

**REPUBLIC OF KENYA**

**COMPETENCY-BASED MODULAR CURRICULUM**

**FOR**

**ENVIRONMENTAL TECHNOLOGY**

**LEVEL 5**

**PROGRAMME CODE: 0521 454 A**

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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 Environment Protection, Water and Natural Resources 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).

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.

# ACKNOWLEDGMENT

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 National Environment Protection, water and Natural Resources Sector Skills Committee (NSSC) in ensuring that competencies required by the industry are addressed in the curriculum. I also thank all stakeholders in the Agriculture 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 National Environment Protection, water and Natural Resources Sector acquire competencies to perform their work more efficiently and effectively.

# ABBREVIATIONS AND ACRONYMS

CDACC : Curriculum Development, Assessment and Certification Council

CPU : Central Processing Unit

SCI : Science

ICT : Information Communication Technology

KCPE : Kenya Certificate of Primary Education

KCSE : Kenya Certificate of secondary Education

KNQA : Kenya National Qualifications Authority

OS : Occupational Standards

OSHA : Occupation Safety and Health Act

OSHS : Occupation Safety and Health Standards

PC : Personal Computer

PPE : Personal Protective Equipment

SOPs : Standard Operating Procedures

SSAC : Sector Skills Advisory Committee

NEMA : National Environmental Management Authority

TVET : Technical and Vocational Education

# KEY TO UNIT CODE

Sector / Industry

Sub Sector

Occupational Area

Version Control

Unit of Competence Number

ISCED level, Programme Orientation and Level of Completion

xx

x

xxx

x

x

x

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# OVERVIEW

Environmental ScienceLevel 5 qualification consists of competencies required by a person to enable him/her to perform the duties of a Environental technician level 5. It involves performing environmental waste management, monitoring pollution and climate change and, performing environmental ecology maintenance

**SUMMARY OF UNITS OF COMPENTENCY**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UNIT CATEGORY** | **UNIT CODE** | **UNIT TITLE** | **UNIT DURATION (HOURS)** | **CREDIT FACTOR** |
| **MODULE I** | | | | |
| Basic | 0611 451 01A | Digital Literacy | 40 | 4 |
| Common | 0531 441 02A | Inorganic and organic chemistry | 120 | 12 |
| Core | 0521 451 03A | Environmental waste management | 150 | 15 |
| Core | 0521 451 04A | Monitoring environmental pollution | 150 | 15 |
| **SUB TOTAL** | | | **460** | **46** | |

# 

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| MODULE II | | | | |
| UNIT CATEGORY | UNIT CODE | UNIT TITLE | UNIT DURATION (HOURS) | CREDIT FACTOR |
| Basic | 0031 441 05A | Communication Skills | 40 | 4 |
| Common | 0521 451 06A | Environmental health and safety practices | 100 | 10 |
| Common | 0521 441 07A | Natural resource economics | 100 | 10 |
| Core | 0521 451 08A | Environmental ecology maintenance | 120 | 12 |
| Core | 0521 451 09A | Monitoring Climate change | 120 | 12 |
| Total 2 | | | 480 | 48 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| MODULE III | | | | |
| UNIT CATEGORY | UNIT CODE | UNIT TITLE | UNIT DURATION(HOURS) | CREDIT FACTOR |
| BASIC | 0417 441 10A | Work Ethics and Practices | 40 | 4 |
| Common | 0031 441 11A | Entrepreneurial Skills | 40 | 4 |
| Common | 0711 451 12A | Laboratory techniques | 100 | 10 |
| Common | 0521 441 13A | Environmental Principles | 100 | 10 |
| Core | 0521 451 14A | Monitoring natural resources | 150 | 15 |
| Total 3 | | | 430 | 43 |
| Industrial training | | | 480 | 48 |
|  | | | 1940 |  |
| **GRAND TOTAL** | | | | |

**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+ (Plus),

or

1. completion of Environmental Technicianlevel 4
2. Equivalent qualification as determined by the TVET Authority

**Trainer qualification**

A trainer for any of the Units of Competency in this course must:

1. Have a minimum of a level 6 qualification or its equivalent in Environmental technology, and any other relevant field.
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 Environmental Protection, Water and Natural Resources 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 Requirements**

The course shall be assessed formatively and summatively:

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 weight shall be 30:70 for each unit of learning.
5. 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 KenyaNational TVET Certificate in Environmental Science 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

# DIGITAL LITERACY

**UNIT CODE: 0611 451 01A**

**DURATION OF UNIT:** 40 HOURS

**Relationship to Occupational Standards**

This unit addresses the unit of competency: **Digital Literacy**

**Unit Description**

This unit covers the competencies required to demonstrate digital literacy. It involves operating computer devices, solving tasks using the Office suite, accessing online/offline data and information, performing online communication and collaboration, applying cybersecurity skills and performing jobs online. It also involves applying job entry techniques.

**Summary of Learning Outcomes**

By the end of this unit, the learner should be able to:

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Operate computer devices | 6 |
|  | Solve task using office suite | 14 |
|  | Manage data and information | 6 |
|  | Apply cyber security skills | 4 |
|  | Online collaboration and communication | 4 |
|  | Perform online jobs | 4 |
|  | Apply job entry techniques | 2 |
| **Total** | | **40** |

