledge and Skill : | Determined by the instructor | | | From Cisco |
| Typical SOHO LANs | | | | |
| Typical Enterprise LANs | | | | |
| The Variety of Ethernet Physical Layer Standards | | | | |
| Building Physical Ethernet Networks with UTP | | | | |
| Transmitting Data Using Twisted Pairs | | | | |
| Breaking Down a UTP Ethernet Link | | | | |
| UTP Cabling Pinouts for 10BASE-T and 100BASE-T | | | | |
| Straight-Through Cable Pinout | | | | |
| Crossover Cable Pinout | | | | |
| Choosing the Right Cable Pinouts | | | | |
| UTP Cabling Pinouts for 1000BASE-T | | | | |
| Sending Data in Ethernet Networks | | | | |
| Ethernet Data Link Protocols | | | | |
| Ethernet Addressing | | | | |
| Identifying Network Layer Protocols with the Ethernet Type Field | | | | |
| Error Detection with FCS | | | | |
| Sending Ethernet Frames with Switches and Hubs | | | | |
| Sending in Modern Ethernet LANs Using Full-Duplex | | | | |
| Using Half-Duplex with LAN Hubs | | | | |
| Attitude: | | | | |
| Speed and accuracy in doing the right thing | | | | |
| Health & Safety: | | | | |
| Compliance with safety protection in the workplace | | | | |

| | time | | | |
|---|------------------------------|-----------|-------|-------------------------------------|
| | theoretical | practical | total | |
| Title: Fundamentals of WANs | | | | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Knowledge and Skill : | Determined by the instructor | | | From Cisco |
| Leased Line WANs | | | | |
| Positioning Leased Lines with LANs and Routers | | | | |
| Physical Details of Leased Lines | | | | |
| Leased Line Cabling | | | | |
| Building a WAN Link in a Lab | | | | |
| Data Link Details of Leased Lines | | | | |
| HDLC Basics | | | | |
| How Routers Use a WAN Data Link | | | | |
| Ethernet as a WAN Technology | | | | |
| Route IP Packets Using Ethernet Emulation | | | | |
| Accessing the Internet | | | | |
| The Internet as a Large WAN | | | | |
| Internet Access (WAN) Links | | | | |
| Digital Subscriber Line | | | | |
| Cable Internet | | | | |
| Attitude: Speed and accuracy in doing the right thing | | | | |
| Health & Safety: Compliance with safety protection in the workplace | | | | |
| Environmental Consideration: Compliance with environmental protection | | | | |

| Title: Fundamentals of IPv4 Addressing and Routing | time | | | |
|--|------------------------------|-----------|-------|--------------------------------------|
| | theoretical | practical | total | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipment's ,tools, materials ,books |
| Knowledge and Skill : Overview of Network Layer Functions Network Layer Routing (Forwarding) Logic Host Forwarding Logic: Send the Packet to the Default Router R1 and R2's Logic: Routing Data Across the Network R3's Logic: Delivering Data to the End Destination How Network Layer Routing Uses LANs and WANs IP Addressing and How Addressing Helps IP Routing Routing Protocols IPv4 Addressing Rules for IP Addresses Rules for Grouping IP Addresses Class A, B, and C IP Networks IP Subnetting IPv4 Routing IPv4 Host Routing Router Forwarding Decisions and the IP Routing Table IPv4 Routing Protocols Other Network Layer Features Using Names and the Domain Name System The Address Resolution Protocol ICMP Echo and the ping Command | Determined by the instructor | | | From Cisco |
| Attitude: Speed and accuracy in doing the right thing | | | | |

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| Health & Safety: | |
| Compliance with safety protection in the workplace | |
| Environmental Consideration: | |
| Compliance with environmental protection | |



*Iran Technical and Vocational
Training Organization*

| Title : Fundamentals of TCP/IP Transport and Applications | time | | | |
|---|------------------------------|-----------|-------|--|
| | theoretical | practical | total | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Knowledge and Skill : | Determined by the instructor | | | From Cisco |
| Transmission Control Protocol | | | | |
| Multiplexing Using TCP Port Numbers | | | | |
| Popular TCP/IP Applications | | | | |
| User Datagram Protocol | | | | |
| TCP/IP Applications | | | | |
| QoS Needs and the Impact of TCP/IP | | | | |
| Applications | | | | |
| Defining Interactive and Batch | | | | |
| Applications | | | | |
| Real-Time Voice and Video Applications | | | | |
| The World Wide Web, HTTP, and SSL | | | | |
| Uniform Resource Locators | | | | |
| Finding the Web Server Using DNS | | | | |
| Transferring Files with HTTP | | | | |
| Attitude: Speed and accuracy in doing the right thing | | | | |
| Health & Safety: Compliance with safety protection in the workplace | | | | |
| Environmental Consideration: Compliance with environmental protection | | | | |

