****

**REPUBLIC OF KENYA**

**COMPETENCY BASED CURRICULUM**

**FOR**

**FORESTRY**

**LEVEL 6**



TVET CDACC

P.O. BOX 15745-00100

NAIROBI

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# FOREWORD

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

Reforms in the education sector are necessary for the achievement of Kenya Vision 2030 and meeting the provisions of the Constitution of Kenya 2010. The education sector had to be aligned to the Constitution and this resulted to the formulation of the Policy Framework for Reforming Education and Training. A key feature of this policy is the radical change in the design and delivery of the 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 mode of delivery allows for multiple entry and exit in TVET programs.

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.

It is my conviction that this curriculum will play a great role towards development of competent human resource for the Forestry sector’s growth and sustainable development.

**PRINCIPAL SECRETARY**

**VOCATIONAL AND TECHNICAL TRAINING**

**MINISTRY OF EDUCATION**

# PREFACE

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

The Technical and Vocational Education and Training Act No. 29 of 2013 on Reforming Education and Training in Kenya, emphasized the need to reform curriculum development, assessment and certification. This called for a shift to CBET in order to address the mismatch between skills acquired through training and skills needed by industry as well as increase the global competitiveness of Kenyan labour force.

TVET Curriculum Development, Assessment and Certification Council (TVET CDACC) in conjunction with Forestry Sector Skills Advisory Committee (SSAC), have developed this curriculum.

This curriculum has been developed following the CBET framework policy; the CBETA Standards and guidelines provided by the TVET Authority and the Kenya National Qualification framework designed by the Kenya National Qualification Authority.

This curriculum is designed and organized with an outline of learning outcomes; suggested delivery methods, training/learning resources and methods of assessing the trainee’s achievement. The curriculum is competency-based and allows multiple entry and exit to the course.

I am grateful to the Council members, Council Secretariat, Forestry SSAC, expert workers and all those who participated in the development of this curriculum.

**CHAIRMAN**

**TVET CDACC**

# ACKNOWLEDGEMENT

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

I recognize with appreciation the role of Forestry Sector Skills Advisory Committee (SSAC) members for their contribution to the development of this curriculum.

I also thank all stakeholders in the Forestry sector for their valuable input and all those who participated in the process of developing this curriculum.

I am convinced that this curriculum will go a long way in ensuring that workers in Forestry acquire competencies that will enable them to perform their work more efficiently.

**COUNCIL SECRETARY/CEO**

**TVET CDACC**

# **ABBREVIATIONS AND ACRONYMNS**

BC Basic Competency

CBET Competency Based Education and Training

CDACC Curriculum Development Assessment and Certification Council

CDACC Curriculum Development Assessment and Certification Council.

CR Core Competency

EMCA Environmental Management and Conservation Act

EMCA Environmental Management and Co-ordination Act

FAO Food and Agriculture Organization.

FCMA Forestry Conservation and Management Act.

FSGOs Forestry Service Guidelines Orders.

ICT Information Communication Technology

ISTA International Seed Testing Association.

IUCN International Union for Conservation of Nature.

KCSE Kenya Certificate of Secondary Education

KEFRI Kenya Forestry Research Institute.

KFSC Kenya Forestry Seed Center.

KNQA Kenya National Qualifications Authority

MAPs Medicinal and Aromatic Plants.

MoE Ministry of Education

NEMA National Environment Management Authority

NGO Non-Governmental Organization

NOS National Occupation Standard

NTFPs Non-Timber Forestry Products.

NWFPs Non-Wood Forestry Products.

OS Occupational Standards

OSH Occupation Safety and Health

OSHA Occupation Safety and Health Act

OSHS Occupational Safety and Health Standards

PFM Participatory Forest Management.

PPE Personal Protective Equipment

PPE Personal Protective Equipment

SOPs Standard Operating Procedures.

TVET Technical and Vocational Education and Training

TVETA Technical and Vocational Education and Training Authority

# KEY TO UNIT CODE

**FO /CU / EN /BC /01/ 6/ A**

Industry or sector

Curriculum

Occupational area

Type of competency

Competency number

Competency level

Version control

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# COURSE OVERVIEW

This course is designed to equip an individual with competencies for forestry management. The qualification consists of competencies that an individual must achieve to propagate tree germplasm, manage tree nursery, implement forest silvicultural operations, manage forest ecosystems, conduct forest inventory and valuation, manage forest engineering operations, manage pests and diseases, manage forest harvesting and logging, undertake wood utilization and processing, conduct forest extension and agroforestry, enforce forest law and policy, conduct forest land survey and mapping and manage forest fires.

