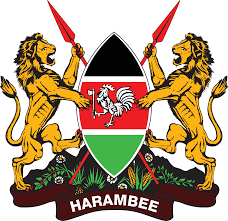
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**REPUBLIC OF KENYA**

**COMPETENCY BASED MODULAR CURRICULUM**

**FOR**

**NETWORK SYSTEM TECHNICIAN**

**KNQF LEVEL 5**

**PROGRAMME CODE: 0612 454A**

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# FOREWORD

The provision of quality education and training is fundamental to the Government’s overall strategy for social and economic development. Quality education and training contribute to the achievement of Kenya’s development blueprint and sustainable development goals.

Reforms in the education sector are necessary to achieve Kenya Vision 2030 and meet the provisions of the Constitution of Kenya 2010. The education sector had to be aligned to the Constitution, and this resulted in the formulation of the Policy Framework for Reforming Education and Training in Kenya (Sessional Paper No. 14 of 2012). A key feature of this policy is the radical change in the design and delivery of TVET training. This policy document requires that training in TVET be competency-based, curriculum development be industry-led, certification be based on demonstration of competence, and the mode of delivery allow for multiple entry and exit in TVET programmes.

These reforms demand that Industry takes a leading role in curriculum development to ensure the curriculum addresses its competence needs. It is against this background that this curriculum has been developed. For trainees to build their skills on foundational hands-on activities of the occupation, units of learning are grouped in modules. This has eliminated duplication of content and streamlined exemptions based on skills acquired as a trainee progresses in the up-skilling process, while at the same time allowing trainees to be employable in the shortest time possible through the acquisition of part qualifications.

It is my conviction that this curriculum will play a great role in developing competent human resources for the ICT Sector’s growth and development.

**PRINCIPAL SECRETARY**

**STATE DEPARTMENT FOR TVET**

**MINISTRY OF EDUCATION**

**PREFACE**

Kenya Vision 2030 aims to transform Kenya into a newly industrializing middle-income country, providing high-quality life to all its citizens by the year 2030. Kenya intends to create globally competitive and adaptive human resource base to meet the requirements of a rapidly industrializing economy through lifelong education and training. TVET has a responsibility to facilitate the process of inculcating knowledge, skills, and worker behaviour necessary for catapulting the nation to a globally competitive country, hence the paradigm shift to embrace Competency-Based Education and Training (CBET).

TVET Act, CAP 210A and Sessional Paper No. 1 of 2019 on Reforming Education and Training in Kenya for Sustainable Development emphasized the need to reform curriculum development, assessment, and certification. This called for a shift to CBET to address the mismatch between skills acquired through training and skills needed by industry, as well as increase the global competitiveness of the Kenyan labour force.

This curriculum has been developed in adherence to the Kenya National Qualifications Framework and CBETA standards and guidelines. The curriculum is designed and organized into Units of Learning with Learning Outcomes, suggested delivery methods, learning resources, and methods of assessing the trainee’s achievement. In addition, the units of learning have been grouped in modules to concretize the skills acquisition process and streamline upskilling.

I am grateful to all expert trainers and everyone who played a role in translating the Occupational Standards into this competency-based modular curriculum.

# ACKNOWLEDGEMENT

This curriculum has been designed for competency-based training and has independent units of learning that allow the trainee flexibility in entry and exit. In developing the curriculum, significant involvement and support were received from expert trainers, institutions and organizations.

I recognize with appreciation the role of the ICT National Sector Skills Committee (NSSC) in ensuring that competencies required by the industry are addressed in the curriculum. I also thank all stakeholders in the ICT sector for their valuable input and everyone who participated in developing this curriculum.

I am convinced that this curriculum will go a long way in ensuring that individuals aspiring to work in the ICT Sector acquire competencies to perform their work more efficiently and effectively.

**COUNCIL SECRETARY/ CEO**

# TABLE OF CONTENTS

[FOREWORD iii](#_Toc197149582)

[ACKNOWLEDGEMENT v](#_Toc197149583)

[TABLE OF CONTENTS vi](#_Toc197149584)

[ABBREVIATION AND ACRONYMS vii](#_Toc197149585)

[COURSE OVERVIEW x](#_Toc197149586)

[MODULE 1 1](#_Toc197149587)

[COMPUTER APPLICATIONS 2](#_Toc197149588)

[COMPUTER NETWORK DESIGN 7](#_Toc197149589)

[COMPUTER REPAIR AND MAINTENANCE 14](#_Toc197149590)

[MODULE 2 20](#_Toc197149591)

[COMPUTER NETWORK SETUP 21](#_Toc197149592)

[COMPUTER NETWORK SOFTWARE INSTALLATION 28](#_Toc197149593)

[MODULE 3 36](#_Toc197149594)

[COMPUTER NETWORK SECURITY CONFIGURATION 37](#_Toc197149595)

[COMPUTER NETWORK MAINTENANCE 45](#_Toc197149596)

[MODULE 4 54](#_Toc197149597)

[COMPUTER NETWORK SECURITY MONITORING 55](#_Toc197149598)

[BASIC ELECTRONICS 64](#_Toc197149599)

[WORK ETHICS AND PRACTICES 71](#_Toc197149600)

# ABBREVIATION AND ACRONYMS

CAD Computer-Aided Design

CCTV Closed Circuit Television

CD Compact Disc

CPU Central Processing Unit

CV Curriculum Vitae

DVD Digital Versatile Disc

DVI Digital Visual Interface

ERP Enterprise Resource Planning

HDMI High-Definition Multimedia Interface

ICT Information Communication Technology

IEEE Institute of Electrical and Electronics Engineers

IP Internet Protocol

KCSE Kenya Certificate of Secondary Education

KNQA Kenya National Qualification Authority

KNQF Kenya National Qualification Framework

LAN Local Area Network

MAC Media Access Control

NOS Network Operating System

POST Power on Self-Test

PRTG Paessler Router Traffic Grapher

RAM Random Access Memory

SFP Small Form-factor Pluggable

SNMP Simple Network Management Protocol

TVET Technical and Vocational Education and Training

TVETA Technical and Vocational Education and Training Authority

URI Uniform Resource Identifier

URL Uniform Resource Locator

USB Universal Serial Bus

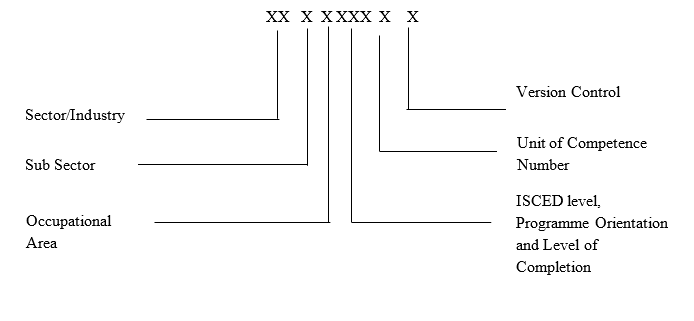
UTP Unshielded Twisted Pair

VGA Video Graphics Array

VLAN Virtual Local Area Network

WAN Wide Area Network

**KEY TO UNIT CODE**



# COURSE OVERVIEW

Network system technology level 5 qualification consists of competencies that a person must achieve to enable him/her to be certified as a network system technician.

A network system technician is a person who can demonstrate knowledge and competence in designing a computer network design, computer network setup, computer network software installation, computer network security configuration, computer network maintenance and computer network security monitoring.

Therefore, a network system technician is a well-trained person who can carry out these responsibilities. These responsibilities comprise the units of competency of a network system technician level 5 which include the following basic, common and core competencies:

**SUMMARY OF UNITS OF COMPETENCY**

**MODULAR UNIT SUMMARY**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **MODULE** | **UNITS** | | | |  |
| **UNIT**  **CATEGORY** | **UNIT CODE** | **UNIT NAME** | **DURATION**  **(Hours)** | **CREDIT FACTORS** |
| **ONE (I)** | **COMMON** | 0611 441 01A | Computer Applications | 90 | 9.0 |
| **CORE** | 0612 451 05A | Computer Network Design | 200 | 20.0 |
| **COMMON** | 0714 451 03A | Computer Repair and Maintenance | 130 | 13.0 |
|  |  | **Total** | **420** | **42.0** |
| **TWO (2)** | **CORE** | 0612 451 06A | Computer Network Setup | 200 | 20.0 |
| **CORE** | 0612 451 07A | Computer Network Software Installation | 200 | 20.0 |
|  |  | **Total** | **400** | **40.0** |
| **THREE (3)** | **CORE** | 0612 451 08A | Computer Network Security Configuration | 210 | 21.0 |
| **CORE** | 0612 451 09A | Computer Network Maintenance | 210 | 21.0 |
|  |  | **Total** | **420** | **42.0** |
| **FOUR (4)** | **CORE** | 0612 451 10A | Computer Network Security Monitoring | 220 | 22.0 |
| **COMMON** | 0714 441 04A | Basic Electronics | 100 | 10.0 |
| **BASIC** | 0417 451 02A | Work Ethics and  Practices | 40 | 4.0 |
|  |  | **TOTAL** | **360** | **36.0** |
|  |  |  | **INDUSTRIAL ATTACHMENT** | **480** | 48.0 |
|  |  |  | **Grand total:** | **2080** | **208.0** |

**Entry Requirements**

An individual entering this course should have any of the following minimum requirements:

1. Kenya Certificate of Secondary Education (KCSE) mean grade D (Plain)

**Or**

1. Any other equivalent qualification determined by TVETA

**Trainer Qualification**

A trainer for any of the units of competency in this course must:

1. Have a minimum a KNQF Level 6 qualification of its equivalent in a trade area related to this course.
2. Be registered by TVETA.