| Title: Building Ethernet LANs with Switches | time | | | |
|---|------------------------------|-----------|-------|-------------------------------------|
| | theoretical | practical | total | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Knowledge and Skill : | Determined by the instructor | | | From Cisco |
| Historical Progression: Hubs, Bridges, and Switches | | | | |
| Switching Logic | | | | |
| The Forward-Versus-Filter Decision | | | | |
| How Switches Learn MAC Addresses | | | | |
| Flooding Frames | | | | |
| Avoiding Loops Using Spanning Tree Protocol | | | | |
| Internal Processing on Cisco Switches | | | | |
| LAN Switching Summary | | | | |
| Design Choices in Ethernet LANs | | | | |
| Collision Domains, Broadcast Domains, and VLANs | | | | |
| Collision Domains | | | | |
| Broadcast Domains | | | | |
| The Impact of Collision and Broadcast Domains on LAN Design | | | | |
| Virtual LANs (VLAN) | | | | |
| Choosing Ethernet Technology for a Campus LAN | | | | |
| Campus Design Terminology | | | | |
| Ethernet LAN Media and Cable Lengths | | | | |
| Autonegotiation | | | | |
| Autonegotiation Results When Only One Node Uses Autonegotiation | | | | |
| Autonegotiation and LAN Hubs | | | | |
| Attitude: Speed and accuracy in doing the right thing | | | | |
| Health & Safety: Compliance with safety protection in the workplace | | | | |
| Environmental Consideration: Compliance with environmental protection | | | | |

| Title Installing and Operating Cisco LAN Switches | time | | | |
|---|------------------------------|-----------|-------|-------------------------------------|
| | theoretical | practical | total | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Knowledge and Skill : | Determined by the instructor | | | From Cisco |
| Switch CLI | | | | |
| Cisco Catalyst Switches and the 2960 Switch | | | | |
| Switch Status from LEDs | | | | |
| Accessing the Cisco IOS CLI | | | | |
| Cabling the Console Connection | | | | |
| Configuring the Terminal Emulator for the Console | | | | |
| Accessing the CLI with Telnet and SSH | | | | |
| Password Security for CLI Access | | | | |
| User and Enable (Privileged) Modes | | | | |
| CLI Help Features | | | | |
| The debug and show Commands | | | | |
| Configuring Cisco IOS Software Configuration Submodes and Contexts | | | | |
| Storing Switch Configuration Files | | | | |
| Copying and Erasing Configuration Files | | | | |
| Initial Configuration (Setup Mode) | | | | |
| IOS Version and Other Reload Facts | | | | |
| Attitude: Speed and accuracy in doing the right thing | | | | |
| Health & Safety: Compliance with safety protection in the workplace | | | | |
| Environmental Consideration: Compliance with environmental protection | | | | |

| Title: Configuring Ethernet Switching | time | | | |
|---|------------------------------|-----------|-------|-------------------------------------|
| | theoretical | practical | total | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Securing the Switch CLI | Determined by the instructor | | | From Cisco |
| Securing Access with Simple Passwords | | | | |
| Securing Access with Local Usernames and Passwords | | | | |
| Securing Access with External Authentication Servers | | | | |
| Configuring Secure Shell (SSH) | | | | |
| Encrypting and Hiding Passwords | | | | |
| Encrypting Passwords with the service password Command | | | | |
| Hiding the Enable Password | | | | |
| Hiding the Passwords for Local Usernames Console and vty Settings | | | | |
| Banners | | | | |
| History Buffer Commands | | | | |
| The logging synchronous and exec-timeout Commands | | | | |
| LAN Switch Configuration and Operation | | | | |
| Enabling IP for Remote Access | | | | |
| Configuring IPv4 on a Switch | | | | |
| Verifying IPv4 on a Switch | | | | |
| Configuring Switch Interfaces | | | | |
| Port Security | | | | |
| Configuring Port Security | | | | |
| Verifying Port Security | | | | |
| Port Security Actions | | | | |
| Securing Unused Switch Interfaces | | | | |
| Attitude: Speed and accuracy in doing the right thing | | | | |
| Health & Safety: Compliance with safety protection in the workplace | | | | |
| Environmental Consideration: Compliance with environmental protection | | | | |