This course consists of the following basic, common and core units of learning:

**Basic Units of Learning**

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit Code** | **Unit Title** | **Duration in Hours** | **Credit Factors** |
| FO/CU/EN/BC/01/6/A | Communication Skills | 40 | 4 |
| FO/CU/EN/BC/02/6/A | Numeracy Skills | 60 | 6 |
| FO/CU/EN/BC/03/6/A | Digital Literacy | 60 | 6 |
| FO/CU/EN/BC/04/6/A | Entrepreneurial Skills | 100 | 10 |
| FO/CU/EN/BC/05/6/A | Employability Skills | 80 | 8 |
| FO/CU/EN/BC/06/6/A | Environmental Literacy | 40 | 4 |
| FO/CU/EN/BC/07/6/A | Occupational Safety and Health Practices | 40 | 4 |
| **Total** | | **420** | **42** |

**Common unit of Learning.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit Code** | **Unit Title** | **Duration in Hours.** | **Credit Factor** |
| MATH/CU/AS/CC/03/6/A | Research Methods | 130 | 13 |
| **Total** | | **130** | **13** |

**Core Units of Learning**

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit Code** | **Unit Title** | **Duration in Hours** | **Credit Factor** |
| FO/CU/EN/CR/01/6/A | Tree Germplasm Propagation. | 120 | 12 |
| FO/CU/EN/CR/02/6/A | Tree Nursery Management. | 100 | 10 |
| FO/CU/EN/CR/03/6/A | Forest Silvicultural Operations. | 150 | 15 |
| FO/CU/EN/CR/04/6/A | Forest Ecosystems Management. | 130 | 13 |
| FO/CU/EN/CR/05/6/A | Forest Inventory and Valuation. | 120 | 12 |
| FO/CU/EN/CR/06/6/A | Forest Engineering. | 120 | 12 |
| FO/CU/EN/CR/07/6/A | Forest Pests and Disease Management. | 80 | 8 |
| FO/CU/EN/CR/08/6/A | Forest Harvesting and Logging. | 100 | 10 |
| FO/CU/EN/CR/09/6/A | Wood Utilization and Processing. | 120 | 12 |
| FO/CU/EN/CR/10/6/A | Forest Extension. | 100 | 10 |
| FO/CU/EN/CR/11/6/A | Agroforestry Systems. | 100 | 10 |
| FO/CU/EN/CR/12/6/A | Forest Law and Policy. | 100 | 10 |
| FO/CU/EN/CR/13/6/A | Forest Land Survey and Mapping. | 120 | 12 |
| FO/CU/EN/CR/14/6/A | Forest Fires. | 100 | 10 |
|  | Field Attachment | 480 | 48 |
|  | **Total** | **2040** | **204** |
|  | **Grand Total** | **2590** | **259** |

**Entry Requirements**

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

1. Kenya Certificate of Secondary Education (KCSE) mean grade of C- (C minus)

**Or**

1. Craft certificate (Level 5) in Forestry

**Or**

1. Equivalent qualifications as determined by Kenya National Qualifications Authority (KNQA)

**Trainer qualification**

A trainer for this course should have a higher qualification than the level of this course

**Field attachment**

An individual enrolled in this course will undergo field attachment in forestry related institutions.

**Assessment**

The course will be assessed at two levels: internal and external.

1. **Internal assessment** conducted continuously by the trainer (internal assessor) who is monitored by an accredited internal verifier.
2. **External assessment** conducted by an external assessor who is monitored by an accredited external verifier.

The assessors and verifiers are accredited by TVET CDACC which also coordinates external assessment.

**Certification**

An individual will be awarded a Certificate of Competency on demonstration of competence in a unit of competency. To be awarded a National Certificate in Forestry Level 6, an individual must demonstrate competence in all the units of competency.

# BASIC UNITS OF LEARNING

# **COMMON UNITS OF LEARNING**

## RESEARCH METHODS

**UNIT CODE:** MATH/CU/AS/CC/03/6/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Apply Research Methods.

**Duration of Unit:** 130hours

**Unit Description**

This unit describes the competencies required by a statistician in order to: Formulate Research Problem, carry out Extensive Literature Review, develop research objectives, Develop Research Design and Sample Design, collect research Data, analyse collected research Data, Interpret, generalise and predict results and Prepare Report and presentation in a work place environment.