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcomes** | **Content** | **Suggested Assessment Methods** |
| 1. Operate computer devices | **Theory**   * 1. Computer devices      1. Definition of terms         1. Digital literacy         2. Computer systems         3. Information communication technology (ICT)      2. Importance of Information and Communication Technology      3. Functions and uses of computers      4. History of computers      5. Classifications of computers      6. Components of computer system      7. Computer Hardware         1. System unit         2. Input devices         3. Output devices         4. Storage Devices         5. Computer ports      8. Computer software         1. Classifications of computer software.         2. Operating system functions      9. Booting a computer      10. Mouse use techniques      11. Keyboard parts and uses techniques      12. Desktop customization      13. Files and folders management using operating system      14. Computer internet connection          1. Mobile networks/data plans          2. Wireless hotspots          3. Cabled (Ethernet/fibre)          4. Dial-Up          5. Satellite      15. Computer external devices          1. Device connections          2. Device controls (volume controls and Display properties)   **Practice**   * 1. Identify, assemble and connect the computer components listed in 1.1.7.      1. Computer hardware         1. System unit         2. Input devices         3. Output devices         4. Storage devices      2. Boot a computer according to booting standards/procedures      3. Customize desktop      4. Manage files and folders | * Written assessment * Practical assessment * Interviews/ Oral questions |
| 1. Solve tasks using office suite | * 1. Microsoft Office Suite      1. Word processing concepts         1. Examples of Word processing         2. Importance of Word processing      2. Working with word documents         1. Opening and closing word processor Create a new document         2. Save a document         3. Switch between open documents      3. Microsoft word screen layout         1. Set basic options/preferences         2. Help resources         3. Use of magnification/zoom tools         4. Display, hide built in tool bar         5. Using navigation tools      4. Creating word document         1. Editing a document         2. Formatting a document         3. Formatting text         4. Formatting paragraphs         5. Formatting page/document      5. Creating and editing tables         1. Editing of tables      6. Formatting tables         1. Border and shadings         2. Adjusting column width and row heights         3. Changing text direction      7. Inserting graphical objects         1. Edit and format an object      8. Mail merging      9. Document print set up         1. Print preview         2. Page layout         3. Paper size         4. Orientation      10. Printing a document   2. Spreadsheets concepts      1. Electronic spreadsheets      2. Importance of electronic spreadsheets      3. Components of spreadsheets      4. Applications areas of spreadsheets      5. Creating worksheets using Microsoft Excel         1. Parts of MS Excel Window         2. Cell data types         3. Cell referencing         4. Block operations         5. Arithmetic operators      6. Data manipulation         1. Basic functions and formulae         2. Database functionalities            1. Sorting data            2. Filtering data            3. Sub-totals      7. Editing a worksheet      8. Formatting a worksheet      9. Visual representation using charts      10. Worksheet printing   3. Electronic presentations      1. Meaning and importance of electronic presentations      2. Examples of an electronic presentations      3. Application areas of electronic presentation.      4. Creating presentations using Microsoft PowerPoint         1. Parts of MS PowerPoint Window         2. Open and close presentation         3. Creating slides         4. Text management         5. Use of magnification tools         6. Switch between open presentations      5. Developing a presentation         1. Presentation views         2. Slides         3. Master slide      6. Text         1. Editing text         2. Formatting text      7. Charts         1. Using charts         2. Organizational charts      8. Graphical objects         1. Insert, and manipulate object         2. Insert tables         3. Draw an object      9. Outputs preparation         1. Apply slides effects and transitions         2. Check and deliver         3. Spell check a presentation         4. Slide orientation         5. Slide shows navigation      10. Print presentations (slides and handouts)  1. **Practice**     1. Create Word document,       1. Insert header and footer       2. Apply document editing techniques       3. Apply formatting tools       4. Format page       5. Insert tables, graphical objects and charts.       6. Save the changes to be printed out later.    2. Create a workbook in Microsoft Excel       1. Use basic formulae and functions to perform calculations       2. Use editing tools such as deleting entries, insert row and columns, copying, moving, finding, replace and spell checking       3. Format the worksheet       4. Generate charts       5. Save and print Workbook    3. Create PowerPoint presentation slides       1. Edit and format texts and paragraphs       2. Insert objects, images, shapes and charts       3. Apply predefined PowerPoint theme       4. Add slide animations and transition effects       5. Deliver presentations | * Written assessment * Practical assessment * Oral assessment * Project |
| 1. Manage data and information | **Theory**   1. Data and Information    * 1. Definition of terms      2. Importance and uses of data and information      3. Computer networks         1. Meaning and types of computer networks      4. Meaning of internet         1. Internet connectivity requirements         2. Internet Service Providers      5. Types of internet services         1. Communication services         2. Information services         3. File transfer         4. Worldwide webs services         5. E –commerce         6. Newsgroup      6. Types Internet access applications         1. Email Client         2. Web browser         3. Internet of things         4. Internet Protocol      7. Web browsing concepts         1. Key concepts         2. Security and safety      8. Web browsing         1. Using web browser         2. Tools and settings         3. Clearing cache and cookies         4. Uniform Resource Locator         5. Bookmarks         6. Web outputs      9. Web based search         1. Search         2. Critical evaluation of information         3. Copyright, data protection      10. Downloads Management      11. Performing Digital Data      12. Backup (Online and Offline)      13. Emerging issues in internet   **Practice**   * 1. Establish an internet connection      1. Open a web browser application allow/block cookie      2. Add bookmarks/ favourites      3. Download files to a location      4. Copy URLs from a web page to another   2. Use search engine to find information | * Written assessment * Oral assessment * Practical assessment |
| 1. Perform online communication and collaboration | **Theory**   * 1. Communication and collaboration      1. Netiquette principles      2. Communication concepts         1. Online communities         2. Communication tools      3. Email concepts         1. importance of effective email         2. email types and their purposes (personal, professional)      4. Electronic Mail         1. Sending E-mail         2. Receiving E-mail         3. Tools and settings         4. Organizing E-mail      5. Digital content copyright and licenses      6. Online collaboration tools         1. Benefits and challenges of online collaboration tools         2. Online storage and productivity            1. Google Drive            2. Dropbox            3. iCloud Drive         3. Online meetings         4. Online learning environment         5. Online calendars (google calendars)         6. Social networks (Facebook/Twitter/setting)      7. Preparation for online collaboration         1. Common set up feature         2. set up      8. Mobile collaboration         1. Key concepts         2. Mobile devices  1. 4.1.7.2 Key types of Mobile Devices    * + 1. Applications        2. Synchronization           1. key aspects of synchronization   **Practice**   * 1. Participate in online communities   2. Download software to support online collaboration tools   3. Upload, download, delete online files/folders   4. Create and send an E-mail   5. Set up an online meeting, share the agenda, and follow up afterward.   6. Share files in an online meeting   7. Install an application on a mobile device   8. Synchronize mobile devices with mail, calendar, other devices |  |
| 1. Apply cybersecurity skills | **Theory**   * 1. Data protection and privacy      1. Introduction to cybersecurity      2. Data security core principles         1. Data confidentiality         2. data integrity         3. data availability      3. Internet security threats         1. malware attacks         2. phishing and social engineering         3. distributed and denial of service         4. password attacks         5. Man-in –the –Middle attack (MitM)         6. Cloud and Internet of Things attacks      4. Computer threats and crimes         1. Environmental threats to computers and information systems         2. Physical threats to computer            1. Theft of hardware            2. Hardware failure            3. Unauthorized access to physical components of a computer system            4. Power surges and outages      5. Computer crimes         1. Types of computer crimes         2. Detection and protection against computer crimes      6. Cybersecurity control measures         1. Physical controls         2. Technical/logical (passwords, pins, biometrics)         3. Operational controls      7. Policies and Laws governing protection of ICT in Kenya         1. The computer Misuse and Cybercrimes Act No.5 of 2018         2. The Data Protection Act No. 24 of 2019   **Practice**   * 1. Create password and biometrics to prevent unauthorized access   2. Use Anti-virus   3. Apply file security   4. Backup data | * Written assessment * Oral assessment * Practical assessment |
| 1. Perform online jobs | **Theory**   1. Online jobs    * 1. Types of online jobs      2. Online job platforms         1. Remotask         2. Cloud worker         3. Data annotation tech         4. Freelance         5. Indeed         6. Oneforma         7. Appen      3. Online account and profile management         1. Types of online accounts and profiles         2. Creating online accounts         3. Managing profiles      4. Online job bidding identification         1. Benefits of online biding         2. Examples of online bidding      5. Online digital identity      6. Executing online task         1. Executing online task effectively      7. Management of online payment accounts         1. Types of online payment accounts         2. Online payment process         3. Steps for effective management   **Practice**   * 1. Search online jobs platforms   2. Create an online account      1. Setup profile      2. Identify online job bidding      3. Create new project | * Written assessment * Oral assessment * Practical assessment * Project |
| 1. Apply job entry techniques | **Theory**   * 1. Job Entry Techniques      1. Types of job opportunities         1. Self-employment         2. Salaried employment         3. Service provision         4. Product development      2. Sources of job opportunities (websites      3. Functional writings         1. Resumes/CV building with word processing tools         2. Crafting effective Cover letters      4. Digital portfolios         1. Academic credentials         2. References and testimonials            1. letter of commendations         3. Certification participations         4. Awards and decorations      5. Interview skills         1. Introduction to interview            1. Virtual interviews            2. Phone interviews            3. Recorded video responses         2. Preparing for virtual interview            1. Setting up your space (quiet environment, background, lighting)            2. Technical readiness (internet connection, camera, microphone)         3. Professional presence on camera            1. Body language (posture, eye contact)            2. Clear and confident communication            3. Grooming for a virtual environment         4. Digital etiquette for virtual interviews            1. Time management (logging in early and checking connections)            2. Muting/unmuting appropriately            3. Handling technical issues            4. Using chat features for technical issues            5. Closing the interview/meeting (thank the interviewer and log out promptly)   **Practice**   * 1. Create a resume and cover letters   2. Using a platform Google site build a portfolio that highlights projects, skills, and accomplishments | * Written Assessment * Practical assessment * Oral assessment * Portfolio of evidence |

**Suggested Methods of Instruction**

* Demonstration by the trainer
* Practical work by trainees
* Viewing of related videos
* Case study
* Role playing
* Project
* Group discussions
* Direct instruction

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** |  |  |  |
|  | Textbooks |  | 5 pcs | 1:5 |
|  | Charts |  |  |  |
|  | PowerPoint presentations | For trainer’s use |  |  |
|  | Whiteboard |  | 1 |  |
|  | Assorted color of whiteboard markers |  |  |  |
|  | Printers |  | 2 |  |
|  | External storage media |  |  |  |
|  | Projector |  | 1 |  |
|  | Whiteboard |  | 1 |  |
|  | Smart board/ Smart TV (where applicable) |  |  |  |
| **B** | **Learning Facilities & infrastructure** |  |  |  |
|  | Lecture/theory room | Size?? | 1 | 1:25 |
|  | Projector |  | 1 |  |
|  | Telephone |  |  |  |
|  | samples of CV |  | 5 |  |
|  | Assorted Flash Cards |  | 25 |  |
|  | Site | Size? | 1 | 1:25 |
| **C** | **Consumable materials** |  |  |  |
|  | Printing Papers |  |  |  |
|  | Assorted color of whiteboard marker |  |  |  |
| **D** | **Tools and Equipment** |  |  |  |
|  | Desktop computers/laptops with the following software:   1. Windows /Linux/Macintosh Operating System 2. Microsoft Office Software 3. Google Workspace Account 4. Antivirus Software |  | 15 pcs |  |
|  | Internet connection | For trainer’s use |  |  |
|  | Rolls flip charts | For trainer’s use | 1 | 1:1 |
|  | Assorted Flash Cards | For trainer’s use | 1 | 1:1 |
|  | Telephone | For trainer’s use | 1 | 1:1 |

# INORGANIC AND ORGANIC CHEMISTRY

**UNIT CODE:** 0531 441 02A

**UNIT DURATION:** 120 HOURS

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Apply inorganic and organic chemistry

**Unit Description**

This unit specifies the competencies required to apply inorganic and organic chemistry. It involves applying physical chemistry principles, inorganic and organic chemistry concepts.

**Summary of Learning Outcomes**

By the end of this unit, the learner should be able to:

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Apply physical chemistry principles | 40 |
|  | Apply inorganic chemistry concepts | 40 |
|  | Apply organic chemistry concepts | 40 |
| **Total** | | **120** |

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcomes** | **Content** | **Suggested Assessment Methods** |
| 1. Apply physical chemistry principles | **Theory**   * 1. Acid and bases      1. Definition of terms         1. Acids         2. Bases         3. Salts      2. Characteristics of acid and bases      3. classification of acids and bases         1. Strong acids and bases         2. Weak acids and bases      4. Uses of acids and bases      5. Preparation of acids and bases   2. Salts      1. Characteristics of Salts      2. classification of Salts      3. Uses of Salts      4. Preparation of Salts   3. Application of ionic and chemical equilibrium properties   4. Application of Gases properties   **Practice**   * 1. Prepare acids and bases   2. Prepare Salts | * Practical * Written tests * Projects * Interviews/ Oral questions * Individual/group assignments * Third party report |
| 1. Apply inorganic chemistry concepts | **Theory**   * 1. Periodic table      1. Definition of terms         1. Periodic Table         2. An element         3. An atom      2. Elements of periodic table      3. Atomic numbers      4. Chemical bonds         1. Ionic bonds         2. Covalent bonds         3. Metallic bonds         4. Hydrogen bonds | * Practical * Written tests * Projects * Interviews/ Oral questions * Individual/group assignments * Third party report |
| 1. Apply organic chemistry concepts | **Theory**   * 1. Organic compounds      1. Definition of a compound      2. Classes of organic compounds         1. Carbohydrates         2. Proteins         3. Lipids         4. Hydrocarbons   2. Physical properties      1. Color      2. Hardness      3. Mass      4. Solubility   3. Chemical properties      1. Ph      2. Chemical stability      3. Radioactivity      4. Flammability      5. Heat of combustion   4. Purification of synthesized compounds      1. Uses of purified compounds   **Practice**   * 1. Carry out purification of ssynthesized compounds | * Practical * Written tests * Projects * Interviews/ Oral questions * Individual/group assignments * Third party report |