**Industry Training**

An individual enrolled in this course will be required to undergo Industry training for a minimum period of 480 hours in ICT sector. The industrial training may be taken after completion of all units for those pursuing the full qualification or be distributed equally in each unit for those pursuing part qualification. In the case of dual training model, industrial training shall be as guided by the dual training policy.

Assessment

The course will be assessed both in formative and summative as follows:

1. During formative assessment all performance criteria shall be assessed based on performance criteria weighting.
2. Number of formative assessments shall minimally be equal to the number of elements in a unit of competency.
3. During summative assessment basic and common units may be integrated in the core units or assessed as discrete units.
4. Theoretical and practical weighting for each unit of learning shall be as follows;
5. 30:70 for units in module one, module two, module three and module four.
6. 40:60 for units in module five and module six
7. Formative and summative assessments shall be weighted at 60% and 40% respectively in the overall unit of learning score

For a candidate to be declared competent in a unit of competency, the candidate must meet the following conditions:

1. Obtained at least 40% in theory assessment in formative and summative assessments.
2. Obtained at least 60% in practical assessment in formative and summative assessment where applicable.
3. Obtained at least 50% in the weighted results between formative assessment and summative assessment where the former constitutes 60% and the latter 40% of the overall score.
4. Assessment performance rating for each unit of competency shall be as follows:

|  |  |
| --- | --- |
| **MARKS** | **COMPETENCE RATING** |
| 80 -100 | Attained Mastery |
| 65 - 79 | Proficient |
| 50 - 64 | Competent |
| 49 and below | Not Yet Competent |
| Y | Assessment Malpractice/irregularities |

1. Assessment for Recognition of Prior Learning (RPL) may lead to award of part and/or full qualification.

**Certification**

A candidate will be issued with a Certificate of Competency upon demonstration of competence in a core unit of competency. To be issued with **Kenya National TVET certificate** in network system technician level 5 the candidate must demonstrate competence in all the units of competency as given in the qualification pack. A Statement of Attainment certificate may be issued upon demonstration of competence in a certifiable element within a unit.

The certificates will be issued by the Qualification Awarding Institution

# MODULE 1

|  |  |  |  |
| --- | --- | --- | --- |
| **UNIT**  **CATEGORY** | **UNIT CODE** | **UNIT NAME** | **DURATION**  **(Hours)** |
| **COMMON** | 0611 441 01A | Computer Applications | 90 |
| **CORE** | 0612 451 05A | Computer Network Design | 200 |
| **COMMON** | 0714 451 03A | Computer Repair and Maintenance | 130 |
|  |  | **Total** | **420** |

## COMPUTER APPLICATIONS

**UNIT CODE:** 0611 441 01A

**Duration of Unit:** 90 hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Apply Computer Applications

**Unit Description**:

This unit covers the competencies required in performing word processing, operating spreadsheet program, preparing PowerPoint presentation, performing document production and managing online resources.

**Summary of Learning Outcomes**

|  |  |
| --- | --- |
| **LEARNING OUTCOMES** | **DURATION (HOURS)** |
| 1. Perform word processing | 30 |
| 1. Operate spreadsheet program | 25 |
| 1. Prepare PowerPoint presentation | 15 |
| 1. Perform document production | 10 |
| 1. Manage online resources | 10 |
| **TOTAL** | **90** |

**Learning outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Perform word processing | * 1. Ergonomics risk factors   2. Creation of word document      1. Introduction to word processing      2. Types of word processors      3. Creating word documents   3. Creating and manipulating tables      1. Inserting tables      2. Working with tables   4. Performing Mail merging   5. Inserting Word processing objects      1. Picture      2. Shapes      3. Table      4. Charts   6. Generating list of figures and table of content      1. List of figures      2. Table of content | * Practical * Oral questions * Written tests * Observation * Portfolio of evidence |
| 2. Operate spreadsheet programs | * 1. Creating Spreadsheet workbook      1. Introduction to spreadsheets      2. Types of spreadsheets programs      3. Components of a spreadsheet program   Cell data entries   * + 1. Formatting and editing worksheets   1. Performing Cell referencing      1. Relative      2. Absolute   2. Application of Formula and functions      1. Sum      2. Average      3. Max      4. Min      5. Rank   3. Generating Charts      1. Charts      2. Pie charts      3. Bar charts      4. Line graphs      5. Column graphs | * Practical * Oral questions * Written tests * Observation * Portfolio of evidence |
| 3.Prepare PowerPoint presentation | * 1. Creating PowerPoint slides      1. Introduction to PowerPoint      2. Types of presentation programs      3. Creation of PowerPoint slides      4. Slide layouts      5. Formatting and editing   2. Exhibiting Presentation views      1. Outline      2. Normal      3. Slide sorter      4. Notes page      5. Reading view   3. Performing animations transitions   4. Presenting Slideshow | * Practical * Oral questions * Written tests * Observation * Portfolio of evidence |
| 4. Document production | * 1. Printing documents      1. Introduction to document production      2. Types of printers      3. Document printing   2. Document scanning      1. Types of scanners      2. Document scanning   3. Document duplication | * Practical * Oral questions * Written tests * Observation * Portfolio of evidence |
| 5. Manage online resources | * 1. Online file transfer      1. Introduction to online resources      2. Creating up online user accounts      3. E-mailing      4. Teleconferencing   2. Online document processing      1. Online data entry      2. File conversion      3. Google documents      4. E- tasks      5. Online file transfer   3. Performing online collaboration      1. Introduction to online collaboration      2. Types of online collaboration tools         1. Video conferencing         2. Chatting         3. Cloud computing         4. Social media         5. Online calendar         6. Mailing | * Practical * Oral questions * Written tests * Observation * Portfolio of evidence |

**Suggested Delivery Methods**

* Demonstration by trainer
* Practical work by trainee
* Viewing of related videos
* Group discussions
* Direct instructions

**Recommended resources for 25 trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Trainee: Item) |
| **A** | **Learning Materials** |  |  |  |
|  | Textbooks |  | 5 pcs | 5:1 |
|  | Flip Charts |  | 5 pcs | 5:1 |
|  | PowerPoint presentations | For trainer’s use |  |  |
| **B** | **Learning Facilities & infrastructure** |  |  |  |
|  | Lecture/theory room |  | 1 | 25:1 |
|  | Computer laboratory |  | 1 | 25:1 |
| **C** | **Consumable materials** |  |  |  |
|  | Printing papers |  | 1 ream | 1:20 |
|  | Foolscaps |  | 1 ream | 1:20 |
|  | Toners |  | 2 pcs | 13:1 |
|  | Assorted colour of whiteboard markers |  |  |  |
| **D** | **Tools and Equipment** |  |  |  |
|  | Computers |  | 25 pcs | 1:1 |
|  | Projector |  | 1 pcs | 25:1 |
|  | Reprographic machines |  | 1 pcs | 25:1 |
|  | Scanner |  | 1 pcs | 25:1 |
|  | Printers |  | 2 pcs | 13:1 |
|  | Whiteboard |  | 1 pcs | 25:1 |
|  | Flash drives |  | 5 pcs | 5:1 |
|  | External Hard drive |  | 5 pcs | 5:1 |
|  | System Software suite |  | 5 pcs | 5:1 |
|  | Application Software suite |  | 5 pcs | 5:1 |
|  | Computer Repair Tool box |  | 5 | 5:1 |

## COMPUTER NETWORK DESIGN

**UNIT CODE:** 0612 451 05A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Design Computer Network

**Unit Duration:** 200 Hours

**Unit Description**

This unit covers the competencies required to design a computer network. It involves performing computer network site survey, designing computer network topology and documenting the network design.