**Summary of Learning Outcomes**

* + - 1. Formulate the Research Problem
      2. Carry out Extensive Literature Review
      3. Develop research objectives
      4. Develop Research Design and Sample Design
      5. Develop research budget proposal & Time plan
      6. Collect research Data
      7. Analyse of collected research Data
      8. Interprat , generalis and predict
      9. Prepare Report and presentation

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

|  |  |  |
| --- | --- | --- |
| **Learning outcome** | **Content** | **Suggested assessment methods** |
| * + - 1. Formulate the Research Problem | * Definition of research   Philosophies   * validity and reliability * Characteristics of research * Types of research * The research processes * Sources of research problems * Formulation of research problems | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| * + - 1. Carry out Literature review | * Reviewing the literature * Sources of literature * Theoretical framework * Conceptual framework * Referencing and citations * Introduction to research sites e.g. Google scholar, research gate * Internet search engines | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| * + - 1. Develop research objectives/hypothesis or research questions | * characteristics of Objectives * Formulation of objectives   + main objectives   + specific -objectives * characteristics of hypothesis * formulation of research hypothesis * Characteristics of research questions * Formulation of research questions | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| * + - 1. Develop Research Design and Sampling Design | * Types of research design * Measurement scales * Identifying Variables * Defining the target population * Sample size determination * Research design e.g * observational * interventional * Sampling techniques * Probability * Non-probability | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| * + - 1. Develop research budget & Work plan | * + Budgeting * Direct costs * Indirect costs   + Factors to consider when costing * Materials * Equipment * Logistics * Administrative * Development of work plan e.g. Gant chart | * Written test * Observation * Oral questioning * Interviews |
| * + - 1. Collect research Data | * Methods of Data Collection and their limitations * Research instruments/ data collection tools * Questionnaires development * Types of questionnaires * Constructing questionnaires * Digitising questionnaires * Mobile technology (ODK) * Piloting the Questionnaire * Experimental data collection * Ethical issues concerning research participants * Ethical issues relating to the researcher | * Written tests * Oral questioning * Assignments * Practical * Supervised exercises |
| * + - 1. Analyse collected research data | * Data Handling e.g. Cleaning, coding, entry * Data Processing e.g. summaries * Data management. E.g., storage, retrieval & security * Data Analysis Methods and tools | * Written tests * Oral questioning * Practical * Assignments * Supervised exercises |
| * + - 1. Interpret research findings | * Interpretations of parameters,   + statistical values,   + predicting values | * Written tests * Oral questioning * Assignments * Practical * Supervised exercises |
| * + - 1. Presentation of findings | * Reporting of findings * Research Project Report Format * List of References /Bibliography | * Written tests * Oral questioning * Assignments * Supervised exercise |

**Suggested Delivery Instruction**

* Instructor led facilitation of theory
* Group discussions
* Demonstration by trainer
* Exercises by trainee
* Use of teaching aids

**Recommended Resources**

* Charts with presentations of data
* Dice
* Computers with internet connection
* Datasets
* Projector
* Statistical Software
* Notes

# CORE UNITS OF LEARNING

## TREE GERMPLASM PROPAGATION

**UNIT CODE:** FO/CU/EN/CR/01/6/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Propagate Tree Seeds.

**Duration of Unit:** 120 hours.

**Unit Description**

This unit covers the competencies required in handling and propagating tree germplasm. Competencies includes; requisition tree seeds, tree seed survey, collect tree seeds, process tree seeds, store tree seeds and propagate plant material.

**Summary of Learning Outcomes**

1. Identify tree species.
2. Tree seed survey.
3. Collect tree seeds.
4. Process and store tree seeds.
5. Requisition tree seeds.
6. Propagate plant material.

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Identify tree species. | * Definition of terms and concepts e.g. * Botany. * Plants. * Plant taxonomy. * Binomial system of nomenclature.   + Ethnobotany   + Phylogenetic.   + Phenology   + Exotic and indigenous species * Ethnobotany. * Importance of Ethnobotany. * Value and importance of traditional Ethnobotany * Scope and importance of plant taxonomy. * Taxonomic hierarchy in plant classification. * Systems of classification * Dendrology.   + Taxonomic characteristics   + Phenological characteristics of gymnosperms and angiosperms   + Taxonomic keys   + Application of Taxonomic Keys on common species in the locality   + Mounting the herbarium specimens * Compiling list(s) of identified tree species | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Tree seed survey. | * Definition of terms. E.g. * Seed provenance. * Seed source. * Forest seed zones of Kenya. * Flowering and seeding calendar * Identification of seed sources. * Farmland seed sources. * Natural forest seed source. * Plantation seed source. * Seed orchard seed source. * Characteristics of Mother trees * Inspection of seeds. * Collection of seed samples. * Testing of seed maturity | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Collect tree seeds. | * Seed collection plan. * Seed collection tools and equipment. * Ways of collecting tree seeds. * Safety precautions during seed collection. * Seed collector’s safety. * Seed handling. * Seed transportation | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview |
| 1. Process and store tree seeds. | * Definition of terms e.g. * Seed dormancy., recalcitrant seed and orthodox seed. * Tree seed handbook * Methods of Seed processing. * Seed quality tests. * Seed cleanness test. * Germination test. * Viability test. * Moisture content test. * Labelling and documentation of processed tree seeds. * Classification and storage of processed tree seeds. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview |
| 1. Requisition tree seeds | * Definition of terms. * Seed indent form. * Seed indent form preparation. * Procedure of filling seed indent form. * Preparation of payment voucher. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Propagate vegetative material. | * Definition of terms.   e.g.   * Propagation * Germplasm * clones * Procedure of collecting of plant materials. * Vegetative Propagation methods. * Preparation of collected plant material | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |

**.**

**Suggested Methods of Instruction**

* On job training
* Demonstration by trainer
* Field trips
* Practice by the trainee
* Group discussions
* Instructor led facilitation of theory

**Recommended Resources**

* Data projector.
* Reference materials.
* Stationery.
* White board.
* White board maker.
* Tools and materials for seed collection and processing.
* Laboratory equipped for seed testing and storage
* Requisite plant growth Hormones

## TREE NURSERY MANAGEMENT

**UNIT CODE:** FO/CU/EN/CR/02/6/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Manage Tree Nursery.

**Duration of Unit:** 100 hours.

**Unit Description**

This unit covers the competencies required in establishing and managing tree nursery. Competencies includes: Identifying tree nursery site, preparing tree nursery site, constructing tree nursery structures, acquiring nursery inputs, performing nursery production operations, ensuring nursery security, compiling nursery records.

**Summary of Learning Outcomes**

1. Identify and prepare tree nursery site.
2. Construct tree nursery structures.
3. Acquire nursery inputs.
4. Perform nursery production operations.
5. Ensure nursery security.
6. Compile nursery records.

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Identify and prepare tree nursery site. | * Definition of terms.   e.g. Tree nursery.   * Types of tree nurseries. * Factors that influence location of nursery. * Factors that influence size of nursery. * Procedure of nursery establishment * Basic nursery tools, equipment and facilities. * Nursery site preparation e.g. bush clearing, levelling | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report * Project |
| 1. Construct tree nursery structure(s). | * Nursery Layout * Nursery structures. * Nursery construction materials. * Constructing tree nursery structures | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report * Project |
| 1. Acquire nursery inputs. | * Nursery inputs. * Forest soils. * Compost manure and fertilizers. * Certified tree seeds/ * Quality vegetative materials. * Agrochemicals. * Watering storage facilities * Watering equipment’s. * Potting materials. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Perform nursery production operations. | * Nursery production operations * Watering practices * Pot filling * Seed sowing * Pricking out procedures. * Weeding * Root pruning * Maintenance * Hardening off process * Transplanting operations * Pest and disease control * Record keeping in nursery production operations | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Ensure nursery security. | * Seedling protection measures * Live fence * Human security * Barbed wire fencing | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Compile nursery records. | * Types of nursery records * Filling the nursery * Updating the nursery * Keeping nursery records | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |

**Suggested Methods of Instructiom**

* On job training
* Demonstration
* Practice by the trainee
* Group discussions
* Instructor led facilitation of theory

**Recommended Resources**

* Data projector.
* Reference materials.
* Stationery.
* White board.
* White board maker.
* Nursery construction materials; e.g.
* Iron sheets.
* Nails.
* Timber.
* Ballast.
* Sand.
* Wheelbarrow.
* Cement
* Hand saws.
* Hammer.
* Chain links.

## FOREST SILVICULTURAL OPERATIONS

**UNIT CODE:** FO/CU/EN/CR/03/6/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Implement Silvicultural Operations.

**Duration of Unit:** 150 hours**.**

**Unit Description**

This unit covers the competencies required in implementing silvicultural operations. Competencies includes; Preparing tree planting site, planting tree seedlings, monitoring tree survival, maintaining tree seedlings, implementing pruning schedule, implementing thinning schedule, keeping compartment registers and assessing forest soil types.

**Summary of Learning Outcomes**

1. Prepare tree planting site.
2. Plant tree seedlings.
3. Monitor tree survival.
4. Maintain tree seedlings.
5. Implement pruning schedule.
6. Implement thinning schedule.
7. Keep compartment registers.
8. Implement forest soil conservation activities.