| Title: Implementing Ethernet Virtual LANs | time | | | |
|--|------------------------------|-----------|-------|-------------------------------------|
| | theoretical | practical | total | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Knowledge and Skill : Virtual LAN Concepts Creating Multiswitch VLANs Using Trunking VLAN Tagging Concepts The 802.1Q and ISL VLAN Trunking Protocols Forwarding Data Between VLANs Routing Packets Between VLANs with a Router Routing Packets with a Layer 3 Switch VLAN and VLAN Trunking Configuration and Verification Creating VLANs and Assigning Access VLANs to an Interface VLAN Trunking Protocol (VTP) VLAN Trunking Configuration Controlling Which VLANs Can Be Supported on a Trunk | Determined by the instructor | | | From Cisco |
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| Attitude: Speed and accuracy in doing the right thing | | | | |
| Health & Safety: Compliance with safety protection in the workplace | | | | |
| Environmental Consideration: Compliance with environmental protection | | | | |

| Title: Troubleshooting Ethernet LANs | time | | | |
|---|------------------------------|-----------|-------|-------------------------------------|
| | theoretical | practical | total | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Troubleshooting Process | Determined by the instructor | | | From Cisco |
| Analyzing LAN Topology Using Cisco Discovery Protocol | | | | |
| Examining Information Learned by CDP | | | | |
| Examining the Status of the CDP Protocols | | | | |
| Analyzing Switch Interface Status | | | | |
| Interface Status Codes and Reasons for Nonworking States | | | | |
| Interface Speed and Duplex Issues | | | | |
| Common Layer 1 Problems on Working Interfaces | | | | |
| Predicting Where Switches Will Forward Frames | | | | |
| Predicting the Contents of the MAC Address Table | | | | |
| Analyzing the Forwarding Path | | | | |
| Port Security and Filtering | | | | |
| Analyzing VLANs and VLAN Trunks | | | | |
| Ensuring That the Right Access Interfaces Are in the Right VLANs | | | | |
| Access VLANs Not Being Defined | | | | |
| Access VLANs Being Disabled | | | | |
| Check the Allowed VLAN List on Both Ends of a Trunk | | | | |
| Mismatched Trunking Operational States | | | | |
| Attitude: Speed and accuracy in doing the right thing | | | | |
| Health & Safety: Compliance with safety protection in the workplace | | | | |
| Environmental Consideration: Compliance with environmental protection | | | | |

| Title: Perspectives on IPv4 Subnetting | time | | | |
|--|------------------------------|-----------|-------|-------------------------------------|
| | theoretical | practical | total | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Knowledge and Skill : Operational View Versus Design View of Subnetting Analyze Subnetting and Addressing Needs Determining the Number of Subnets Determining the Number of Hosts per Subnet Defining the Size of a Subnet Multiple Subnet Sizes (Variable-Length Subnet Masks) Make Design Choices Choose a Classful Network Public IP Networks Growth Exhausts the Public IP Address Space Private IP Networks Choosing an IP Network During the Design Phase Choose the Mask Classful IP Networks Before Subnetting Borrowing Host Bits to Create Subnet Bits Choosing Enough Subnet and Host Bits Masks and Mask Formats Build a List of All Subnets | Determined by the instructor | | | From Cisco |
| Attitude: Speed and accuracy in doing the right thing | | | | |
| Health & Safety: Compliance with safety protection in the workplace | | | | |
| Environmental Consideration: Compliance with environmental protection | | | | |

| Title: Analyzing Classful IPv4 Networks | time | | | |
|---|------------------------------|-----------|-------|-------------------------------------|
| | theoretical | practical | total | |
| | | | | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Knowledge and Skill : | Determined by the instructor | | | From Cisco |
| Classful Network Concepts | | | | |
| IPv4 Network Classes and Related Facts | | | | |
| Actual Class A, B, and C Networks | | | | |
| Address Formats | | | | |
| Default Masks | | | | |
| Number of Hosts per Network | | | | |
| Deriving the Network ID and Related Numbers | | | | |
| Unusual Network IDs and Network Broadcast Addresses | | | | |
| Practice with Classful Networks | | | | |
| Practice Deriving Key Facts Based on an IP Address | | | | |
| Practice Remembering the Details of Address Classes | | | | |
| Attitude: Speed and accuracy in doing the right thing | | | | |
| Health & Safety: Compliance with safety protection in the workplace | | | | |
| Environmental Consideration: Compliance with environmental protection | | | | |