**Summary of Learning Outcomes**

|  |  |
| --- | --- |
| **Learning Outcomes** | **Duration (Hours)** |
| 1. Perform Computer network site survey | 60 |
| 1. Design Computer network topology | 100 |
| 1. Document Computer network design | 40 |
| **TOTAL** | **200** |

**Learning Outcomes, Content, and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Perform Computer network site survey | * 1. Evaluation of Network infrastructure      1. Introduction to computer networks      2. Advantages and disadvantages of computer networks      3. Purpose and scope of computer networks.         1. Scalability         2. Resilience         3. Quality of service         4. compatibility      4. Application of computer networks.      5. Types of computer networks.      6. Components of computer networks.      7. Types of computer networking transmission media.      8. Computer network topologies.   2. Identification of network needs      1. Conducting needs analysis      2. Advantages and disadvantages of network needs      3. Importance of network needs Communication         1. Resource sharing         2. Data sharing and collaboration         3. Internet access         4. Data back-up and recovery         5. Security         6. Fault tolerance and Redundancy   3. Fundamentals of Network Design      1. Key concepts of network design      2. Importance of network design      3. Factors to consider in network design         1. Security         2. Fault tolerance         3. High performance         4. Reliability         5. Number of users         6. Scalability         7. Performance         8. Flexibility         9. QOS         10. Accessibility      4. Network design tools         1. Software design tools   4. Computer network site layout design      1. Types of network sites      2. Factors to consider when designing a site layout      3. Site layout plan development   5. Computer network Transmission media      1. Introduction to transmission media      2. Categories of transmission media         1. Bound/wired         2. Unbound/wireless      3. Types of transmission media         1. Coaxial cable         2. Fibre Optic         3. Twisted pair cable         4. Satellite         5. Microwave      4. Selection criteria for transmission media   6. Computer network E-waste management      1. Definition of terms      2. Advantages and disadvantages of managing E-waste      3. Laws and regulations governing E-waste management in Kenya      4. Types of E-waste         1. Obsolete servers         2. Obsolete switches and routers         3. Networking cables and connectors         4. Obsolete computers and computer accessories      5. Procedures for disposing E-waste   7. Green energy in computer networking      1. Key concepts in green energy      2. Designing sustainable computer network         1. Renewable energy sources         2. Energy efficient hardware         3. Virtualization and Consolidation         4. Energy aware routing         5. Energy monitoring and reporting      3. Pros and cons of green energy in computer networking | * Practical Assessment * Project * Portfolio of evidence * Oral questioning * Interviews * Third party report * Written Assessment * Case study |
| 1. Design Computer network topology. | * 1. Network plan design.      1. Floor design      2. Wireless design   2. Tools and components for designing computer networks.      1. Tools for designing computer networks         1. Software tools      2. Computer network components and their functions         1. Gateways         2. NIC         3. Router         4. Switch         5. Modem         6. Firewall         7. Wireless access point         8. Repeaters   3. Determining network device location      1. IEEE Standards Requirements      2. Determining Device location Placement         1. Switch         2. Router         3. Wireless Access points   4. Computer network topology design      1. Key Concepts      2. Types of network topology         1. Star         2. Ring         3. Bus         4. Mesh         5. Hybrid      3. Criteria for selecting network topology design | * Practical Assessment * Project * Portfolio of evidence * Oral questioning * Interviews * Third party report * Written Assessment * Case study |
| 1. Document Computer network configurations | * 1. Computer Network documentation policy. (IEEE 802.11, 802.3)      1. Network performance report      2. Security report      3. Inventory report      4. Usage report      5. Incident report   2. Computer Network topology diagram      1. Physical topology diagrams   3. Network Mapping documentation      1. Device names, roles and IP address documentation. | * Practical Assessment * Project * Portfolio of evidence * Oral questioning * Interviews * Third party report * Written Assessment * Case study |

**Suggested Methods of delivery**

* Role playing
* Viewing of related videos
* Group discussions.
* Instructor led facilitation using active learning strategies.
* Projects.
* Demonstrations.
* Site visits.

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Trainee: Item) |
| **A** | **Learning Materials** | | | |
|  | Textbooks |  | 13 pcs | 2:1 |
|  | Installation manuals |  |  |  |
|  | Flip Charts |  |  |  |
|  | PowerPoint presentations | For trainer’s use |  |  |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Lecture/theory room |  | 1 | 25:1 |
|  | Laboratory |  | 1 | 25:1 |
| **C** | **Consumable materials** | | | |
|  | Printing papers |  | 1 ream | 1:20 |
|  | Toners/Cartridges |  | 2 pcs | 13:1 |
|  | Assorted colour of whiteboard markers |  |  |  |
| **D** | **Tools and Equipment** | | | |
|  | Computers |  | 25 pcs | 1:1 |
|  | Projector |  | 1 pc | 25:1 |
|  | Signal testers |  | 5 pcs | 5:1 |
|  | Header checker |  | 25 pcs | 1:1 |
|  | Crimping tools |  | 13 pcs | 2:1 |
|  | Cable tester |  | 5 pcs | 5:1 |
|  | Punch Downs |  | 5 pcs | 5:1 |
|  | Switches |  | 5pcs | 5:1 |
|  | Repeaters |  | 5pcs | 5:1 |
|  | Routers/modem |  | 5pcs | 5:1 |
|  | Network tool kit |  | 25 pcs | 1:1 |
|  | Gateways |  | 5pcs | 5:1 |
|  | Packets of RJ45 |  | 300 pcs | 1:10 |
|  | Fibre Modules (SFP) |  | 5pcs | 5:1 |
|  | UTP Ethernet Cable |  | 300 meters | 1:10 |
|  | Antistatic gloves |  | 25 pairs | 1:1 |

## COMPUTER REPAIR AND MAINTENANCE

**UNIT CODE:** 0714 451 03A

**Duration of Unit:** 130 Hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Perform Computer Repair and Maintenance

**Unit Description**

This unit covers the competencies required for performing computer repair and maintenance. It involves performing computer troubleshooting, repairing faulty components, testing computer component functionality and performing computer maintenance.

**Summary of Learning Outcomes**

|  |  |
| --- | --- |
| **Learning Outcomes** | **Duration (Hours)** |
| 1. Computer troubleshooting | 20 |
| 1. Faulty components | 50 |
| 1. Computer component functionality | 30 |
| 1. Computer maintenance | 30 |
| **TOTAL** | **130** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Perform computer troubleshooting | * 1. User data assessment      1. Introduction to computer repair and maintenance      2. Documenting faulty computer user data   2. Computer problems identification      1. Computer troubleshooting approaches      2. Basic computer hardware faults      3. Methods of information gathering      4. User data analysis   3. Determining solution to the problem      1. Computer hardware faults remedies      2. Test hypothesis      3. Problem Identification      4. Documentation of solution | * Practical assessment * Project * Observation Checklist * Product Checklist * Written assessment * Portfolio of evidence |
| 1. Repair faulty components. | * 1. Selection of computer components for replacement      1. Computer hardware components         1. Factors to consider in selecting computer components         2. computer hardware components parts acquisition   2. Assembly of tools for repairing or replacing      1. Computer repair and maintenance tools         1. Straight-head screwdriver, large and small         2. Phillips-head screwdriver, large and small         3. Tweezers or part retriever         4. Needle-nosed pliers         5. Wire cutters         6. Chip extractor         7. Hex wrench set         8. Torx screwdriver   3. Observation of Safety procedures      1. Safety measures and procedures         1. Personal Protective Equipment’s         2. Proper use of tools and equipment         3. Fire safety         4. Classes of fires         5. Fire extinguishers         6. Emergency procedures         7. First AID kit         8. Emergency contact         9. Contingency measures   4. Repair and replacing computer components      1. Computer components Instruction manuals      2. Computer components disassembly process      3. Reassembling repaired or replaced computer components   5. Disposing faulty or obsolete computer hardware components      1. Pollution      2. E- waste      3. Hazards      4. Types of E-waste      5. Proper disposal methods | * Practical assessment * Project * Observation Checklist * Product Checklist * Written assessment * Portfolio of evidence |
| 1. Test computer component functionality | * 1. Performing POST on computer   2. Performing computer component test      1. Importance of testing      2. Testing techniques         1. Testing of repaired or replaced components      3. Evaluation of test Results   3. Computer component’s functionality report      1. Generation of test results report | * Practical assessment * Project * Observation Checklist * Product Checklist * Written assessment * Portfolio of evidence |
| 1. Perform computer maintenance | 1. Computer maintenance scheduling    * 1. Introduction to computer maintenance         1. Definition of computer maintenance         2. Importance of computer maintenance      2. Types of computer maintenance      3. Prepare computer maintenance schedule 2. Performing computer maintenance    * 1. Computer maintenance utilities      2. Uses of computer maintenance utilities      3. Perform computer maintenance    1. Computer maintenance report       1. Importance of computer maintenance report       2. Components of computer maintenance report | * Practical assessment * Project * Observation Checklist * Product Checklist * Written assessment * Portfolio of evidence |

**Suggested Delivery Methods**

* Instructor led facilitation using active learning strategies
* Demonstration by trainer
* Practical work by trainee
* Viewing of related videos
* Group discussions
* Direct instructions

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  **(Trainee: Item)** |
| A | Learning Materials |  |  |  |
|  | Textbooks |  | 5 pcs | 5:1 |
|  | Installation manuals |  | 5 pcs | 5:1 |
|  | Flip Charts |  | 5 pcs | 5:1 |
|  | PowerPoint presentations | For trainer’s use |  |  |
|  | Magazines/brochures/business cards |  |  |  |
| B | Learning Facilities & infrastructure |  |  |  |
|  | Lecture/theory room |  | 1 | 25:1 |
|  | Computer Laboratory |  | 1 | 25:1 |
| C | Consumable materials |  |  |  |
|  | Printing papers |  | 1 ream | 1:20 |
|  | Foolscaps |  | 1 ream |  |
|  | Toners |  | 2 pcs | 13:1 |
|  | Assorted colour of whiteboard markers |  |  |  |
| D | Tools and Equipment |  |  |  |
|  | Computers |  | 25 pcs | 1:1 |
|  | Projector |  | 1 pcs | 25:1 |
|  | Printers |  | 2 pcs | 13:1 |
|  | Whiteboard |  | 1 pcs | 25:1 |
|  | Flash drives |  | 5 pcs | 5:1 |
|  | 1 External Hard drive |  | 1 pcs | 25:1 |
|  | Computer Repair Tool box |  | 5 | 5:1 |

# MODULE 2

|  |  |  |  |
| --- | --- | --- | --- |
| **UNIT**  **CATEGORY** | **UNIT CODE** | **UNIT NAME** | **DURATION**  **(HOURS)** |
| **CORE** | 0612 451 06A | Computer Network Setup | 200 |
| **CORE** | 0612 451 07A | Computer Network Software Installation | 200 |
|  | **Total** | | **400** |

## COMPUTER NETWORK SETUP

**UNIT CODE:** 0612 451 06A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Setup Computer Network

**Unit Duration**: 200 Hours

**Unit Description**

This unit covers the competencies required to setup a computer network. It involves setting up computer network, testing computer network connectivity, documenting computer network configurations and conducting computer network user training.