**Suggested Methods of Instruction**

* Demonstration
* Role playing
* Group discussion
* Direct instruction
* Question & Answer

**Recommended Resources for 25 trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** |  |  |  |
| 1.) | **Nitric acid (HNO₃)** |  | 25 lit | 1:1 |
| 2.) | **Sulfuric acid (H₂SO₄)** |  | 25 lit | 1.1 |
| 3.) | **Calcium hydroxide (Ca (OH)₂)** |  |  |  |
| 4.) | **Sodium hydroxide (NaOH)** |  | 25 lit | 1.1 |
| 5.) | **Phosphoric acid (H₃PO₄)** |  | 25 lit | 1.1 |
| **B** | **Learning Facilities & infrastructure** |  |  |  |
| 1.) | Lecture/theory room |  | 1 | 1:25 |
| 2.) | Laboratory |  | 1 | 1:25 |
| **C** | **Tools and Equipment** |  |  |  |
| 1.) | **Beakers** |  | 25 pcs | 1:1 |
| 2.) | **Funnels** |  | 25 pcs | 1:1 |
| 3.) | **Magnetic stirrers** |  | 25 pcs | 1:1 |
| 4.) | **Flasks** |  | 5 pcs | 1:5 |
| 5.) | **Test tubes and racks** |  | 25 pcs | 1:1 |
| 6.) | **Pipettes** |  | 25 pcs | 1:1 |
| 7.) | **Thermometers** |  | 25 pcs | 1:1 |
| 8.) | **pH meters or pH strips** |  | 25 pcs | 1:1 |

# ENVIRONMENTAL WASTE MANAGEMENT

**UNIT CODE:** 0521 451 03A

**UNIT DURATION:** 150 HOURS

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: perform environmental waste management

**Unit Description**

This unit covers the competencies required to perform environmental waste management. It involves performing environmental waste segregation, performing environmental waste collection, performing environmental waste transportation, carrying out environmental waste treatment, carrying out environmental waste disposal and creating environmental waste management awareness

**Summary of Learning Outcomes**

By the end of this unit, the learner should be able to:

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Perform environmental waste segregation | 25 |
|  | Perform environmental waste collection | 25 |
|  | Perform environmental waste transportation | 25 |
|  | Carry out environmental waste treatment | 25 |
|  | Carry out environmental waste disposal | 25 |
|  | Create environmental waste management awareness | 25 |
| **Total** | | **150** |

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcomes** | **Content** | **Suggested Assessment Methods** |
| 1. Perform environmental waste collection | **Theory**   * 1. Environmental waste collection      1. Types of waste      2. Sources of waste      3. Waste composition and characteristics   2. Waste collection and storage bins      1. Waste collection bins and Colour coding   3. Waste collection      1. Waste collection points      2. Methods of waste collection      3. Procedure of waste collection      4. Types of waste collection vehicles      5. Waste collection scheduling routes      6. Importance of waste collection      7. Challenges facing waste collection      8. Mitigation measures   4. Waste collection safety   **Practice**   * 1. Carry out waste collection and color code | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 1. Perform environmental waste segregation | **Theory**   * 1. Waste Segregation and Sorting      1. Waste Segregation methods         1. Manual sorting         2. Automated sorting      2. Waste segregation process      3. Benefits of waste segregation      4. Waste segregation Challenges   **Practice**   * 1. Set up waste segregation station | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 1. Perform Environmental waste transportation | **Theory**   * 1. Waste transportation      1. Waste transportation facilities      2. Transportation safety      3. Challenges facing waste transportation   2. Environmental regulations SWMA 2022      1. Principles of transportation according to SWMA 2020   **Practice**   * 1. Transport waste to designated area | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 4. Carry out environmental waste treatment | **Theory**   * 1. Environmental waste treatment      1. Waste treatment facilities      2. Waste treatment procedure      3. Safety measures      4. Importance of treating waste      5. Challenges facing waste treatments   2. Methods of waste treatment   3. Monitoring and evaluation   4. Waste treatment policy and guidelines   **Practice**   * 1. Carry out waste treatment | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 5. Carry out environmental waste disposal | **Theory**   1. Environmental waste disposal    * 1. Waste disposal activities    1. Waste Disposal Site Mapping       1. Importance of mapping waste disposal sites       2. Techniques and tools for site mapping          1. Geographic Information Systems (GIS)       3. Factors to consider when mapping disposal sites    2. Environmental Impacts of Improper Waste Management    3. Guidelines for safe environmental waste disposal   **Practice**   * 1. Carry out waste disposal. | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 6. Create environmental waste management awareness | **Theory**   1. Environmental Waste Management Awareness    * 1. Types of waste management awareness activities      2. Importance of community education and involvement    1. Waste management tools and strategies for monitoring       1. Importance of monitoring waste management performance    2. Significance of waste management    3. Waste management activities       1. Monitoring of waste management activities   **Practice**   * 1. Practice waste management awareness in schools and market place | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |

**Suggested Methods of Instruction**

* Demonstration
* Role playing
* Group discussion
* Direct instruction

**Recommended Resources for 25 trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** |  |  |  |
| 1.) | Brooms |  | 25pcs | 1:1 |
| 2.) | Bins |  | 10 pcs | 1.5 |
| 3.) | PPEs |  | 25 pcs | 1.1 |
| **B** | **Learning Facilities & infrastructure** |  |  |  |
| 1.) | Lecture/theory room |  | 1 | 1:25 |
| 2.) | Laboratory |  | 1 | 1:25 |
| **C** | **Tools and Equipment** |  |  |  |
| 1.) | Shovel |  | 5 pcs | 1:5 |
| 2.) | Rakes |  | 25pcs | 1:1 |
| 3.) | Dump trucks and trailers |  | 25 pcs | 1:1 |
| 4.) | Waste compactor |  | 5 Pcs | 1.5 |

**ENVIRONMENTAL POLLUTION**

**UNIT CODE:** 0521 451 04A

**UNIT DURATION:**150 HOURS

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Monitor environmental pollution

**Unit Description**

This unit specifies the competencies required to monitor environmental pollution. It involves assessing air quality, monitoring water quality, monitoring soil quality, monitoring noise pollution and creating environmental pollution awareness

**Summary of Learning Outcomes**

By the end of this unit the trainee should be able to:

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Assess air quality | 30 |
|  | 2. Monitor water quality | 30 |
|  | 3. Monitor soil quality | 30 |
|  | 4. Monitor noise pollution | 30 |
|  | 5. Conduct environmental pollution awareness | 30 |
| **Total** | | **150** |

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcomes** | **Content** | **Suggested Assessment Methods** |
| 1. Assess air quality | **Theory**   * 1. Air Quality      1. Types of air pollution      2. Sources of air pollution      3. Health and environmental effects of air pollution   2. Air Quality emissions      1. Components of air quality emission   3. Air quality monitoring      1. Air Quality Monitoring Networks      2. Air Quality Measurement Techniques         1. Sampling methods (passive and active)         2. Analytical techniques for measuring air pollutants (spectroscopy, chromatography)   4. **Air Quality determination tool**      1. **Data Analysis Tools**          1. Statistical analysis and modelling of air quality data         2. Spatial and temporal analysis of air pollution patterns   5. Air quality assessment process   6. Air Pollution Control and Mitigation      1. Emission Control Technologies      2. Clean Energy and Sustainable   7. Air quality management plans      1. Air Quality Monitoring and Enforcement   **Practice**   * 1. Carry out air quality assessment | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 1. Monitor water quality | **Theory**   1. Water quality    * 1. Water pollution         1. Types of water pollutants: point and non-point sources         2. Sources of water pollution: industrial, agricultural, domestic, municipal         3. Impacts of water pollution on human health, ecosystems, and economic activities    1. Water Quality Sampling       1. Water quality Sampling tools          1. Sampling Bottles          2. Sampling Dippers and Buckets    2. Water quality Sampling methods       1. Grab samples       2. Composite samples    3. Water quality measurement       1. Key water quality parameters measured          1. Physical          2. Chemical          3. Biological    4. Water quality measuring tools    5. Water quality measurement importance    6. Water Pollution Control and Mitigation    7. Water Quality Monitoring and Enforcement   **Practice**   * 1. Carry out water quality assessment | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 1. Monitor soil quality | **Theory**   * 1. Soil quality      1. Soil sampling         1. Methods of soil sampling         2. Soil sampling tool         3. Procedure of soil sampling   2. Soil sampling analysis      1. Types of soil tests      2. Importance of soil testing      3. Steps in soil testing   3. Soil quality monitoring   **Practice**   * 1. Carry out soil testing | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 1. Monitor noise pollution | **Theory**   1. Noise pollution    * 1. Sources of noise pollution      2. Impacts of Noise Pollution    1. Noise pollution levels       1. Noise measurements tools       2. Noise measurement principles       3. Measurement Technique       4. Standards and Guidelines    2. Noise pollution control       1. Noise Source Control       2. Noise Propagation Control       3. Noise Exposure Control    3. Routine noise pollution inspection       1. Inspection technique       2. Importance of routine inspection    4. Noise pollution management    5. Noise Pollution Monitoring and Enforcement       1. Monitoring and compliance       2. Application of EMCA Recommendations   **Practice**   * 1. Measure and analyse noise pollution levels | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 5. Conduct environmental pollution awareness | 1. Environmental pollution Awareness    * 1. Types of environmental pollution      2. Sources of environmental pollution    1. Environmental pollution assessment       1. Pollution monitoring techniques       2. Data Analysis and Interpretation    2. Environmental Pollution Control and Mitigation       1. Pollution Prevention and Control Technologies       2. Sustainable Practices and Policies    3. Environmental pollution awareness    4. Environmental awareness activities   **Practice**   * 1. Identify and map environmental pollution emission sources | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |

**Suggested Methods of Instruction**

* Demonstration
* Role playing
* Group discussion
* Direct instruction

**Recommended Resources for 25 trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** |  |  |  |
| 1.) | Khaki bags |  | 25pcs | 1:1 |
| 2.) | Labelling tags |  | 25 pcs | 1.1 |
| **B** | **Learning Facilities & infrastructure** |  |  |  |
| 1.) | Lecture/theory room |  | 1 | 1:25 |
| 2.) | Laboratory |  | 1 | 1:25 |
| **C** | **Tools and Equipment** |  |  |  |
| 1.) | Buckets |  | 25 pcs | 1:1 |
| 2.) | PPEs |  | 25pcs | 1:1 |
| 3.) | Jembe |  | 10 pcs | 1:5 |

**MODULE II**

# COMMUNICATION SKILLS

**UNIT CODE:** 0031 441 02A

**UNIT DURATION: 40** HOURS

**Relationship to Occupational Standards**

This unit addresses the unit of competency: **Demonstrate communication skills.**

**Unit Description**

This unit covers the competencies required to demonstrate communication skills. It involves applying communication channels, written, non-verbal, oral, and group communication skills.

**Summary of Learning Outcomes**

By the end of this unit, the learner should be able to:

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Apply communication channels | 10 |
|  | Apply written communication skills | 12 |
|  | Apply non-verbal communication skills | 4 |
|  | Apply oral communication skills | 4 |
|  | Apply group communication skills | 10 |
| **Total** | | **40** |

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcomes** | **Content** | **Suggested Assessment Methods** |
| 1. Apply communication channels | **Theory**   1. Communication Channels    * 1. Introduction to communication.      2. Importance of communication.      3. Elements of communication.      4. Principles of effective communication.      5. Channels of communication.      6. Factors to consider when selecting the channels of communication.      7. Flows /patterns of communication.      8. Sources of information.      9. Organizational policies.    1. Challenges of effective communication   Barriers to effective communication.   * + 1. Ways to overcome barriers to effective communication.   1. Evaluation of Communication channels at workplace.      1. Ways of evaluating communication channels.   **Practise**   * 1. Draw communication process, discuss and present its elements of communication. | * Written tests * Individual/group assignments * Interviews/ Oral questions * Reflection papers * Third party report |
| 1. Apply written communication skills | **Theory**   1. Written communication. 2. Definition of written communication. 3. Importance of written communication. 4. Challenges of written communication.    1. Written communication needs.       1. Types of written communication. 5. Letters 6. Memorandums 7. Notices 8. Minutes 9. Curriculum vitae 10. Reports 11. Speech 12. Agenda 13. Advertisements 14. Emails 15. Short messages     * 1. Barriers of written communication needs.     1. Analysis, evaluation, and revising of written communication.   2.3.1 Organisation requirements for written communication.  **Practise**   * 1. Draft functional writings based on the checklist.  1. Letters 2. memorandums 3. Notices 4. Minutes 5. Reports 6. speech 7. Agenda 8. Advertisement 9. Curriculum 10. Emails 11. Short messages | * Written tests * Individual/group assignments * Interviews/ Oral questions * Reflection papers * Third party report |
| 1. Apply non-verbal communication skills | **Theory**   1. Non-verbal communication. 2. Definition of non-verbal communication.    1. Non-verbal communication techniques.       1. Body language          1. Body movement (Nodding &Shaking of head)          2. Eye contact          3. Posture          4. Facial expression          5. Touch/smell          6. Physiological changes          7. Change of time(chronemics)          8. Paralanguage ( vocalus)          9. Gestures.       2. Importance of non-verbal communication.       3. Challenges of non-verbal communication.   **Practice**   * 1. In pairs demonstrate types of body language. | * Written tests * Interviews/ Oral questions * Individual/group assignments |
| 1. Apply oral communication skills | **Theory**   1. Oral communication. 2. Definition of terms.    1. Oral communication.    2. Communication pathways.    3. Policy.    4. Organization policy.    5. Questioning techniques.    6. Etiquette.    7. Active listening.    8. Types of oral communication in an organization.       1. Face to face.       2. Telephone.       3. Record in video.       4. Public speaking.       5. Monologue.       6. Dialogue.       7. Lecturing.       8. Preaching.    9. Communication pathways       1. Types of Communication Pathways          1. Formal.          2. Informal.       2. Advantages and disadvantages of formal and informal communication pathways.    10. Ways of reviewing communication Pathways of oral communication.    11. Maintenance of oral communication pathways.    12. Workplace etiquette.        1. Types of etiquette applied at the work place.        2. Importance of etiquette at the work place.    13. Active listening.        1. Importance of active listening.        2. Techniques of active listening.           1. Pay attention.           2. Show that you are listening.           3. Withholding judgement.           4. Clarifying.           5. Reflecting.           6. Summarizing.           7. Sharing.        3. Stages of active listening.           1. Receiving.           2. Understanding.           3. Evaluating.           4. Remembering.           5. Responding. 3. **Practice**    1. In groups practice how etiquette is applied at the workplace.    2. In pairs initiate a conversation based on Question answer method.    3. Prepare a presentation on public speaking and present. | * Written tests * Individual/group assignments * Interviews/ Oral questions * Reflection papers * Third party report |
| 1. Apply group communication skills. | **Theory**   1. Group communication strategies. 2. Definition of terms. 3. Group communication. 4. Communication strategies. 5. Establishing rapport.    1. Organization of groups. 6. Ways to develop action plan.    1. Effective questioning, listening and non-verbal communication techniques. 7. Effective questioning techniques. 8. Types of questions. 9. Leading questions. 10. Open ended questions. 11. Closed questions. 12. Probing questions. 13. Clarifying questions. 14. Factual questions. 15. Descriptive questions. 16. Opinion questions. 17. Follow-up questions. 18. Rhetoric questions. 19. Reflective questions. 20. Hypothetical questions. 21. Clarifying questions. 22. Benefits of effective questioning. 23. Challenges of effective questioning. 24. Turn-taking techniques. 25. Importance of turn taking in a speech. 26. Challenges of turn taking in a speech.     1. Challenges of Group communication.        1. Issues/challenges of group communication.        2. Types of conflicts.     2. Intrapersonal conflict     3. Interpersonal conflict     4. Intergroup conflict     5. Intragroup conflict     6. Individual and group conflict.     7. Inter organizational conflict.        1. Conflict resolution techniques.     8. Team work.        1. Definition of team work.        2. Elements of teamwork.           1. Teamwork skills.           2. Benefits of team work.           3. Challenges of teamwork.   **Practice**   * 1. In pairs practice turn –taking in a speech.   2. Delegate roles and responsibilities in a group. | * Written tests * Individual/group assignments * Interviews/ Oral questions * Reflection papers * Third party report |

**Suggested Methods of Instruction**

* Role playing
* Group discussion
* Direct instruction

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** |  |  |  |
|  | Textbooks |  | 5 pcs | 1:5 |
|  | Charts |  |  |  |
|  | PowerPoint presentations | For trainer’s use |  |  |
|  | Whiteboard |  | 1 |  |
|  | Assorted color of whiteboard markers |  |  |  |
|  | Printers |  | 2 |  |
|  | External storage media |  |  |  |
|  | Projector |  | 1 |  |
|  | Whiteboard |  | 1 |  |
|  | Smart board/ Smart TV (where applicable) |  |  |  |
| **B** | **Learning Facilities & infrastructure** |  |  |  |
|  | Lecture/theory room | Size?? | 1 | 1:25 |
|  | Projector |  | 1 |  |
|  | Telephone |  |  |  |
|  | samples of CV |  | 5 |  |
|  | Assorted Flash Cards |  | 25 |  |
|  | Site | Size? | 1 | 1:25 |
| **C** | **Consumable materials** |  |  |  |
| 1. | Printing Papers |  |  |  |
| 2. | Assorted color of whiteboard marker |  |  |  |
| **D** | **Tools and Equipment** |  |  |  |
|  | Desktop computers/laptops with the following software:   1. Windows /Linux/Macintosh Operating System 2. Microsoft Office Software 3. Google Workspace Account 4. Antivirus Software |  | 15 pcs |  |
|  | Internet connection | For trainer’s use |  |  |
|  | Rolls flip charts |  |  |  |
|  | Assorted Flash Cards |  |  |  |
|  | Telephone |  |  |  |

# ENVIRONMENTAL HEALTH AND SAFETY PRACTICES

**UNIT CODE:** 0521 451 06A

**UNIT DURATION:** 100 HOURS

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: **Perform Environmental health and safety** **practices**