| Title: Analyzing Subnet Masks | time | | | |
|---|------------------------------|-----------|-------|-------------------------------------|
| | theoretical | practical | total | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Knowledge and Skill : Subnet Mask Conversion Three Mask Formats Converting Between Binary and Prefix Masks Converting Between Binary and DDN Masks Converting Between Prefix and DDN Masks Identifying Subnet Design Choices Using Masks Masks Divide the Subnet's Addresses into Two Parts Masks and Class Divide Addresses into Three Parts Classless and Classful Addressing Calculations Based on the IPv4 Address Format | Determined by the instructor | | | From Cisco |
| Attitude: Speed and accuracy in doing the right thing | | | | |
| Health & Safety: Compliance with safety protection in the workplace | | | | |
| Environmental Consideration: Compliance with environmental protection | | | | |

| Title: Analyzing Existing Subnets | time | | | |
|--|------------------------------|-----------|-------|-------------------------------------|
| | theoretical | practical | total | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Knowledge and Skill : Subnet ID Concepts Subnet Broadcast Address Range of Usable Addresses Analyzing Existing Subnets: Binary Finding the Subnet ID: Binary Finding the Subnet Broadcast Address: Binary Binary Practice Problems Shortcut for the Binary Process Brief Note About Boolean Math Finding the Range of Addresses Analyzing Existing Subnets: Decimal Analysis with Easy Masks Predictability in the Interesting Octet Finding the Subnet ID: Difficult Masks Finding the Subnet Broadcast Address: Difficult Masks | Determined by the instructor | | | From Cisco |
| Attitude: Speed and accuracy in doing the right thing | | | | |
| Health & Safety: Compliance with safety protection in the workplace | | | | |
| Environmental Consideration: Compliance with environmental protection | | | | |

| Title: Operating Cisco Routers | time | | | |
|---|------------------------------|-----------|-------|-------------------------------------|
| | theoretical | practical | total | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Knowledge and Skill : | Determined by the instructor | | | From Cisco |
| Installing Enterprise Routers | | | | |
| Cisco Integrated Services Routers | | | | |
| Physical Installation | | | | |
| Installing Internet Access Routers | | | | |
| A SOHO Installation with a Separate Switch, Router, and Cable Modem | | | | |
| A SOHO Installation with an Integrated Switch, Router, and DSL Modem | | | | |
| Enabling IPv4 Support on Cisco Routers | | | | |
| Comparisons Between the Switch CLI and Router CLI | | | | |
| Router Interfaces | | | | |
| Interface Status Codes | | | | |
| Router Interface IP Addresses | | | | |
| Bandwidth and Clock Rate on Serial Interfaces | | | | |
| Router Auxiliary (Aux) Port | | | | |
| Operational Status with the show version Command | | | | |
| Attitude: Speed and accuracy in doing the right thing | | | | |
| Health & Safety: Compliance with safety protection in the workplace | | | | |
| Environmental Consideration: Compliance with environmental protection | | | | |

| Title: Configuring IPv4 Addresses and Routes | time | | | |
|---|------------------------------|-----------|-------|-------------------------------------|
| | theoretical | practical | total | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Knowledge and Skill : | Determined by the instructor | | | From Cisco |
| Routing | | | | |
| Potential Routing Performance Issues | | | | |
| Cisco Router Fast Switching and CEF | | | | |
| Configuring Connected Routes | | | | |
| Connected Routes and the ip address Command | | | | |
| Routing Between Subnets on VLANs | | | | |
| Configuring Routing to VLANs using 802.1Q on Routers | | | | |
| Configuring Routing to VLANs Using a Layer 3 Switch | | | | |
| Secondary IP Addressing | | | | |
| Supporting Connected Routes to Subnet Zero | | | | |
| Configuring Static Routes | | | | |
| Static Route Configuration | | | | |
| Static Default Routes | | | | |
| Attitude: Speed and accuracy in doing the right thing | | | | |
| Health & Safety: Compliance with safety protection in the workplace | | | | |
| Environmental Consideration: Compliance with environmental protection | | | | |