**Summary of Learning Outcomes**

|  |  |
| --- | --- |
| **LEARNING OUTCOMES** | **DURATION (HOURS)** |
| 1. Setup Computer Network | 50 |
| 1. Test Computer Network Connectivity | 50 |
| 1. Document Computer Network Configurations | 50 |
| 1. Conduct Computer Network User Training | 50 |
| **TOTAL** | **200** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Setup computer network. | * 1. Network Components      1. Introduction to network components      2. Examples of network components         1. Router         2. Switch         3. Hub         4. Modem         5. Firewall         6. Access point         7. Server         8. Cable         9. Wireless adapter      3. Identifications of network tools         1. Crimping tool         2. Cable tester         3. Wire stripper         4. Multimeter         5. Screwdriver set         6. Ethernet cable and connectors   2. Networking standards      1. Introduction to Cable termination IEEE 802.3 standards      2. Type of cable termination standards         1. T568A,         2. T568B      3. Methods of cable termination         1. Crimped termination         2. Compression termination         3. Wire-wrap termination         4. Insulation displacement   3. Network components and network devices configuration as per IEEE standards * IP addressing * Routing configuration * Network security   + 1. Wireless network configuration | * Practical test * Project * Portfolio of evidence * Oral questioning * Interviews * Third party report * Written tests * Case study |
| 1. Test Computer network connectivity | * 1. Network Component performance testing      1. Types of computer network component tests         1. Performance testing         2. Functionality testing         3. Security testing         4. Resilience and Recovery Testing         5. connectivity testing         6. Media testing         7. Bandwidth testing   2. Network Performance test   3. Network testing reports      1. Types of network reporting.         1. Network performance test report         2. Security vulnerability assessment report         3. Quality of service test report         4. Incidence response exercise report   4. Computer network Transmission media      1. Introduction to transmission media      2. Categories of transmission media         1. Bound/wired         2. Unbound/wireless      3. Types of transmission media         1. Coaxial cable         2. Fibre Optic         3. Twisted pair         4. Satellite         5. Microwave      4. Selection criteria for transmission media      5. Types of network transmission media testing         1. Cable continuity testing         2. Crosstalk test         3. Bandwidth and throughput testing         4. Signal quality testing         5. Wireless media testing | * Practical test * Project * Portfolio of evidence * Oral questioning * Interviews * Third party report * Written tests * Case study |
| 1. Document Computer network configurations | * 1. Network component configuration documentation      1. Importance of network configuration documentation.      2. Types of documentations.         1. Device configuration         2. Network topologies         3. Security configuration.   2. Introduction Network data points      1. Types of Network Data Points         1. Ethernet ports         2. Coaxial cable outlets         3. Fibre optic terminals      2. Importance of Network Data Points      3. Factors to Consider When Installing Network Data Points      4. Common Applications of Network Data Points      5. Best practices for data points management   3. Labelling of Network topology designs | * Practical test * Project * Portfolio of evidence * Oral questioning * Interviews * Third party report * Written tests * Case study * Written tests * Case study |
| 1. Conduct Computer Network user training | * 1. Basic network navigation training      1. Importance of network user training.      2. Types of network training materials      3. Preparing for the network user training.      4. Types of user training.      5. Conducting network user training.   2. Network troubleshooting      1. Importance of network trouble shooting      2. Common issues in network trouble shooting      3. Network troubleshooting process      4. Network troubleshooting tools      5. Troubleshooting methodology   3. Data backup and recovery      1. Data identification and classification      2. Backup strategy design      3. Selection of backup solutions      4. Implementation of backup procedures      5. Regular backup execution      6. Monitoring and verification | * Practical test * Project * Portfolio of evidence * Oral questioning * Interviews * Third party report * Written tests * Case study |

**Suggested Methods of delivery**

* Role playing
* Viewing of related videos
* Group discussions.
* Instructor led facilitation using active learning strategies.
* Projects.
* Demonstrations.
* Site visits.

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Trainee: Item) |
| **A** | **Learning Materials** | | | |
|  | Textbooks |  | 13 pcs | 2:1 |
|  | Installation manuals |  |  |  |
|  | Flip Charts |  |  |  |
|  | PowerPoint presentations | For trainer’s use |  |  |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Lecture/theory room |  | 1 | 25:1 |
|  | Laboratory |  | 1 | 25:1 |
| **C** | **Consumable materials** | | | |
|  | Printing papers |  | 1 ream | 1:20 |
|  | Toners/Cartridges |  | 2 pcs | 13:1 |
|  | Assorted colour of whiteboard markers |  |  |  |
| **D** | **Tools and Equipment** | | | |
|  | Computers |  | 25 pcs | 1:1 |
|  | Projector |  | 1 pc | 25:1 |
|  | Signal testers |  | 5 pcs | 5:1 |
|  | Header checker |  | 25 pcs | 1:1 |
|  | Crimping tools |  | 13 pcs | 2:1 |
|  | Cable tester |  | 5 pcs | 5:1 |
|  | Punch Downs |  | 5 pcs | 5:1 |
|  | Switches |  | 5pcs | 5:1 |
|  | Repeaters |  | 5pcs | 5:1 |
|  | Routers/modem |  | 5pcs | 5:1 |
|  | Network tool kit |  | 25 pcs | 1:1 |
|  | Gateways |  | 5pcs | 5:1 |
|  | Packets of RJ45 |  | 300 pcs | 1:10 |
|  | Fibre Modules (SFP) |  | 5pcs | 5:1 |
|  | UTP Ethernet Cable |  | 300 meters | 1:10 |
|  | Antistatic gloves |  | 25 pairs | 1:1 |

## COMPUTER NETWORK SOFTWARE INSTALLATION

**UNIT CODE:** 0612 451 07A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Install Computer Network Software

**Unit Duration:** 200 Hours

**Unit Description**

This unit covers the competencies required to install computer network software. It involves conducting network software simulation, performing computer software installation, testing computer network software and conducting computer network software user training and monitoring computer network software performance.