**Unit Description**

This unit covers the competencies required to perform Environmental health and safety practices it involves performing hazard identification, assessing environmental health and safety risks, managing environmental health and safety risks and creating environmental health and safety awareness

**Summary of Learning Outcomes**

By the end of this unit, the learner should be able to:

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Perform hazard identification | 30 |
|  | Assess environmental health and safety risks | 30 |
|  | Manage environmental health and safety risks | 30 |
|  | Create environmental health and Safety Awareness | 30 |
| **Total** | | **120** |

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcomes** | **Content** | **Suggested Assessment Methods** |
| 1.Perform hazard identification | **Theory**   * 1. Environmental Health and Safety      1. Definition of terms         1. Introduction to Environmental Health and Safety      2. Types of Environmental Hazards         1. Physical hazards         2. Chemical hazards         3. Biological hazards         4. Ergonomic hazards   2. hazard identification techniques   3. hazard categorization   4. Hazard control and prevention   5. Environmental health and safety management systems   6. Environmental Health and Safety Monitoring and Evaluation   **Practice**   1. Conduct hazard identification and categorization | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 2. assess environmental health and safety risks | **Theory**   * 1. Environmental Health and Safety Risks      1. Potential environmental health and safety risks      2. Types of Health and Safety Risks  1. Risks identification techniques 2. Prioritization Environmental Health and Safety Risks    * 1. Prioritization Criteria 3. Risk assessment    * 1. Methods of conducting risk assessment      2. Tools of conducting risk assessment      3. Risk assessment procedure 4. Environmental health and safety risks Mitigation and Monitoring    * 1. Risk Mitigation Plans      2. Monitoring   **Practice**   * 1. Conduct risk assessments   2. Perform hazard identification exercise | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 3.Manage environmental health and safety risks | **Theory**     1. Hierarchy of Controls for Environmental Hazards    * 1. Hierarchy of control    1. Environmental Protection Measures    2. Environmental and health policies    3. Environmental Health and Safety Risk Emergency Response Measures       1. Emergency Response Planning       2. Response procedures   **Practice**   * 1. Practice the application of the hierarchy of controls   2. Conduct mock emergency response exercises | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 4. Create environmental health and Safety Awareness | **Theory**   * 1. Environmental and safety committee      1. llegal framework for environmental health and safety (EHS) committees in Kenya.      2. Roles and responsibilities of EHS committees      3. Procedures for constituting an EHS committee in organizations.   2. Environmental hazards and risks exposure      1. Work Procedures for Managing Environmental Hazards   3. Environmental health and safety awareness      1. EHS Awareness Programs         1. Importance of raising awareness on workplace environmental hazards.         2. Components of a successful EHS awareness program      2. Training on Environmental Health and Safety      3. Communication and Reporting in EHS   **Practice**   * 1. Design and present an EHS awareness campaign tailored to a specific industry or workplace. | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |

**Suggested Methods of Instruction**

* Demonstration
* Role playing
* Group discussion
* Direct instruction

**Recommended Resources for 25 trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** |  |  |  |
| 1.) | Waste Storage |  | 10 pcs | 1:3 |
| 2.) | Khaki bags |  | 25 pcs | 1.1 |
| 3.) | Plastic bags |  | 25 pcs | 1.1 |
| **B** | **Learning Facilities & infrastructure** |  |  |  |
| 1.) | Lecture/theory room |  | 1 | 1:25 |
| 2.) | Laboratory |  | 1 | 1:25 |
| **C** | **Tools and Equipment** |  |  |  |
| 1.) | Centrifuges |  | 25 pcs | 1:1 |
| 2.) | Refrigeration |  | 5 pcs | 1:5 |
| 3.) | Microscopes |  | 5 pcs | 1:5 |
| 4.) | Heating Equipment |  | 25 pcs | 1:1 |
| 5.) | Analytical Instruments |  | 5 pcs | 1:5 |
| 6.) | Safety Equipment |  | 25 pcs | 1:1 |
| 7.) | pH Meters and Conductivity Meters |  | 25 pcs | 1:1 |

# NATURAL RESOURCE ECONOMICS

**UNIT CODE:** 0521 441 07A

**UNIT DURATION:** 100 HOURS

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency**: Apply natural resource economics**

**Unit Description**

This unit covers the competencies required to apply natural resource economics, it involves applying economics principles of natural resource, determining commodity prices, interpreting production function curves, applying tragedy of the commons, applying sustainable development goals.

**Summary of Learning Outcomes**

By the end of this unit, the learner should be able to:

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Apply economics principles of natural resource, | 20 |
|  | Determine commodity prices, | 20 |
|  | Interpret production function curves, | 40 |
|  | Apply tragedy of the commons, | 30 |
|  | To apply sustainable development goals | 30 |
| **Total** | | **140** |

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcomes** | **Content** | **Suggested Assessment Methods** |
| 1.Apply economics principles of natural resource | **Theory**   1. Principles of natural resources    * 1. Definition of natural resources      2. Types of natural resources      * 1. Data Collection Tools      1. Types of tools used for data collection in natural resource management   2. Natural Economic Resource Data Management      1. Data Management Principles   3. Economic criteria      1. Monitoring Economic Criteria      2. Work Procedures for Monitoring Economic Criteria      3. Challenges in Monitoring Economic Criteria      * 1. Command and control standards      1. Definition of CAC Standards      2. Types of CAC Standards      3. Purpose of CAC Standards      4. Implementation of CAC Standards      5. Economic Evaluation of Command-and-Control Policies   **Practice**   * 1. Conduct a basic Cost-Benefit Analysis for a natural resource project | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 2. Determine commodity prices | * 1. Commodity Prices      1. Natural Resource Prices      2. The process of determining the market value of natural resources      3. Importance of pricing natural resources  1. Resource price allocation    * 1. Definition and Importance resource price allocation      2. Work Procedures for Implementing Pricing Allocation         1. Institutional Guidelines         2. Allocation Methods 2. Property Right Approaches    * 1. Importance of Property Rights      2. Implementing Property Right Approaches      3. Property Rights and Economic Development 3. Market Failure    * 1. Types of Market Failure in Natural Resource      2. Market Demand and Its Role in Resource Allocation      3. Tools for Monitoring Market Failure      4. Role of Government and Institutions   **Practice**   1. Conduct market demand analysis and identify market failures | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 3.Interpret production function curves | **Theory**   1. Definition of terms    * 1. Demand      2. Supply      3. Demand analysis      4. Supply analysis      5. Equilibrium Price 2. Factors Affecting Supply and Demand 3. Shifts in Supply and Demand 4. Natural Resources    * 1. Types of Natural Resources      2. Economic Importance of Natural resource      3. Resource Scarcity      4. Economic Value of Natural Resources    1. Production Decisions Based on Market Demand       1. Market Demand in Production Decision-Making       2. Production Strategies Based on Demand    2. Production Relationship Based on Input and Output Performance in an Agricultural Enterprise    3. Principles of Production Function Based on the Nature of Agricultural Enterprise   **Practice**   * 1. Implement sustainable practices in a simulated environment | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 4. Apply tragedy of the commons | **Theory**   1. Common environmental resources    * 1. Types of Environmental Common Resources      2. Work Procedures for Resource Identification   .   1. Environmental common resources utilization    * 1. Data Collection Tools      2. Data Collection Protocols 2. Utilization Threats to Environmental Common Resources    * 1. Threat Assessment Techniques      2. Types of threats in common resources 3. Utilization Models for Environmental Common Resources    * 1. Common utilization modes      2. Effectiveness of the models   **Practice**   1. Practice identification of common resources using field surveys and GIS tools | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 5. Apply sustainable development goals | **Theory**   * 1. SDG Models identification      1. Overview of SDGs and their importance in sustainable development      2. Key principles and objectives of Agenda 2   2. SDG Models application      1. Model Development      2. Implementation Strategies   **Practice**   * 1. Develop and apply SDG models in simulated environments | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |

**Suggested Methods of Instruction**

* Demonstration
* Role playing
* Group discussion
* Direct instruction

**Recommended Resources for 25 trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** |  |  |  |
| 1.) | Textbooks |  | 25pcs | 1:1 |
| 2.) | Reading Materials |  | 25 pcs | 1.1 |
| 3.) | Policy Documents |  | 25 pcs | 1.1 |
| **B** | **Learning Facilities & infrastructure** |  |  |  |
| 1.) | Lecture/theory room |  | 1 | 1:25 |
| **C** | **Tools and Equipment** |  |  |  |
| 1.) | Analytical Tools |  | 25 pcs | 1:1 |

# ENVIRONMENTAL ECOLOGY MAINTENANCE

UNIT CODE: 0521 451 08A

UNIT DURATION: 120 HOURS

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: **Perform environmental ecology maintenance**

**Unit Description**

This unit covers the competencies required to perform environmental ecology maintenance, it involves carrying out biological resource inventory, performing plant propagation, maintaining ecological wildlife sanctuary and performing ecological restoration.