| Title: Learning IPv4 Routes with OSPFv2 | time | | | |
|---|------------------------------|-----------|-------|-------------------------------------|
| | theoretical | practical | total | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Comparing Dynamic Routing Protocol Features | Determined by the instructor | | | From Cisco |
| Routing Protocol Functions | | | | |
| Interior and Exterior Routing Protocols | | | | |
| Comparing IGPs | | | | |
| IGP Routing Protocol Algorithms | | | | |
| Metrics | | | | |
| Other IGP Comparisons | | | | |
| Administrative Distance | | | | |
| Understanding the OSPF Link-State Routing Protocol | | | | |
| Building the LSDB and Creating IP Routes | | | | |
| Topology Information and LSAs | | | | |
| Applying Dijkstra SPF Math to Find the Best Routes | | | | |
| Using OSPF Neighbor Relationships | | | | |
| The Basics of OSPF Neighbors | | | | |
| Meeting Neighbors and Learning Their Router ID | | | | |
| Scaling OSPF Through Hierarchical Design | | | | |
| OSPF Configuration | | | | |
| OSPF Single-Area Configuration | | | | |
| Matching with the OSPF network Command | | | | |
| Verifying OSPF | | | | |
| Configuring the OSPF Router ID | | | | |
| Miscellaneous OSPF Configuration Settings | | | | |
| OSPF Passive Interfaces | | | | |
| OSPF Default Routes | | | | |
| Attitude: Speed and accuracy in doing the right thing | | | | |
| Health & Safety: Compliance with safety protection in the workplace | | | | |
| Environmental Consideration: Compliance with environmental protection | | | | |

| Title: Configuring and Verifying Host Connectivity | time | | | |
|---|------------------------------|-----------|-------|-------------------------------------|
| | theoretical | practical | total | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Knowledge and Skill : Configuring Routers to Support DHCP DHCP Protocol Messages and Addresses Supporting DHCP for Remote Subnets with DHCP Relay Information Stored at the DHCP Server DHCP Server Configuration and Verification on Routers IOS DHCP Server Configuration IOS DHCP Server Verification Detecting Conflicts with Offered Versus Used Addresses Verifying Host IPv4 Settings IP Address and Mask Configuration Name Resolution with DNS Default Routers Testing Connectivity with ping, traceroute, and telnet The ping Command Testing IP Routes with ping on a Router Controlling the Source IP Address with Extended ping The traceroute Command How the traceroute Command Works traceroute and Similar Commands Telnet and Suspend | Determined by the instructor | | | From Cisco |
| Attitude: Speed and accuracy in doing the right thing | | | | |
| Health & Safety: Compliance with safety protection in the workplace | | | | |
| Environmental Consideration: Compliance with environmental protection | | | | |

| Title: Subnet Design | time | | | |
|---|------------------------------|-----------|-------|-------------------------------------|
| | theoretical | practical | total | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Finding All the Masks: Concepts | Determined by the instructor | | | From Cisco |
| Finding All the Masks: Math | | | | |
| The Formal Process | | | | |
| Finding All Subnet IDs | | | | |
| First Subnet ID: The Zero Subnet | | | | |
| Finding the Pattern Using the Magic Number | | | | |
| A Formal Process with Less Than 8 Subnet Bits | | | | |
| Finding All Subnets with Exactly 8 Subnet Bits | | | | |
| Finding All Subnets with More Than 8 Subnet Bits | | | | |
| Process with 9–16 Subnet Bits | | | | |
| Process with 17 or More Subnet Bits | | | | |
| Finding All Subnet IDs | | | | |
| Problems for Finding All Subnet IDs | | | | |
| Additional Practice for Finding All Subnet IDs | | | | |
| Attitude: Speed and accuracy in doing the right thing | | | | |
| Health & Safety: Compliance with safety protection in the workplace | | | | |
| Environmental Consideration: Compliance with environmental protection | | | | |

| Title: Variable-Length Subnet Masks | time | | | |
|--|------------------------------|-----------|-------|--|
| | theoretical | practical | total | |
| | | | | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Knowledge and Skill : VLSM Concepts and Configuration Classless and Classful Routing Protocols VLSM Configuration and Verification Finding VLSM Overlaps Adding a New Subnet to an Existing VLSM Design Adding New VLSM Subnets | Determined by the instructor | | | From Cisco |
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| Attitude: Speed and accuracy in doing the right thing | | | | |
| Health & Safety: Compliance with safety protection in the workplace | | | | |
| Environmental Consideration: Compliance with environmental protection | | | | |