**Summary of Learning Outcomes**

|  |  |
| --- | --- |
| **LEARNING OUTCOMES** | **DURATION (HOURS)** |
| 1. Conduct Network Software Simulation | 30 |
| 1. Perform Computer Network Software Installation | 30 |
| 1. Test Computer Network Software | 30 |
| 1. Conduct Computer Network Software User Training | 50 |
| 1. Monitor Computer Network Software Performance | 60 |
| **TOTAL** | **200** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Conduct Network Software Simulation   . | * 1. Computer network software requirements      1. Introduction to computer software      2. Computer network software         1. Network protocols and services         2. Operating systems         3. Network management software         4. Remote desktop software         5. Network backup and recovery software         6. VoIP software   2. Introduction to Installation and configuration of Computer network simulation Software      1. Types of Computer network simulation Software         1. Cisco(packet tracer)         2. Graphical Network Simulator         3. Wire shark      2. Uses of network simulators      3. Best practices in Installation and configuration of Computer network simulation Software   3. Basic Network Simulations activities      1. Simple Network Design      2. Troubleshooting Network Issues      3. Configuring Basic Protocols |  |
| 1. Perform Computer Network software installation | * 1. Network operating system Installation      1. Introduction to computer Network operating system      2. Functions of a NOS         1. File Sharing         2. Print Sharing         3. Resource Management         4. Security         5. Network Management      3. Features of Using a NOS         1. User authentication and authorization:         2. File and directory services         3. Network security         4. Backup and recovery         5. Remote management         6. Monitoring and reporting      4. Benefits of Using a NOS         1. Improved network performance         2. Enhanced security         3. Simplified network management         4. Increased collaboration         5. Cost savings   2. Network monitoring and management tools      1. Network management tools         1. FortiManager         2. OpManager Plus         3. Azure Virtual         4. WANQuantum Spark Security Management Portal      2. Network monitoring tools         1. Paessler PRTG Network Monitor         2. Progress WhatsUp Gold         3. Nagios XILogicMonitor         4. SolarWinds Network         5. Performance Monitor         6. Wireshark         7. Nagios         8. Zabbix         9. Cisco Prime Infrastructure   3. Network monitoring tools configuration      1. Types of network monitoring tools         1. Traffic monitoring tools         2. Performance monitoring tools         3. Security monitoring tools      2. Network monitoring tools configuration strategies | * Practical test * Project * Portfolio of evidence * Oral questioning * Interviews * Third party report * Written tests * Case study |
| 1. Test Computer Network Software | * 1. Network Software Testing      1. Meaning and importance of software testing.      2. Types of computer network Software testing performed as per user requirements         1. Exploratory testing         2. Test case design         3. Defect reporting         4. Performance testing         5. Security testing         6. User acceptance testing         7. Functionality test      3. Continuous Improvement of Computer Network Software         1. Regular Reviews         2. Security Awareness         3. Training Incident Response Plan         4. Proactive Monitoring   2. Performing Corrective Actions on Computer Network Software      1. Corrective actions      2. Patch Management      3. Configuration Management      4. Security Measures      5. Network Troubleshooting      6. Performance Optimization      7. Backup and Recovery      8. Continuous Improvement of Computer Network Software         1. Regular Reviews         2. Security Awareness         3. Training Incident Response Plan         4. Proactive Monitoring   3. Introduction to Computer software functionality test report      1. Steps in conducting Computer software functionality test      2. Computer software Functional testing types         1. Unit testing         2. Smoke testing         3. User acceptance         4. Regression testing         5. Localization testing | * Practical test * Project * Portfolio of evidence * Oral questioning * Interviews * Third party report * Written tests * Case study |
| 1. Conduct Computer Network software user training | * 1. User skill gap      1. Meaning of skill gap in computer networks      2. Identification of skill gap in computer networks   2. User training manuals      1. Definition of training manual      2. Types of computer network training manuals         1. Cisco network training manual         2. Microsoft certified network engineer associates         3. Linux network training manual   3. Network user training      1. Key Concepts Network user training         1. Basic network concepts and terminologies         2. Connecting to the networks         3. Network security best practices         4. Resources access and file sharing         5. Performance optimization   4. Training reports      1. Meaning and identification of computer networks training reports.      2. Types of computer networks training reports         1. Training evaluation report         2. Training completion report | * Practical test * Project * Portfolio of evidence * Oral questioning * Interviews * Third party report * Written tests * Case study * Written tests * Case study |
| 1. Monitor computer network software performance | * 1. Real-time network monitoring      1. Types of network software performance real –time monitoring.         1. SNMP         2. Packet sniffers         3. Performance monitoring tools         4. Flow-based analytics   2. Bandwidth and Throughput analysis      1. Definition of Bandwidth and Throughput      2. Factors Affecting Throughput analysis         1. Network Congestion         2. Network Congestion         3. Latency         4. Packet Loss         5. Protocol Overhead         6. Hardware Limitations      3. Tools for measuring and optimizing throughput and bandwidth      4. Network performance monitoring tools         1. Speed test applications         2. Quality of service         3. Traffic analysis         4. Bandwidth management and control tools         5. Predictive analytics and capacity planning tools      5. Best practices for managing bandwidth and throughput   3. Network Alerts and notifications      1. Types of Network Alerts and notifications         1. Security alerts         2. Performance alerts         3. Hardware alerts         4. Configuration alerts | * Practical test * Project * Portfolio of evidence * Oral questioning * Interviews * Third party report * Written tests * Case study * Written tests * Case study |

**Suggested Methods of delivery**

* Role playing
* Viewing of related videos
* Group discussions.
* Instructor led facilitation using active learning strategies.
* Projects.
* Demonstrations.
* Site visits.

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**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Trainee: Item) |
| **A** | **Learning Materials** | | | |
|  | Textbooks |  | 13 pcs | 2:1 |
|  | Installation manuals |  |  |  |
|  | Flip Charts |  |  |  |
|  | PowerPoint presentations | For trainer’s use |  |  |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Lecture/theory room |  | 1 | 25:1 |
|  | Laboratory |  | 1 | 25:1 |
| **C** | **Consumable materials** | | | |
|  | Printing papers |  | 1 ream | 1:20 |
|  | Toners/Cartridges |  | 2 pcs | 13:1 |
|  | Assorted colour of whiteboard markers |  |  |  |
| **D** | **Tools and Equipment** | | | |
|  | Computers |  | 25 pcs | 1:1 |
|  | Projector |  | 1 pc | 25:1 |
|  | Flash drives |  | 25 pairs | 1:1 |
|  | External CD/DVD drives |  | 13 pcs | 2:1 |

# MODULE 3

|  |  |  |  |
| --- | --- | --- | --- |
| **UNIT**  **CATEGORY** | **UNIT CODE** | **UNIT NAME** | **DURATION**  **(Hours)** |
| **CORE** | 0612 451 08A | Computer Network Security Configuration | 210 |
| **CORE** | 0612 451 09A | Computer Network Maintenance | 210 |
|  | **Grand total** | | **420** |

## COMPUTER NETWORK SECURITY CONFIGURATION

**UNIT CODE:** 0612 451 08A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Configure Computer Network Security

**Unit Duration:** 210 Hours

**Unit Description**

This unit covers the competencies required to configure computer network security. It involves conducting computer network risk assessment, performing computer network segmentation, configuring computer network firewall and conducting computer network security user training.

**Summary of Learning Outcomes**

| **LEARNING OUTCOMES** | **DURATION (HOURS)** |
| --- | --- |
| 1. Conduct Computer Network Risk Assessment | 50 |
| 1. Perform Computer Network Segmentation | 60 |
| 1. Configure Computer Network Firewall | 60 |
| 1. Conduct Computer Network Security User Training | 40 |
| **TOTAL** | **210** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Conduct computer network risk assessment   . | * 1. Inventory of computer network      1. Introduction of computer network inventory.      2. Types of computer network inventory.         1. Hardware inventory         2. Software inventory         3. IP address inventory         4. Device configuration inventory   2. Identify and prioritize security threats and vulnerabilities      1. Introduction to computer network, security threats and vulnerabilities.      2. Categories of computer network, security threats         1. Internal (Outdated or unpatched software Misconfigured firewalls / operating systems, Denial of service, Man in the middle attack etc)         2. External (Malware attacks, Social engineering attacks, Phishing etc)      3. Types of computer network vulnerabilities.   3. Develop security Controls      1. Introduction to computer network security controls.      2. Types of computer network security controls.         1. Preventive         2. Detective controls         3. Corrective controls         4. Deterrent controls         5. Compensating controls         6. Administrative control         7. Logical/technical control         8. Physical controls         9. Technological controls   4. Risk assessment documentation      1. Meaning of computer network Risk Assessment Report      2. Types of computer network Risk Assessment Report.         1. Qualitative Risk Assessment Report         2. Quantitative Risk Assessment Report         3. Operation Risk Assessment Report | * Practical test * Project * Portfolio of evidence * Oral questioning * Interviews * Third party report * Written tests * Case study |
| 1. Perform computer network segmentation | * 1. IP addressing scheme.      1. IP addressing and subnetting      2. IP address fundamentals         1. Physical address. MAC address.         2. Logical address. IP address.         3. Hostname.         4. IPv4 vs. IPv6         5. Classful addressing         6. Static vs. Dynamic IP Addressing         7. Public vs. Private IP Addresses      3. Steps in Designing an IP Addressing Scheme   2. Network segmentation      1. Introduction to network segmentation         1. Definition of network segmentation         2. Physical & logical segmentation         3. Importance of network segmentation      2. Types of network segmentation         1. IP based         2. VLANs         3. Subnetting         4. Firewalls         5. Physical segmentation      3. Tools and techniques for network segmentation         1. Firewalls, Routers, and Access Control Lists (ACLs)         2. Network Access Control (NAC)      4. Monitoring and Managing Network Segments   3. Network privileges.      1. Introduction to network privilege management         1. Definition of Network Privileges.         2. Roles of network privileges.      2. Types of Network Privileges:         1. Read, Write, Execute      3. Roles of Privilege Management in Network Security         1. Administrator privileges         2. User privileges         3. Read-only access         4. Remote access privileges      4. implementation of network access control      5. Understand Network Access Requirements      6. Develop Access Control Policies      7. Select a Network Access Control Solution | * Practical test * Project * Portfolio of evidence * Oral questioning * Interviews * Third party report * Written tests * Case study |
| 1. Configure network firewall | * 1. Firewall security      1. Introduction to firewall security      2. Types of firewall security         1. Hardware firewall         2. Software firewall         3. Cloud firewall         4. Open-source firewall      3. Firewall architecture and components   2. Firewall Zone and IP address      1. Types of firewall zones      2. IP address structure         1. Network ID         2. Hosting ID   3. Access Control list      1. Network Access Control List (ACL)Concepts         1. Purpose of ACLs         2. Wildcard mask in ACLs         3. Types of IPv4 ACLs   4. Login and Firewall services      1. Firewall login and configuration concepts      2. Types of firewall services         1. Packet filtering         2. Stateful inspection         3. Application-level gateway         4. Virtualization   5. Firewall Configuration      1. Concepts of Firewall configuration      2. Steps of Firewall configuration      3. Best practices for firewall configuration      4. Objectives of firewall testing      5. Steps of Firewall testing      6. Tools for Firewall testing      7. Best practices for firewall testing   6. Firewall management      1. Concepts of firewall management         1. Firewall maintenance         2. Firewall monitoring         3. Compliance and auditing         4. Firewall documentation | * Practical test * Project * Portfolio of evidence * Oral questioning * Interviews * Third party report * Written tests * Case study * Written tests * Case study |
| 1. Conduct Computer Network security user training | * 1. Security Awareness      1. Introduction to computer network security awareness      2. User and customer training methods   2. Network security implementation      1. User training on implementation of Network security practices         1. Network security policies         2. Network security best practices         3. Network segmentation user training         4. Firewall implementation   3. Incidence Responses      1. User training on computer network incident response.      2. Types of computer network incident response      3. Components of incident response training for users      4. Incident response team functions and responsibilities   4. Regular updates      1. User training on computer networks regular updates.      2. Patch management   5. Network Compliance training      1. Concepts of computer networks Compliance training.      2. Legal and regulatory requirement.      3. Compliance policies and procedures      4. Compliance monitoring and auditing      5. Emerging trends in computer network compliance   6. Network testing and simulation      1. Introduction to network testing and simulation.      2. Components of network testing and simulation.         1. Network performance testing         2. Network security testing         3. Network simulation techniques | * Practical test * Project * Portfolio of evidence * Oral questioning * Interviews * Third party report * Written tests * Case study |

**Suggested Methods of delivery**

* Role playing
* Viewing of related videos
* Group discussions.
* Instructor led facilitation using active learning strategies.
* Projects.
* Demonstrations.
* Site visits.