**Summary of Learning Outcomes**

By the end of this unit the trainee should be able to:

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Carry out biological resource inventory | 30 |
|  | Perform plant propagation | 40 |
|  | Maintain ecological wildlife sanctuary | 40 |
|  | Perform ecological restoration | 40 |
| **Total** | | **150** |

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcomes** | **Content** | **Suggested Assessment Methods** |
| 1. Carry out biological resource inventory | **Theory**   * 1. Resources for inventory      1. Define of terms         1. Resource         2. Resource inventory      2. Resource mapping techniques         1. Geographic Information System (GIS) tools and techniques         2. Field mapping methods   2. Inventory data collection tools      1. Types of Data Collection Tools:         1. Digital tools         2. Manual tools      2. Data collection techniques         1. Random         2. Systematic         3. Stratified      3. Safety and compliance   **Practice**   * 1. Carry Mapping Exercises      1. Using GIS tools for resource mapping      2. Creating and interpreting resource maps   2. Data Collection Simulations      1. Conducting mock field data collection      2. Practicing with various data collection tools | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 1. Perform plant propagation | **Theory**   * 1. Plant propagation      1. Definition and importance of plant propagation      2. Types of plant propagation         1. Sexual         2. Asexual      3. Plant propagation tools      4. Tool preparation and maintenance   2. Plant Species Identification:      1. Characteristics of different plant species      2. Tools for species identification   3. Monitoring Plant growth      1. Growth Monitoring Techniques      2. Data Collection and Analysis   **Practice**   * 1. Propagation Simulations      1. Conducting mock propagation using various methods   2. Growth Monitoring Drills      1. Practicing growth monitoring techniques and recording data | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 3.Maintain ecological wildlife sanctuary | 1. Wildlife sanctuary    * 1. Definition of wildlife sanctuary      2. Types of wildlife sanctuary      3. Importance of wildlife sanctuary 2. Wildlife identification    * 1. Characteristics of various species      2. Tools for species identification 3. Wildlife sanctuary data collection    * 1. Types of data collection tools         1. GPS tracking         2. Direct observation 4. Wildlife sanctuary maintenance    * 1. Ecosystem Management Practices      2. Monitoring and Evaluation      3. Community Involvement   **Practice**   1. Mapping Exercise 2. Data Collection Simulations 3. Ecosystem Management Drills | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 4 Perform ecological restoration | **Theory**   * 1. Degraded ecology      1. Criteria for identifying degradation      2. Ecological degradation indicators      3. Types of restoration tools         1. Soil stabilization tools         2. Planting equipment         3. Erosion control materials   2. Ecological restoration      1. Definition and significance of ecological restoration      2. 4.2.2 Goals and objectives of restoration projects      3. Restoration techniques      4. Restoration process      5. Monitoring and evaluation      6. Challenges in ecological restoration   **Practice**   * 1. Identify and map degraded ecological areas in the field   2. Conduct mock restoration activities using various techniques | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |

**Suggested Methods of Instruction**

* Demonstration
* Role playing
* Group discussion
* Direct instruction

**Recommended Resources for 25 trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** |  |  |  |
| 1.) | Books and Manuals |  | 25pcs | 1:1 |
| **B** | **Learning Facilities & infrastructure** |  |  |  |
| 1.) | Lecture/theory room |  | 1 | 1:25 |
| **C** | **Tools and Equipment** |  |  |  |
| 1.) | Camera Traps |  | 5 pcs | 1:5 |
| 2.) | Data Loggers |  | 25pcs | 1:1 |
| 3.) | GPS Devices |  | 25 pcs | 1:1 |

# CLIMATE CHANGE

**UNIT CODE:** 0521 451 09A

**UNIT DURATION:** 120 HOURS

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Monitor climate change

**Unit Description**

This unit covers the competencies required to monitor climate impact assessment. It involves carrying out weather data collection, monitoring greenhouse gas emissions and creating awareness on climate change

**Summary of Learning Outcomes**

By the end of this unit the trainee should be able to:

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Carryout weather data collection | 40 |
|  | 2. Monitor greenhouse gas emissions | 40 |
|  | 3. Create awareness on climate change | 40 |
| **Total** | | **120** |

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcomes** | **Content** | **Suggested Assessment Methods** |
| 1. Carryout weather data collection | **Theory**   * 1. Weather Data Collection      1. Definition of terms      2. Climate      3. Weather   2. Types of weather forecasting instruments      1. Thermomotor      2. Barometers,      3. Anemometer      4. Rain gauges   3. Importance of weather forecasting instrument   4. Weather Patterns      1. Procedure of recording weather patterns      2. Weather patterns recording Techniques   5. Maintaining Weather Forecasting Instruments      1. Maintenance Procedures      2. Importance of maintaining the equipment   **Practice**   * 1. Carry out weather pattern recording | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 2.Monitor greenhouse gas emissions | * 1. Greenhouse gas Emission      1. Definition and types of greenhouse gases CO₂, methane, nitrous oxide      2. Sources and effects on climate change   2. Greenhouse Gas Determination Tools      1. Types of Determination Tools   3. Measuring Greenhouse Gas Emissions      1. Measurement Techniques         1. Direct Measurement         2. Remote Sensing         3. Modelling and Estimation   4. Steps in Measurement   5. Significance of measuring greenhouse gases   6. Greenhouse gas emission reduction awareness      1. Strategies for Raising Awareness   7. Monitoring Greenhouse Gas Emissions      1. Methods of monitoring GHG emission      2. Steps of Monitoring GHG emission      3. Regulatory Framework Monitoring GHG emission   **Practice**   * 1. Carry out GHG emission monitoring | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 3. To create awareness on climate change | **Theory**   * 1. Climate change      1. Causes of climate change      2. Impacts of climate change   2. Climate Change Awareness      1. Data collection strategies      2. Climate change awareness Strategies   3. Climate change intervention measures      1. Mitigation strategies      2. Adaptation strategies      3. Policy and governance   **Practice**   * 1. Carry out climate change awareness campaigns | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |

**Suggested Methods of Instruction**

* Demonstration
* Role playing
* Group discussion
* Direct instruction

**Recommended Resources for 25 trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Facilities & infrastructure** |  |  |  |
| 1.) | Lecture/theory room |  | 1 | 1:25 |
| 2.) | Laboratory |  | 1 | 1:25 |
| **B** | **Tools and Equipment** |  |  |  |
| 1.) | Rain gauge |  | 10 pcs | 1:5 |
| 2.) | Wind vane |  | 25pcs | 1:1 |
| 3.) | Thermometer |  | 25 pcs | 1:1 |
| 4.) | Sechi disc |  | 10pcs | 1.5 |
| 5.) | Lightning detector |  | 10 pcs | 1.5 |
| 6.) | Windsock |  | 10 pcs | 1.5 |

**MODULE III**

**WORK ETHICS AND PRACTICES**

**UNIT CODE:** 0417 441 10A

**Duration of Unit:** 40 hours

**Relationship to Occupational Standards**

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

**Unit Description**

This unit covers competencies required to demonstrate employability skills. It involves the ability to: conduct self-management, promote ethical work practices and values, promote teamwork, manage workplace conflicts, maintain professional and personal development, apply problem-solving, and promote customer care.

**S**

**ummary of Learning Outcomes**

By the end of this unit the learner should be able to:

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Apply Self-Management Skills | 10 |
|  | Promote Ethical Practices and Values | 4 |
|  | Promote Teamwork | 10 |
|  | Maintain Professional and Personal Development | 10 |
|  | Apply Problem-Solving Skills | 4 |
|  | 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 challenges   5. Emotional intelligence * Coping with Work Stress. * Assertiveness versus aggressiveness and passiveness * Developing and maintaining high self-esteem * Developing and maintaining positive self-image   1. Time management   2. Setting performance targets   3. Monitoring and evaluating performance targets | * Practical * Portfolio of evidence * Third party report * Written tests * Oral tests |
| 1. Promote Ethical Work Practices And Values | * 1. Integrity   2. Core Values, ethics and beliefs   3. Patriotism   4. Professionalism   5. Organizational codes of conduct   2.6 Industry policies and procedures | * Practical * Portfolio of evidence * Third party report * Written tests * Oral tests |
| 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   3.9 Team performance and evaluation   * 1. Conflicts and conflict resolution   2. Gender and diversity mainstreaming   3. Developing Healthy workplace relationships   4. Adaptability and flexibility   5. Coaching and mentoring skills | * Practical * Portfolio of evidence * Third party report * Written tests * Oral tests |
| 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 | * Practical * Portfolio of evidence * Third party report * Written tests * Oral tests |
| 1. Apply Problem-Solving Skills | 5.1Causes of problems   * 1. Methods of solving problems   2. Problem-solving process   3. Decision making   4. Creative thinking and critical thinking process in development of innovative and practical solutions | * Practical * Portfolio of evidence * Third party report * Written tests * Oral tests |
| 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 | * Practical * Portfolio of evidence * Third party report * Written tests * Oral tests |

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 | Recommendation ratio  (item; Trainee) |
|  | Reference books |  | 5 | 1:5 |
|  | Case studies |  | 5 | 1:5 |
|  | Desktop computers/laptops |  | 5 | 1:5 |
|  | Operating system |  | 1 | 1:25 |
|  | Internet connection |  | 1 | 1:25 |
|  | 1 Projector |  | 1 | 1:25 |
|  | Business plan templates |  | 5 | 1:5 |
|  | 1 Whiteboard |  | 1 | 1:25 |
|  | Assorted color of whiteboard markers |  | Assorted | 1:25 |
|  | Stationery |  | Assorted | 1:5 |
|  | Online pattern libraries |  | Assorted | 1:5 |
|  | Video clips |  | 5 | 1:25 |
|  | Newspapers and Handouts |  | 5 | 1:5 |
|  | 5 Business Journals |  | 5 | 1:5 |
|  | 25 sets of Writing materials |  | 25 | 1:1 |

# LABORATORY TECHNIQUES

**UNIT CODE:** 0711 451 12A

**UNIT DURATION:** 100HOURS

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: **Perform laboratory techniques**