*From Technical and Vocational
Training Organization*

| Title: Route Summarization | time | | | |
|---|------------------------------|-----------|-------|-------------------------------------|
| | theoretical | practical | total | |
| | | | | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Knowledge and Skill : | Determined by the instructor | | | From Cisco |
| Manual Route Summarization Concepts | | | | |
| Route Summarization Basics | | | | |
| Route Summarization and the IPv4 Subnetting Plan | | | | |
| Verifying Manually Summarized Routes | | | | |
| Choosing the Best Summary Routes | | | | |
| The Process to Find the Best Summary Route | | | | |
| | | | | |
| | | | | |
| | | | | |
| Attitude: Speed and accuracy in doing the right thing | | | | |
| Health & Safety: Compliance with safety protection in the workplace | | | | |
| Environmental Consideration: Compliance with environmental protection | | | | |

Iran Technical and Vocational Training Organization

| Title: Basic IPv4 Access Control Lists | time | | | |
|--|------------------------------|-----------|-------|-------------------------------------|
| | theoretical | practical | total | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Knowledge and Skill : IPv4 Access Control List Basics ACL Location and Direction Matching Packets Standard Numbered IPv4 ACLs List Logic with IP ACLs Matching Logic and Command Syntax Matching the Exact IP Address Matching a Subset of the Address with Wildcards Binary Wildcard Masks Finding the Right Wildcard Mask to Match a Subnet Matching Any/All Addresses Implementing Standard IP ACLs Troubleshooting and Verification Tips Practice Applying Standard IP ACLs Practice Building access-list Commands Reverse Engineering from ACL to Address Range | Determined by the instructor | | | From Cisco |
| Attitude: | | | | |
| Speed and accuracy in doing the right thing | | | | |
| Health & Safety: | | | | |
| Compliance with safety protection in the workplace | | | | |
| Environmental Consideration: | | | | |
| Compliance with environmental protection | | | | |

| Title: Advanced IPv4 ACLs and Device Security | time | | | |
|---|------------------------------|-----------|-------|-------------------------------------|
| | theoretical | practical | total | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Knowledge and Skill : | Determined by the instructor | | | From Cisco |
| Extended Numbered IP Access Control Lists | | | | |
| Matching the Protocol, Source IP, and Destination IP | | | | |
| Matching TCP and UDP Port Numbers | | | | |
| Extended IP ACL Configuration | | | | |
| Building access-list Commands | | | | |
| Named ACLs and ACL Editing | | | | |
| Named IP Access Lists | | | | |
| Editing ACLs Using Sequence Numbers | | | | |
| Numbered ACL Configuration Versus Named ACL Configuration | | | | |
| Router and Switch Security | | | | |
| Controlling Telnet and SSH Access with ACLs | | | | |
| ACL Implementation Considerations | | | | |
| Network Time Protocol | | | | |
| Attitude: Speed and accuracy in doing the right thing | | | | |
| Health & Safety: Compliance with safety protection in the workplace | | | | |
| Environmental Consideration: Compliance with environmental protection | | | | |

| Title: Network Address Translation | time | | | |
|---|------------------------------|-----------|-------|-------------------------------------|
| | theoretical | practical | total | |
| | | | | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Knowledge and Skill : | Determined by the instructor | | | From Cisco |
| IPv4 Address Scalability | | | | |
| CIDR | | | | |
| Route Aggregation for Shorter Routing Tables | | | | |
| IPv4 Address Conservation | | | | |
| Private Addressing | | | | |
| Network Address Translation Concepts | | | | |
| Static NAT | | | | |
| Dynamic NAT | | | | |
| Overloading NAT with Port Address Translation (PAT) | | | | |
| NAT Overload (PAT) on Consumer Routers | | | | |
| NAT Configuration and Troubleshooting | | | | |
| Static NAT Configuration | | | | |
| Dynamic NAT Configuration | | | | |
| Dynamic NAT Verification | | | | |
| NAT Overload (PAT) Configuration | | | | |
| NAT Troubleshooting | | | | |
| Attitude: Speed and accuracy in doing the right thing | | | | |
| Health & Safety: Compliance with safety protection in the workplace | | | | |
| Environmental Consideration: Compliance with environmental protection | | | | |