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**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Trainee: Item) |
| **A** | **Learning Materials** | | | |
|  | Textbooks |  | 13 pcs | 2:1 |
|  | Installation manuals |  |  |  |
|  | Flip Charts |  |  |  |
|  | PowerPoint presentations | For trainer’s use |  |  |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Lecture/theory room |  | 1 | 25:1 |
|  | Laboratory |  | 1 | 25:1 |
| **C** | **Consumable materials** | | | |
|  | Printing papers |  | 1 ream | 1:20 |
|  | Toners/Cartridges |  | 2 pcs | 13:1 |
|  | Assorted colour of whiteboard markers |  |  |  |
| **D** | **Tools and Equipment** | | | |
|  | Computers |  | 25 pcs | 1:1 |
|  | Projector |  | 1 pc | 25:1 |
|  | Flash drives |  | 25 pairs | 1:1 |
|  | External CD/DVD drives |  | 13 pcs | 2:1 |

## COMPUTER NETWORK MAINTENANCE

**UNIT CODE:** 0612 451 09A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Perform Computer Network Maintenance

**Unit Duration:** 210Hours

**Unit Description**

This unit covers the competencies required to perform computer network repair and maintenance. It involves analysing computer network performance, troubleshooting computer network components, performing computer network component repair and maintaining computer network.

**Summary of Learning Outcomes**

|  |  |
| --- | --- |
| **LEARNING OUTCOMES** | **DURATION (HOURS)** |
| 1. Analyse Computer Network Performance | 40 |
| 1. Troubleshoot Computer Network Component | 70 |
| 1. Perform Computer Network Components Repair | 60 |
| 1. Maintain Computer Network | 40 |
| **TOTAL** | **210** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Analyze Computer Network Performance | * 1. Computer Network Traffic analysis.      1. Introduction to network traffic analysis      2. Concepts and metrics in network traffic analysis      3. Types of Network Traffic and Protocols      4. TCP/IP, UDP, ICMP and other common protocols         1. Unicast traffic         2. Broadcast traffic         3. Multicast traffic      5. Tools for Network Traffic Analysis         1. Wireshark,         2. tcpdump,         3. SolarWinds, NetFlow      6. Implementation of network traffic analysis         1. Locate all key network components         2. Using network monitoring software         3. Create alerts for component health and metrics         4. Bandwidth monitoring         5. Packet inspection         6. Performance optimization         7. Forensic analysis         8. Real-time monitoring and alerts   2. Network Bandwidth utilizationmonitoring      1. Introduction to Network Bandwidth Utilization      2. Definition of terms         1. Monitoring         2. bandwidth,         3. throughput,         4. latency,         5. packet loss      3. Bandwidth Monitoring Tools and Technologies         1. NetFlow,         2. PRTG,         3. SolarWinds         4. Web browsing monitoring         5. File downloads monitoring   3. Computer network Latency measurement      1. Introduction to Network Latency Measurement      2. Definition of terms         1. Network latency         2. jitter,         3. round-trip time (RTT)      3. Types of Latency and measurements      4. Tools for Network Latency Measurement         1. Ping         2. Traceroute         3. Wireshark         4. Network monitoring tools   4. Network Device performance monitoring      1. Introduction to Network Device Performance Monitoring      2. Importance of monitoring network devices      3. Network monitoring criteria         1. CPU usage,         2. Memory utilization,         3. Bandwidth,         4. Error rates      4. Key concepts for Monitoring Network Devices         1. Metrics tracking         2. Alerting         3. Real-time monitoring         4. Security monitoring         5. Latency, packet loss, error rates, and uptime         6. memory and CPU usage in network device      5. Network Device Performance Optimization Techniques      6. Optimizing device settings for better performance.      7. Implementing load balancing to reduce device load.      8. Adjusting network topology for optimal device performance. | * Practical test * Project * Portfolio of evidence * Oral questioning * Interviews * Third party report * Written tests * Case study |
| 1. Troubleshoot computer network components | * 1. Basic Electronic skills      1. Introduction to basic electronic skills         1. Electricity and circuits Components         2. Electronic devices         3. Power supplies         4. Analog and Digital signals         5. Electronic measurement         6. Safety and practical considerations   2. Network component testing      1. Types of network components tests         1. Cable continuity test         2. Connectivity test         3. Performance test         4. Security test         5. Load test         6. Protocol test   3. Network Configuration verification      1. Concepts of Network configuration verification      2. Understanding network topologies      3. Device configuration checks      4. Network service configuration checks      5. Security configurations checks      6. Performance testing checks   4. Network Logging and error message review   5. Preparation of network troubleshooting Report | * Practical test * Project * Portfolio of evidence * Oral questioning * Interviews * Third party report * Written tests * Case study |
| 1. Perform computer network component repair | * 1. Safety measures      1. Introduction to computer network Safety measures   2. Faulty network component      1. Importance of network maintenance      2. Types of computer network components faults         1. Switch faults         2. Router fault         3. Cabling faults         4. Server faults   3. Computer network problem-solving procedure      1. Network components Troubleshooting process      2. Types of network component repair   4. Network monitoring and maintenance tools   5. Faults Identifications      1. Procedures of identifying network faults      2. Types of network faults         1. Transmission errors         2. Network latency         3. Hardware faults         4. Protocol faults         5. Configuration errors         6. Data packet loss      3. Possible Solution for computer networks faults   6. Network component repair      1. General network components Repair procedures         1. Diagnosis         2. Isolation         3. Repair process         4. Documentation      2. Best practices for network component repair   7. E-waste Management      1. Network components disposal methods         1. Recycling         2. Donation         3. Incineration      2. Emerging trends in E-waste disposal | * Practical test * Project * Portfolio of evidence * Oral questioning * Interviews * Third party report * Written tests * Case study * Written tests * Case study |
| 1. Maintain computer network | * 1. Network Hardware and Software maintenance      1. Introduction to computer networks hardware and software maintenance      2. Types of hardware and software maintenance         1. Preventive         2. Adaptive         3. Corrective         4. Predictive   2. Network Monitoring      1. Concepts of Network monitoring and Performance optimization      2. Types of network monitoring         1. SNMP monitoring         2. Flow based monitoring         3. Packet capture and monitoring      3. Types Network monitoring tools      4. Best practices for network monitoring and performance optimization   3. Backup and disaster recovering      1. Introduction to network disaster recovery      2. Types of network backup         1. Full backup         2. Incremental backup         3. Deferential backup      3. Disaster recovery planning      4. Backup and disaster recovery tools      5. Best practices for backup and disaster recovery   4. Documentation and inventory maintenance      1. Types of documentation         1. Network documentation         2. Network inventory      2. Best practices for network documentation and inventory   5. Computer network compliance and regulatory updates      1. Common regulations affecting computer networks      2. Regulatory Updates in network compliance      3. Best practices forkeep up with compliance and regulatory updates         1. Regular audit and reviews         2. Continuous monitoring and threat detection      4. User training | * Practical test * Project * Portfolio of evidence * Oral questioning * Interviews * Third party report * Written tests * Case study |

**Suggested Methods of delivery**

* Role playing
* Viewing of related videos
* Group discussions.
* Instructor led facilitation using active learning strategies.
* Projects.
* Demonstrations.
* Site visits.

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**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Trainee: Item) |
| **A** | **Learning Materials** | | | |
|  | Textbooks |  | 13 pcs | 2:1 |
|  | Installation manuals |  |  |  |
|  | Flip Charts |  |  |  |
|  | PowerPoint presentations | For trainer’s use |  |  |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Lecture/theory room |  | 1 | 25:1 |
|  | Laboratory |  | 1 | 25:1 |
| **C** | **Consumable materials** | | | |
|  | Printing papers |  | 1 ream | 1:20 |
|  | Toners/Cartridges |  | 2 pcs | 13:1 |
|  | Assorted colour of whiteboard markers |  |  |  |
| **D** | **Tools and Equipment** | | | |
|  | Computers |  | 25 pcs | 1:1 |
|  | Projector |  | 1 pc | 25:1 |
|  | Flash drives |  | 25 pairs | 1:1 |
|  | External CD/DVD drives |  | 13 pcs | 2:1 |

# MODULE 4

|  |  |  |  |
| --- | --- | --- | --- |
| **UNIT**  **CATEGORY** | **UNIT CODE** | **UNIT NAME** | **DURATION**  **(Hours)** |
| **CORE** | 0612 451 10A | Computer Network Security Monitoring | 220 |
| **COMMON** | 0714 441 04A | Basic Electronics | 100 |
| **BASIC** | 0417 451 02 A | Work Ethics and Practices | 40 |
| **TOTAL** | | | **360** |
| **INDUSTRIAL ATTACHMENT** | | | **480** |

## COMPUTER NETWORK SECURITY MONITORING

**UNIT CODE:** 0612 451 10A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Monitor Computer Network Security

**Unit Duration:** 220 Hours

**UNIT DESCRIPTION**

This unit covers the competencies required to monitor computer network security. It involves conducting computer network security assessment, monitoring computer network firewall activities and performing fundamental computer networking segmentation.