**Unit Description**

This unit covers the competencies required to perform laboratory techniques it involves maintaining laboratory safety, administering first aid, maintaining laboratory equipment, carrying out sample collection and preparing specimen samples

**Summary of Learning Outcomes**

By the end of this unit the learner should be able to:

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Maintain laboratory safety | 20 |
|  | Administer first aid | 20 |
|  | Maintain laboratory equipment | 20 |
|  | Carry out sample collection | 20 |
|  | Prepare specimen samples | 20 |
| **Total** | | **100** |

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcomes** | **Content** | **Suggested Assessment Methods** |
| 1. Maintain laboratory safety | **Theory**   * 1. Laboratory safety      1. Define of terms         + 1. Laboratory safety           2. Risks,           3. Hazards,           4. PPEs      2. Importance of Safety in Laboratories   2. Sources of danger      1. Types of Laboratory Hazards         1. Chemical hazards         2. Biological hazards         3. Physical hazards         4. Ergonomic hazards         5. Equipment Hazards         6. Fire and Explosion Risks      2. Effects of laboratory hazards      3. Ways of minimizing laboratory hazards   3. ***S***afety precaution measures      1. Standard Operating Procedures (SOPs)      2. Personal Protective Equipment (PPE) usage and maintenance      3. Safe handling and storage of hazardous material      4. Emergency procedures and first aid   4. Laboratory occupational, health and safety operation policy      1. laboratory safety policy      2. Policy implementation and communication      3. Safety audits and inspection      4. Training and education of lab personnel   5. laboratory Accidents      1. Types of laboratory accidents         1. Chemical spillage or exposure         2. Biological exposure         3. Physical injuries         4. Equipment malfunctions         5. Fire and explosions      2. Immediate response procedures      3. Reporting and documentations      4. Accident review and prevention actions   **Practice**   * 1. Conducting risk assessments   1.6.1 Identification of Hazards in the laboratory   * + 1. Risk evaluation     2. Control measures  1. Review of historical lab accidents and lessons learned    * 1. Incident Selection      2. Detailed Analysis      3. Preventive measures      4. Application preventive measures | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 1. Administer first aid | **Theory**   1. First Aid    * 1. Definition of terms         1. First Aid         2. First aid kit      2. Types of first aid kits      3. Contents of a Standard First Aid Kit 2. First aid administration    * 1. Basic First Aid Procedures:         1. Treating cuts, burns, and chemical exposures         2. CPR and emergency response         3. Handling chemical spills and exposure         4. Treating thermal burns and electrical shocks         5. Importance of first aid administration    1. First aid communication       1. Define first aid communication       2. Channel of communication       3. Importance of first aid communication   **Practice**   * 1. Simulated Emergency Scenarios:      1. Mock drills for chemical spills, burns, and injuries      2. Role-playing exercises   2. Feedback and Improvement:      1. Debriefing sessions after drills      2. Continuous improvement based on feedback | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 3.Maintain laboratory equipment’s | **Theory**   * 1. Laboratory Equipment      1. Laboratory equipment’s calibration         1. Definition of lab equipment’s calibration         2. Importance of calibration         3. Common Laboratory equipment requiring calibration   2. Calibration Procedures      1. Calibration processes      2. Maintaining calibration logs      3. Traceability and compliance with regulations      * 1. Servicing laboratory equipment      1. Types of maintenance         1. Preventive maintenance         2. Corrective maintenance         3. Importance of servicing   2. Cleaning of laboratory equipment’s      1. Types of contaminants in a laborator      2. Importance of regular cleaning      3. Cleaning procedure      4. Handling and disposing of cleaning waste   **Practice**   * 1. Calibrate various laboratory instruments      1. Glassware      2. Heating Equipment      3. Analytical Instruments      4. Safety Equipment      5. Real-time troubleshooting | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 4 carry out sample collection | 1. Laboratory sample collection    * 1. Types of sample collection      2. Importance of sample collection      3. Procedures of collecting laboratory samples    1. Sample storage procedures and requirements       1. Importance of storing laboratory samples       2. Types of samples and storage requirements          1. Biological samples          2. Environmental samples    2. Sample storage conditions       1. Temperature and humidity control     **Practice**   * 1. Collection Simulation   2. Conducting mock sample collections   3. Practice labelling and storage | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 5 Prepare specimen samples | **Theory**   1. Specimen sample preparation    * 1. Types of specimens and their uses         1. Water Samples         2. Soil Samples         3. Air Samples         4. Biological Samples    1. Methods of preparing different types of specimens   **Practice**   * 1. Carry out Samples preparation      1. Specimen Handling      2. Preparation Techniques      3. Safety Measures   2. Specimen experimental findings      1. Data Recording Methods      2. Reporting Results | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |

**Suggested Methods of Instruction**

* Demonstration
* Role playing
* Group discussion
* Direct instruction

**Recommended Resources for 25 trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** |  |  |  |
| 1.) | Waste Storage |  | 10 pcs | 1:3 |
| 2.) | Khaki bags |  | 25 pcs | 1.1 |
| 3.) | Plastic bags |  | 25 pcs | 1.1 |
| **B** | **Learning Facilities & infrastructure** |  |  |  |
| 1.) | Lecture/theory room |  | 1 | 1:25 |
| 2.) | Laboratory |  | 1 | 1:25 |
| **C** | **Tools and Equipment** |  |  |  |
| 1.) | Centrifuges |  | 25 pcs | 1:1 |
| 2.) | Refrigeration |  | 5 pcs | 1:5 |
| 3.) | Microscopes |  | 5 pcs | 1:5 |
| 4.) | Heating Equipment |  | 25 pcs | 1:1 |
| 5.) | Analytical Instruments |  | 5 pcs | 1:5 |
| 6.) | Safety Equipment |  | 25 pcs | 1:1 |
| 7.) | pH Meters and Conductivity Meters |  | 25 pcs | 1:1 |

# ENVIRONMENTAL PRINCIPLES

**UNIT CODE:** 0521 441 13A

**UNIT DURATION:** 100 HOURS

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: **Apply environmental principles**

**Unit Description**

This unit covers the competencies required to applying environmental principles, it involves applying basic environmental principles, determining energy flow in an ecosystem, applying environmental ethics and values, applying environmental impact assessment principles, applying environmental legislations, applying environmental research techniques.

**Summary of Learning Outcomes**

By the end of this unit the learner should be able to:

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Apply basic environmental principles | 10 |
|  | Determine energy flow in an ecosystem | 20 |
|  | Apply environmental ethics and values | 20 |
|  | Apply environmental impact assessment principles | 20 |
|  | Apply environmental legislations, | 10 |
|  | Apply environmental research techniques. | 20 |
| **Total** | | **100** |

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcomes** | **Content** | **Suggested Assessment Methods** |
| 1. apply basic environmental principles | **Theory**   * 1. Environmental Principles components      1. Definition of terms      2. Components of environment   2. Types of environmental resources   3. Genetics of Organisms      1. Introduction to genetic principles      2. Genetic diversity in plants and animals and its importance in conservation      3. National Biosafety Regulation Guidelines      4. Genetics Research on Plants and Animals         1. Techniques for genetic studies         2. Ethical considerations in genetic modification and biodiversity conservation.  1. Environmental resource conflict management    * 1. Sources of Environmental Resource Conflicts      2. Conflict Resolution Mechanisms      3. Resource Conflict Management    1. Resource Conservation Plans       1. Types of Resource Conservation       2. Types of Resource Conservation Strategies       3. Implementation of Conservation Plans   **Practice**   * 1. Identify Sources of Environmental conflicts and their resolution | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 2. Determine energy flow in an ecosystem | **Theory**   1. Ecosystem energy flow    * 1. Definition and Classification of Ecosystems      2. Indicators of Ecosystem Health 2. Ecological interaction    * 1. Types of Ecological Interactions      2. Assessing Ecological Interactions      3. Techniques for monitoring 3. Bio-geochemical Cycle    * 1. carbon cycle      2. The nitrogen cycles      3. The phosphorus cycle ecosystems      4. The water cycles 4. Guidelines for Monitoring Bio-geochemical Cycles 5. Impact of Bio-geochemical Cycles   **Practice**   1. Conduct field studies to observe and record ecological interactions | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 3.Apply environmental ethics and values | **Theory**   1. Environmental Legislations on Conservation    * 1. Major international environmental agreements and protocol      2. Environmental principles 2. Multilateral Environmental Agreements    * 1. Purpose of MEAs in promoting environmental sustainability      2. Significant MEAs      3. Implementation and Monitoring of MEAs 3. Local ordinances on resource use    * 1. Local Ordinances and International Laws      2. Challenges in Harmonizing Local and International Laws      3. process of implementing local ordinances 4. Environmental ethics on resource consumption    * 1. Principles of Environmental Ethics      2. International Laws Promoting Ethical Resource Use      3. Cultural Perspectives on Environmental Ethics   **Practice**   * 1. Practice the implementation of multilateral agreements | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 4. apply environmental impact assessment principles | **Theory**   1. Environmental Impact Assessment    * 1. Definition of terms         1. EIAs      2. Importance of mapping in Environmental Impact Assessments (EIAs)      3. Steps of EIAs      4. EMCA 2003 (Amended 2019) Regulations on Mapping 2. Baseline Data Collection Tools    * 1. Data Collection Tools      2. Data Collection Protocols 3. Baseline Parameters    * 1. Baseline Environmental Parameters      2. Methods and tools used to measure each parameter      3. 4.3.3 Legal requirement 4. Project Legal and Legislative Framework    * 1. Environmental Legal Framework      2. Project-Specific Legal Requirements 5. Potential Environmental Impacts    * 1. Types of environmental impacts      2. Tools for impact identification      3. Guidelines for Impact Identification 6. Project Stakeholders    * 1. Project key Stakeholders      2. Importance of stakeholder engagement in environmental assessment      3. Role of Stakeholders in EIAs: 7. Public Participation Data Collection    * 1. Methods for collecting public participation data for EIAs      2. Importance of public participation in EIAs      3. Guidelines for Public Participation 8. Environmental Mitigation Measures 9. Baseline Data Collection Tools maintenance    * 1. Tool Maintenance Procedures    1. Monitoring Environmental Outcomes       1. Monitoring techniques   **Practice**   * 1. conduct baseline data collection, impact identification, mitigation planning | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 5. Apply environmental legislations | **Theory**   * 1. Environmental legislation      1. Definition and significance of environmental legal frameworks      2. Key principles and objectives of The Environmental (Impact Assessment and Audit) Regulations, 2003      3. Role of **NEMA** (National Environment Management Authority) in enforcing regulations.   2. Environmental Legal and Legislative Frameworks   3. Environmental Legislation's Compliance      1. Monitoring and compliance      2. Procedure for conducting environmental audits      3. **Consequences of Non-Compliance**   **Practice**   * 1. Develop a mock compliance monitoring plan for an ongoing project   2. Conduct an environmental audit an write a report | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 6.Apply environmental research techniques | **Theory**   1. Environmental Research Techniques    * 1. Criteria for Selecting Environmental Study Areas      2. Mapping Techniques and Tools      3. Steps in Mapping Environmental Study Areas    1. Environmental Samples       1. Introduction to Standard Operating Procedures (SOPs)       2. Types of Environmental Samples       3. Tools for environmental sample collection       4. Environmental Sample Collection Procedures       5. Sample Preservation and Transportation       6. Sample Preparation for Analysis       7. Challenges in Sample Preparation    2. Data Collection       1. Data Collection requirements       2. Types of Data Collected          1. Quantitative Data          2. Qualitative Data       3. Data Collection Methodologies       4. Ethical Considerations    3. Specimen findings       1. Importance of Recording Specimen Findings       2. Institutional SOPs for Record-Keeping       3. Data Management Systems    4. Documenting Environmental Observations       1. Importance of Documenting Environmental Observation       2. SOPs for Environmental Observations       3. Documentation Techniques    5. Importance of Tool Maintenance   **Practice**   * 1. Conduct environmental observations and document them following SOPs. | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |

**Suggested Methods of Instruction**

* Demonstration
* Role playing
* Group discussion
* Direct instruction

**Recommended Resources for 25 trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Facilities & infrastructure** |  |  |  |
| 1.) | Lecture/theory room |  | 1 | 1:25 |
| **B** | **Tools and Equipment** |  |  |  |
| 1.) | Sampling equipment |  | 25 pcs | 1:1 |
| 2.) | pH meters |  | 25 pcs | 1:1 |
| 3.) | Temperature probes |  | 25 pcs | 1:1 |
| 4.) | Moisture meters |  | 25 pcs | 1:1 |
| 5.) | Camera traps |  | 10 pcs | 1:3 |
| 6.) | Air quality monitors |  | 5 pcs | 1:5 |

# NATURAL RESOURCES MONITORING

**UNIT CODE:** 0521 451 14A

**UNIT DURATION:** 150Hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: **Monitor natural resources**

**Unit Description**

This unit covers the competencies required to monitor natural resources; it involves carrying out environmental landscaping techniques, carrying out environmental trail management, maintaining forestry resources, performing wildlife management, performing range land management and performing water resource stewardship

**Summary of Learning Outcomes**

By the end of this unit the trainee should be able to:

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Carry out environmental landscaping techniques, | 25 |
|  | Carry out environmental trail management, | 25 |
|  | Maintain forestry resources, | 25 |
|  | Perform wildlife management, | 25 |
|  | Perform range land management | 25 |
|  | Perform water resource stewardship | 25 |
| **Total** | | **150** |

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcomes** | **Content** | **Suggested Assessment Methods** |
| 1. Carry out environmental landscaping techniques | **Theory**   * 1. Environmental Landscaping      1. Definition and importance of environmental landscaping      2. Benefits of landscaping to the environment and community      3. Landscaping areas   2. Mapping Designated Landscaping Areas      1. Criteria for selecting areas for landscaping      2. Types of Landscaping Tools         1. Hand tools: shovels, rakes, pruners         2. Power tools: lawn mowers, trimmers   3. Landscaping procedure   4. Maintaining landscaped areas      1. Maintenance Practices      2. Monitoring and Evaluation:         1. Regular inspection of landscaped area         2. Adaptive maintenance strategies         3. Education and awareness programs   **Practice**   * 1. Carry Out Landscaping Activities   2. Assemble Landscaping Tools | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 2. Carry out environmental trail management | **Theory**   * 1. Environmental Trail Management      1. Definition and significance      2. Benefits of managing ecosystems for biodiversity and conservation      3. Relevant laws and guidelines for ecological management  1. Sensitive ecosystem    * 1. Types of sensitive ecosystem      2. Criteria for identifying sensitive ecosystems      3. Importance of sensitive ecosystems    1. Ecological Trails Areas       1. Identification ecological trail area       2. Tools for carrying out ecological trail       3. Procedure of creating ecological trails       4. Importance of ecological trails       5. Challenges facing ecological trails    2. Maintenance of ecological trails   **Practice**   * 1. Create ecological trails   2. Maintain ecological trial | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 1. Maintain forestry resources, | **Theory**   1. Forest Conservation and Management    * 1. Types of forest resources 2. Benefits of Forest Conservation    * 1. Environmental      2. Social      3. Economic 3. Tools for collecting data on forest resources    * 1. Types of Data Collection Tools      2. Digital tools: GPS devices, data loggers, tablets      3. Manual tools: notebooks, measuring tapes, calipers 4. Forest Resources Inventor    * 1. Inventory Techniques      2. Data Collection      3. Safety Protocols      4. Documentation 5. Implementing Inventory Recommendations    * 1. Analysis and Reporting      2. Implementation Strategies      3. Monitoring and Evaluation 6. Monitoring Forest Resources    * 1. Monitoring Techniques      2. Regular inspections      3. Field surveys 7. Data Analysis    * 1. Analysing monitoring data to assess forest health      2. Identifying signs of degradation or improvement   **Practice**   1. Conduct mock forest inventories | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 1. Perform wildlife management | **Theory**   * 1. Wildlife Management      1. Types of wildlife resources      2. Importance of wildlife resources   2. Mapping Wildlife Resources      1. Mapping Techniques      2. GIS tools      3. Field mapping methods   3. Data Collection   4. Conducting Wildlife Inventory      1. Inventory Techniques      2. Safety Protocols      3. Analysis and Reporting      4. Implementation Strategies   5. Monitoring Wildlife resources      1. Monitoring Techniques on Wildlife resources   **Practice**   1. wildlife resources using GIS tools | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 5.perform range land management | **Theory**   1. Range land Management    * 1. Definition and characteristics of rangelands      2. Types of rangelands (grasslands, shrublands, savannas)      3. Importance of rangelands for biodiversity, ecosystem services, and livelihood    1. Rangeland Inventory       1. Rangeland Inventory Methods       2. Transect surveys       3. Remote sensing techniques (aerial photography, satellite imagery)       4. Ground-based measurements (vegetation cover, soil erosion)    2. Rangeland Management       1. Practices in rangeland management       2. Benefits of rangeland management       3. Challenges in rangeland management    3. Rangeland management techniques       1. Rangeland monitoring       2. Rangeland evaluation    4. Range governance and policy   **Practice**   * 1. Conduct a transect survey to measure vegetation cover and soil erosion. | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |
| 6.Perform water resource stewardship | **Theory**   * 1. Water resources      1. Types of water resources      2. Challenges facing water resources      3. Water governance policy   2. Water resource mapping      1. GIS      2. Remote sensing   3. Water Resource Conservation      1. Water conservation strategies      2. Water pollution control   4. Water resource monitoring      1. Water quality monitoring      2. Water quantity monitoring   5. Water Resource Management Planning      1. Integrated Water Resource Management (IWRM)      2. Community-Based Water Management   6. Water conservation awareness      1. Water Conservation Campaigns      2. Water Education Programs      3. Community engagement   **Practice**   * 1. Map water resources   2. Design and execute mock awareness campaigns | * Practical * Written tests * Individual/group assignment * Projects * Interviews/ Oral questions * Third party * Case Studies |

**Suggested Methods of Instruction**

* Demonstration
* Role playing
* Group discussion
* Direct instruction

**Recommended Resources for 25 trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Facilities & infrastructure** |  |  |  |
| 1.) | Lecture/theory room |  | 15 | 1:25 |
| **B** | **Tools and Equipment** |  |  |  |
| 1.) | Shovel |  | 10 pcs | 1:3 |
| 2.) | Rakes |  | 10 pcs | 1:3 |
| 3.) | Pruning Shear |  | 5 pcs | 1:5 |
| 4.) | Lawn mower |  | 5 pcs | 1:5 |
| 5.) | Grass trimmer |  | 5 pcs | 1:5 |
| 6.) | Wheelbarrow |  | 5 pcs | 1:5 |
| 7.) | Lawn aerator |  | 5 pcs | 1:5 |