| Title: Fundamentals of IP Version 6 | time | | | |
|--|------------------------------|-----------|-------|-------------------------------------|
| | theoretical | practical | total | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Knowledge and Skill : The Historical Reasons for IPv6 The IPv6 Protocols IPv6 Routing IPv6 Routing Protocols IPv6 Addressing Formats and Conventions Representing Full (Unabbreviated) IPv6 Addresses Abbreviating and Expanding IPv6 Addresses Abbreviating IPv6 Addresses Expanding Abbreviated IPv6 Addresses Representing the Prefix Length of an Address Calculating the IPv6 Prefix (Subnet ID) Finding the IPv6 Prefix Working with More Difficult IPv6 Prefix Lengths | Determined by the instructor | | | From Cisco |
| Attitude: | | | | |
| Speed and accuracy in doing the right thing | | | | |
| Health & Safety: | | | | |
| Compliance with safety protection in the workplace | | | | |
| Environmental Consideration: | | | | |
| Compliance with environmental protection | | | | |

| Title: IPv6 Addressing and Subnetting | time | | | |
|---|------------------------------|-----------|-------|-------------------------------------|
| | theoretical | practical | total | |
| | | | | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Knowledge and Skill : | Determined by the instructor | | | From Cisco |
| Global Unicast Addressing Concepts | | | | |
| Public IPv4 Addressing Concepts | | | | |
| Private IPv4 Addressing Concepts | | | | |
| Public and Private IPv6 Addresses | | | | |
| The IPv6 Global Routing Prefix | | | | |
| Address Ranges for Global Unicast Addresses | | | | |
| IPv6 Subnetting Using Global Unicast Addresses | | | | |
| The Mechanics of Subnetting IPv6 Global Unicast Addresses | | | | |
| Listing the IPv6 Subnet Identifier | | | | |
| List All IPv6 Subnets | | | | |
| Assign Subnets to the Internetwork Topology | | | | |
| Assigning Addresses to Hosts in a Subnet | | | | |
| Unique Local Unicast Addresses | | | | |
| Subnetting with Unique Local IPv6 Addresses | | | | |
| The Need for Globally Unique Local Addresses | | | | |
| Attitude: | | | | |
| Speed and accuracy in doing the right thing | | | | |
| Health & Safety: | | | | |
| Compliance with safety protection in the workplace | | | | |
| Environmental Consideration: | | | | |
| Compliance with environmental protection | | | | |

| Title: Implementing IPv6 Addressing on Routers | time | | | |
|---|------------------------------|-----------|-------|-------------------------------------|
| | theoretical | practical | total | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Knowledge and Skill : | Determined by the instructor | | | From Cisco |
| Implementing Unicast IPv6 Addresses on Routers | | | | |
| Static Unicast Address Configuration | | | | |
| Configuring the Full 128-Bit Address | | | | |
| Enabling IPv6 Routing | | | | |
| Verifying the IPv6 Address Configuration | | | | |
| Generating a Unique Interface ID Using EUI-64 | | | | |
| Dynamic Unicast Address Configuration | | | | |
| Special Addresses Used by Routers | | | | |
| Link-Local Addresses | | | | |
| Link-Local Address Concepts | | | | |
| Creating Link-Local Addresses on Routers | | | | |
| IPv6 Multicast Addresses | | | | |
| Broadcasts Versus Multicasts | | | | |
| Common Local Scope Multicast Addresses | | | | |
| Solicited-Node Multicast Addresses | | | | |
| Miscellaneous IPv6 Addresses | | | | |
| Attitude: Speed and accuracy in doing the right thing | | | | |
| Health & Safety: Compliance with safety protection in the workplace | | | | |
| Environmental Consideration: Compliance with environmental protection | | | | |

| Title: Implementing IPv6 Addressing on Hosts | time | | | |
|--|------------------------------|-----------|-------|-------------------------------------|
| | theoretical | practical | total | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Knowledge and Skill : The Neighbor Discovery Protocol Discovering Routers with NDP RS and RA Discovering Addressing Info for SLAAC with NDP RS and RA Discovering Neighbor Link Addresses with NDP NS and NA Discovering Duplicate Addresses Using NDP NS and NA NDP Summary Dynamic Configuration of Host IPv6 Settings Dynamic Configuration Using Stateful DHCP and NDP Differences Between DHCPv6 and DHCPv4 DHCPv6 Relay Agents Using Stateless Address Autoconfiguration Building an IPv6 Address Using SLAAC Combining SLAAC with NDP and Stateless DHCP Verification of Host IPv6 Connectivity Verifying Host IPv6 Connectivity from Hosts Verifying Host Connectivity from Nearby Routers | Determined by the instructor | | | From Cisco |
| Attitude: Speed and accuracy in doing the right thing | | | | |
| Health & Safety: Compliance with safety protection in the workplace | | | | |
| Environmental Consideration: Compliance with environmental protection | | | | |