**Summary of Learning Outcomes**

|  |  |
| --- | --- |
| **LEARNING OUTCOMES** | **DURATION (HOURS)** |
| 1. Conduct computer network security assessment | 50 |
| 1. Monitor Computer Network Firewall activities | 90 |
| 1. Perform fundamental Computer Network segmentation | 80 |
| **TOTAL** | **220** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Elements**  *These describe the key outcomes which make up workplace functions* | **Performance Criteria**  *These are assessable statements which specify the required level of performance for each of the elements*  **(Bold and italicized terms are elaborated in the range)** | **Suggested Assessment Methods** |
| 1. Conduct computer network security assessment | * 1. Network Security Threats & Vulnerabilities      1. Introduction to computer network security      2. Importance of computer network security         1. Preventing unauthorized access:         2. Protecting data integrity:         3. Ensuring business continuity:      3. Types of network security threats and vulnerabilities         1. Malware         2. Phishing         3. Man in the middle attack         4. Denial of service attack         5. SQL injection         6. Weak authentication and authorization         7. Physical security threats   2. Network Security Controls      1. Types of computer network security controls         1. Preventive controls         2. Detective controls         3. Corrective controls      2. Implementation of computer network security controls         1. Physical controls * Lock & Keys * Biometrics * Access Cards & Badges * CCTVs   + - 1. Technical controls * Firewalls * Data Encryption * Network Segmentation * Network monitoring and logging   + - 1. Administrative controls * Access controls * Employee training on security awareness. * Screening and verification * Authentication mechanism   1. Computer network risk assessment reports      1. computer network risk assessment      2. reasons for conducting computer network risk assessment      3. Key components of a computer network risk assessment      4. How to conduct a computer network risk assessment      5. Tools and technologies for computer network risk assessment         1. Planning and preparation:         2. Threat analysis         3. Vulnerability scanners:         4. ‍Risk management software      6. Best practices for network risk assessment      7. Documentation of the risk assessment report | 1. Practical test 2. Project 3. Portfolio of evidence 4. Oral questioning 5. Interviews 6. Third party report 7. Written tests 8. Case study |
| 1. Monitor Computer Network Firewall activities | * 1. Computer Network Firewall      1. Introduction to computer network firewall      2. Importance of computer network firewall      3. Factors to consider in firewall monitoring      4. Types of firewall logs         1. Traffic         2. Event         3. System         4. Threat      5. Tools and techniques used in firewall monitoring         1. Packet filtering         2. Logging and reporting         3. Bandwidth management         4. URL Filtering         5. SolarWinds Network Performance Monitor (NPM)      6. Best practices for firewall management   2. Firewall updates      1. Importance of regular firewall updates      2. procedure to updating firewall firmware and software   3. Computer network traffic.      1. Introduction to computer network traffic monitoring.      2. Benefits of computer network traffic monitoring      3. Monitoring of computer network traffic      4. Computer Network traffic monitoring tools         1. Wireshark         2. SolarWinds Network Performance Monitor (NPM)         3. Cisco Network Assistant (CNA) | * Practical test * Project * Portfolio of evidence * Oral questioning * Interviews * Third party report * Written tests * Case study |
| 1. Perform fundamental Computer Network segmentation | * 1. IP addressing scheme.      1. IP addressing and subnetting      2. IP address fundamentals         1. Physical address. MAC address.         2. Logical address. IP address.         3. Hostname.         4. IPv4 vs. IPv6         5. Classful addressing         6. Static vs. Dynamic IP Addressing         7. Public vs. Private IP Addresses      3. Steps in Designing an IP Addressing Scheme   2. Network segmentation      1. Introduction to network segmentation         1. Definition of network segmentation         2. Physical & logical segmentation         3. Importance of network segmentation      2. Types of network segmentation         1. IP based         2. VLANs         3. Subnetting         4. Firewalls         5. Physical segmentation      3. Tools and techniques for network segmentation         1. Firewalls, Routers, and Access Control Lists (ACLs)         2. Network Access Control (NAC)      4. Monitoring and Managing Network Segments   3. Network privileges.      1. Introduction to network privilege management         1. Definition of Network Privileges.         2. Roles of network privileges.      2. Types of Network Privileges:         1. Read, Write, Execute      3. Roles of Privilege Management in Network Security         1. Administrator privileges         2. User privileges         3. Read-only access         4. Remote access privileges      4. implementation of network access control      5. Understand Network Access Requirements      6. Develop Access Control Policies      7. Select a Network Access Control Solution | * Practical test * Project * Portfolio of evidence * Oral questioning * Interviews * Third party report * Written tests * Case study |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| * **Network security Threats & Vulnerabilities** may include but not limited to; | * + Malware   + Phishing   + Man in the middle attack   + Denial of service attack   + SQL injection   + Weak authentication and authorization   + Physical security threats |
| * **Network Security Controls** may include but not limited to; | * + Firewalls   + Network segmentation   + Network monitoring and logging   + Authentication mechanisms |
| * **Firewall activities** may include but not limited to; | * + Packet filtering   + Logging and reporting   + Bandwidth management   + URL Filtering |
| * **IP addressing scheme** may include but not limited to; | * + Classful addressing   + Private IP addressing   + Public IP addressing |
| * **Network segmentation** may include but not limited to; | * + VLANs   + Subnetting   + Firewalls   + Physical segmentation |
| * **Network privileges** may include but not limited to; | * + Administrator privileges   + User privileges   + Read-only access   + Remote access privileges |

**Suggested Methods of delivery**

* Role playing
* Viewing of related videos
* Group discussions.
* Instructor led facilitation using active learning strategies.
* Projects.
* Demonstrations.
* Site visits.

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**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Trainee: Item) |
| **A** | **Learning Materials** | | | |
|  | Textbooks |  | 13 pcs | 2:1 |
|  | Installation manuals |  |  |  |
|  | Flip Charts |  |  |  |
|  | PowerPoint presentations | For trainer’s use |  |  |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Lecture/theory room |  | 1 | 25:1 |
|  | Laboratory |  | 1 | 25:1 |
| **C** | **Consumable materials** | | | |
|  | Printing papers |  | 1 ream | 1:20 |
|  | Toners/Cartridges |  | 2 pcs | 13:1 |
|  | Assorted colour of whiteboard markers |  |  |  |
| **D** | **Tools and Equipment** | | | |
|  | Computers |  | 25 pcs | 1:1 |
|  | Projector |  | 1 pc | 25:1 |
|  | Flash drives |  | 25 pairs | 1:1 |
|  | External CD/DVD drives |  | 13 pcs | 2:1 |

## BASIC ELECTRONICS

**UNIT CODE**: 0714 441 04A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Apply Basic Electronics

**Duration of Unit:** 100 Hours

**Unit description**

This unit specifies the competencies required to demonstrate basic skills of electronics. It includes identifying electrical circuits, identifying electronic components, applying semi-conductor theory, classifying computer memory, applying logic gates and performing Boolean algebra operations.

**Summary of Learning Outcomes**

|  |  |
| --- | --- |
| **LEARNING OUTCOMES** | **DURATION (HOURS)** |
| 1. Identify electric circuits | 4 |
| 1. Identify electronic components | 4 |
| 1. Apply semi-conductor theory | 20 |
| 1. Classify computer memory | 20 |
| 1. Apply logic gates | 32 |
| 1. Perform Boolean algebra operations | 20 |
| **TOTAL** | **100** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning outcomes** | **Content** | **Suggested Assessment**  **Methods** |
| 1. Identify electrical   circuits | 1. Electrical circuit identification    * 1. Definition of electrical circuit      2. Components of electrical circuit 2. Electrical quantities and their S.I units identification    * 1. Basic electrical quantities and their units         1. Emf in volts         2. Current in Amperes         3. Power in watts         4. Energy in joules         5. Resistance in ohms 3. Types of electrical circuits    * 1. AC – Alternating Current      2. DC – Direct Current | * + Practical exercises   + Written   + Observation   + Oral |
| 1. Identify Electronic components | * 1. Identification of electronic components      1. Resistor      2. Capacitor      3. Diode      4. Inductor   2. Characteristic of electronic components.   3. Application of electronic components.   4. Characteristics of integrated circuit | * + Practical exercises   + Written   + Observation   + Oral |
| 1. Apply semi-conductor theory | * 1. Explanation of semiconductor theory   2. Descriptions of structure of matter   3. Explanation of Electrons in conductors and semiconductors   4. Types of semiconductor materials      1. Silicon      2. Germanium   5. Explanation of P-type and N-type materials   6. Description of P-N junction diodes      1. Forward biasing      2. Reverse biasing   7. Types and operations of transistors      1. PNP type      2. NPN type   8. Application of Semiconductor theory | * + Practical exercises   + Written   + Observation   + Oral |
| 1. Classify computer memory | * 1. Identification of computer memories      1. Definition of computer memory      2. Classification of computer memory         1. Primary memory         2. Secondary memory      3. Types of computer memories         1. RAM         2. ROM         3. DAM   2. Identification of Memory hierarchy speed      1. Registers      2. Cache memory      3. Main memory      4. Secondary storage      5. Tertiary storage   3. Identification of memory storage levels      1. Internal      2. Main      3. Online      4. Offline bulk   4. Classify computer memories as per the technology used      1. Semiconductor memory      2. Magnetic memory      3. Optical memory | * + Practical exercises   + Written   + Observation   + Oral |
| 1. Apply logic gates | * 1. Identification of Logic gates      1. Definition of terms      2. Types of logic gates         1. AND Gate         2. OR Gate         3. NOT Gate         4. NAND Gate         5. NOR Gate         6. XOR Gate         7. XNOR Gate   2. Development of Logic circuits   3. Simplification of Logic circuits      1. Logic circuits Simplification Methods         1. Boolean Algebra         2. K-Maps         3. Quine-McCluskey Algorithm         4. Software and CAD Tools   5.4 Application of logic gates in electronic circuits | * + Practical exercises   + Written   + Observation   + Oral |
| 1. Perform Boolean algebra operations | * 1. Identify key concepts in Boolean algebra      1. Boolean variables      2. Logical operations      3. Boolean expressions      4. Laws and rules of Boolean algebra      5. Truth tables      6. De Morgan’s theorem   2. Demonstration of Boolean expressions   3. Performance of Basic Boolean operations   4. Methods of simplifying Boolean expressions   5. Illustration of Boolean Laws and Theorems   6. Simplification rules for Boolean expressions | * + Practical exercises   + Written   + Observation   + Oral |

**Suggested Delivery Methods**

* Instructor led facilitation using active learning strategies
* Demonstration by trainer
* Practical work by trainee
* Viewing of related videos
* Group discussions
* Direct instructions

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Trainee: Item) |
| **A** | **Learning Materials** | | | |
|  | Textbooks |  | 13 pcs | 2:1 |
|  | Installation manuals |  |  |  |
|  | Flip Charts |  |  |  |
|  | PowerPoint presentations | For trainer’s use |  |  |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Lecture/theory room |  | 1 | 25:1 |
|  | Laboratory |  | 1 | 25:1 |
| **C** | **Consumable materials** | | | |
|  | Printing papers |  | 1 ream | 1:20 |
|  | Toners/Cartridges |  | 2 pcs | 13:1 |
|  | Assorted colour of whiteboard markers |  |  |  |
| **D** | **Tools and Equipment** | | | |
|  | Computers |  | 25 pcs | 1:1 |
|  | Projector |  | 1 pc | 25:1 |
|  | Signal testers |  | 5 pcs | 5:1 |
|  | Header checker |  | 25 pcs | 1:1 |
|  | Crimping tools |  | 13 pcs | 2:1 |
|  | Cable tester |  | 5 pcs | 5:1 |
|  | Punch Downs |  | 5 pcs | 5:1 |
|  | Switches |  | 5pcs | 5:1 |
|  | Repeaters |  | 5pcs | 5:1 |
|  | Routers/modem |  | 5pcs | 5:1 |
|  | Network tool kit |  | 25 pcs | 1:1 |
|  | Gateways |  | 5pcs | 5:1 |
|  | Packets of RJ45 |  | 300 pcs | 1:10 |
|  | Fibre Modules (SFP) |  | 5pcs | 5:1 |
|  | UTP Ethernet Cable |  | 300 meters | 1:10 |
|  | Antistatic gloves |  | 25 pairs | 1:1 |
|  | Ohmmeter |  |  |  |
|  | Ammeter |  |  |  |
|  | Digital Multi meter |  |  |  |
|  | Power supplies |  |  |  |
|  | Circuits |  |  |  |
|  | Semiconductor materials |  |  |  |
|  | Conductors e.g., copper, gold, silver |  |  |  |
|  | Insulators |  |  |  |
|  | Screw Drivers |  |  |  |
|  | Resistors |  |  |  |
|  | Capacitors |  |  |  |
|  | Logic gates |  |  |  |
|  | Inductors |  |  |  |
|  | Transistors |  |  |  |
|  | Transformers batteries, power supplies |  |  |  |
|  | Conducting wires |  |  |  |

## WORK ETHICS AND PRACTICES

**UNIT CODE**: 0417 451 02A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Apply work ethics and practices.

**Duration of Unit:** 40 hours

**Unit Description**

This unit covers competencies required to demonstrate employability skills. It involves the ability to: conducting self-management, promoting ethical work practices and values, promoting teamwork, managing workplace conflicts, maintaining professional and personal development, applying problem-solving, and promoting customer care.

**Summary of Learning Outcomes**

|  |  |
| --- | --- |
| **LEARNING OUTCOMES** | **DURATION (HOURS)** |
| 1. Apply self-management skills | 10 |
| 1. Promote ethical practices and values | 4 |
| 1. Promote teamwork | 10 |
| 1. Maintain professional and personal development | 10 |
| 1. Apply problem-solving skills | 4 |
| 1. Promote customer care. | 2 |
| **TOTAL** | **40** |

**Learning Outcomes, Content, and Suggested Assessment Methods**

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| 1. Apply self-management skills | * 1. Self-awareness   2. Formulating personal vision, mission, and goals   3. Healthy lifestyle practices   4. Strategies for overcoming work challenge   5. Emotional intelligence   6. Coping with Work Stress.   7. Assertiveness versus aggressiveness and passiveness   8. Developing and maintaining high self-esteem   9. Developing and maintaining positive self-image   10. Time management   11. Setting performance targets   12. Monitoring and evaluating performance targets | * Observation * Written assessment * Oral assessment * Third party reports * Portfolio of evidence * Project * Practical |
| 1. Promote ethical work practices and values | * 1. Integrity   2. Core Values, ethics and beliefs   3. Patriotism   4. Professionalism   5. Organizational codes of conduct   6. Industry policies and procedures | * Observation * Written assessment * Oral assessment * Third party reports * Portfolio of evidence * Project * Practical |
| 1. Promote Teamwork | * 1. Types of teams   2. Team building   3. Individual responsibilities in a team   4. Determination of team roles and objectives   5. Team parameters and relationships   6. Benefits of teamwork   7. Qualities of a team player   8. Leading a team   9. Team performance and evaluation   10. Conflicts and conflict resolution   11. Gender and diversity mainstreaming   12. Developing Healthy workplace relationships   13. Adaptability and flexibility   14. Coaching and mentoring skills | * Observation * Written assessment * Oral assessment * Third party reports * Portfolio of evidence * Project * Practical |
| 1. Maintain professional and personal development | * 1. Personal vs professional development and growth   2. Avenues for professional growth   3. Recognizing career advancement   4. Training and career opportunities   5. Assessing training needs   6. Mobilizing training resources   7. Licenses and certifications for professional growth and development   8. Pursuing personal and organizational goals   9. Managing work priorities and commitments   10. Dynamism and on-the-job learning | * Observation * Written assessment * Oral assessment * Third party reports * Portfolio of evidence * Project * Practical |
| 1. Apply Problem-solving skills | * 1. Causes of problems   2. Methods of solving problems   3. Problem-solving process   4. Decision making   5. Creative thinking and critical thinking process in development of innovative and practical solutions | * Observation * Written assessment * Oral assessment * Third party reports * Portfolio of evidence * Project * Practical |
| 1. Promote Customer Care | * 1. Identifying customer needs   2. Qualities of good customer service   3. Customer feedback methods   4. Resolving customer concerns   5. Customer outreach programs   6. Customer retention | * Observation * Written assessment * Oral assessment * Third party reports * Portfolio of evidence * Project * Practical |

**Suggested Methods of Instruction**

* Instructor lead facilitation of theory using active learning strategies.
* Demonstrations
* Simulation/Role play
* Group Discussion
* Presentations
* Projects
* Case studies
* Assignments

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  **(Trainee: Item)** |
| **A** | **Learning Materials** |  |  |  |
|  | 1. Textbooks |  | 5 pcs | 5:1 |
|  | 1. PowerPoint presentations | For trainer’s use |  |  |
|  | 1. Assorted colour of whiteboard markers | For trainer’s use | 2 packets |  |
|  | 1. e-Didactics | For trainer’s use |  |  |
|  | 1. Flashcards |  |  |  |
|  | 1. Flip charts |  |  |  |
|  | 1. Whiteboard |  |  |  |
| **B** | **Learning Facilities & infrastructure** |  |  |  |
|  | 1. Lecture/theory room |  | 1 | 25:1 |
| **C** | **Consumable materials** |  |  |  |
|  | 1. Printing Papers |  | 1 ream | 1:20 |
|  | 1. Toners |  | 2 pcs | 13:1 |
|  | 1. Internet connection |  |  |  |
| **D** | **Tools and Equipment** |  |  |  |
|  | 1. Projectors |  | 1 | 25:1 |
|  | 1. Printers |  | 4 | 6:1 |
|  | 1. Computers/Mobile Phones |  | 25 pcs | 1:1 |