| Title: Implementing IPv6 Routing | time | | | |
|---|------------------------------|-----------|-------|-------------------------------------|
| | theoretical | practical | total | |
| | | | | |
| Knowledge ,skill ,attitude ,safety, Environmental Consideration | | | | Equipments ,tools, materials ,books |
| Knowledge and Skill : | Determined by the instructor | | | From Cisco |
| Connected and Local IPv6 Routes | | | | |
| Rules for Connected and Local Routes | | | | |
| Static IPv6 Routes | | | | |
| Static Routes Using the Outgoing Interface | | | | |
| Static Routes Using Next-Hop IPv6 Address | | | | |
| Static Default Routes | | | | |
| Dynamic Routes with OSPFv3 | | | | |
| Comparing OSPF for IPv4 and IPv6 | | | | |
| OSPF Routing Protocol Versions and Protocols | | | | |
| Comparing OSPFv2 and OSPFv3 | | | | |
| Configuring Single-Area OSPFv3 | | | | |
| OSPFv3 Passive Interfaces | | | | |
| Verifying OSPFv3 Status and Routes | | | | |
| Verifying OSPFv3 Configuration Settings | | | | |
| Verifying OSPFv3 Neighbors | | | | |
| Examining the OSPFv3 Database | | | | |
| Examining IPv6 Routes Learned by OSPFv3 | | | | |
| Attitude: | | | | |
| Speed and accuracy in doing the right thing | | | | |
| Health & Safety: | | | | |
| Compliance with safety protection in the workplace | | | | |
| Environmental Consideration: | | | | |
| Compliance with environmental protection | | | | |

Equipment standard form

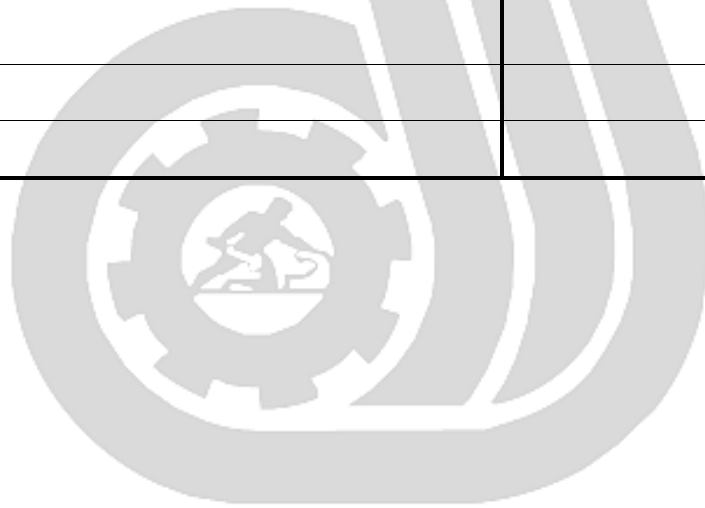
| | Title | Technical specification | Quantity |
|---|--------------------------|---------------------------------|----------|
| 1 | Computer | Ram:2G VGA:Intel CPU:i3 HDD:256 | 7 |
| 2 | Switch | Switch Cisco 2960 & 2950 | 1 |
| 3 | Router | Router Cisco 2911 & 2901 & 2811 | 1 |
| 4 | Console Cable | | 2 |
| 5 | Ethernet Cable | | 2 |
| 6 | Packet Tracer | Last Version | 7 |
| 7 | Video Projector | | 1 |
| 8 | Smart Board & Whiteboard | | 1 |

***Required quantity for each 15 Trainees**

*Iran Technical and Vocational
Training Organization*

Resources (books, site, software...)

| title | author | publication |
|---|---------------------|--------------------|
| CISCO.com | | |
| Packet Tracer Software Boson NetSim Software GNS 3 | | |
| Cisco CCENT ICND1 100-101 | Wendell Odom | Cisco press |
| | | |
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