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Prepare tree planting site. | * Identification of tree planting site. * Factors to consider when selecting a tree planting site. * Preparation of selected tree planting site. * Clearing using appropriate methods e.g. total, strip, spot, chemical, fire * Cutting of stakes. * Staking out. * Pitting. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Plant tree seedlings. | * Preparation of tree seedlings. * Hardening off. * Organising tree planting teams * Transportation of seedlings to planting site. * Planting of tree seedlings. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report Practical. * Project |
| 1. Maintain and monitor tree seedling survival. | * Tree seedling maintenance practices. * Weeding. * cleaning * Survival count. * Beating up. * Protecting planting site | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report * project |
| 1. Implement pruning schedule. | * Identifying the plantation to be pruned * Species pruning schedule * Organise pruning teams * Pruning prescription * Pruning tools * Pruning Demos * Perform the Pruning on different species | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report * project |
| 1. Implement thinning schedule. | * Identify plantation for thinning * Species thinning schedule. * Mobilize the thinning tools * Thinning demonstration * Perform the thinning of different species | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report * project |
| 1. Keep compartment registers. | * Acquisition of compartment register sheets. * Procedure of filling compartment register. * Updating compartment register | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Implement forest soil conservation activities. | * Definition of terms. e.g. Soil. * Soil survey as per FAO guidelines * Concept of soil. * Difference between forest soil and agricultural soil. * Soil profile/catena. * Soil formation * Soil types * Physical and chemical properties of soil. * Soil sampling techniques as per FAO guidelines. * Soil plant relationships. * Identify features of problematic soils in the locality * Soil and organic matter. * Soil erosion. * Soil conservation measures. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report * project |

**Suggested Methods of Instruction**

* On job training
* Demonstration
* Practice by the trainee
* Field trips
* Instructor led facilitation of theory

**Recommended Resources**

* Data projector.
* Reference materials.
* White board.
* White board maker.
* Pruning saw.
* Thinning saw.
* Selection hammer.

## FOREST ECOSYSTEMS MANAGEMENT

**UNIT CODE:** FO/CU/EN/CR/04/6/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Manage Forest Ecosystem.

**Duration of Unit:** 130 hours.

**Unit Description**

This unit covers the competencies required in managing forest ecosystem. Competencies includes: Identifying forest structure, evaluating forest types, assessing forest status, evaluating forest resources, assessing forest use values, rehabilitating degraded sites, building forest stakeholder capacity and managing natural resource conflicts.

**Summary of Learning Outcomes**

1. Identify forest types.
2. Evaluate forest types.
3. Evaluate forest resources.
4. Manage and rehabilitate degraded sites
5. Build forest stakeholder capacity.
6. Manage natural resource conflicts.

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Identify forest types. | * Ecological classification of ecosystems. * Types and sources of forest maps. * Raise a reacquisition maps as per survey of Kenya guidelines * Delineation of forest areas.   i.e. Ground truthing.   * Data collection and analysis of tree species composition and diversity. * Types of forest structures * Description of forest structures in a locality. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report * project |
| 1. Evaluate forest types. | * Classification of forest types. * Species composition and diversity. * Types of tree species on site. * Analysis of tree species composition. * Conservation status and threats to forests. * Natural threats e.g. wildfires, wildlife. * Anthropogenic threats | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Evaluate forest resources. | * Different values of forests. * Use and non-use values. * Direct and indirect benefits. * Forest resource assessment. * Data collection and analysis of forest resources in gazetted forests. * Data collection and analysis of forest resources on farmlands. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Manage and rehabilitate natural forest. | * Definition of terms e.g. * Forest degradation. * Rehabilitation. * Restoration. * Deforestation. * Causes of forest degradation. * Classification of degraded sites. * Resource mobilization for forest conservation. * Forest rehabilitation strategies. * Natural rehabilitation activities | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report * project |
| 1. Build forest stakeholder capacity. | * Stakeholder mapping and analysis; roles and responsibilities. * Community participation on forest conservation. * Types of participation. * Types of forest benefits. * Benefit sharing mechanisms. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Manage natural resource conflicts. | * Definition of terms. * Natural resources. * Conflicts. * Sources and types of conflicts. * Stakeholder assessment in conflict management. * Conflict resolution strategies. * Addressing constraints of conflict management. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report * project |

**Suggested Methods of Instruction**

* On job training
* Field trips
* Group discussions
* Instructor led facilitation of theory

**Recommended Resources**

* Data projector.
* Reference materials.
* White board.
* White board maker.
* Chalk board.
* Chalk.
* Stationery.
* Photographs of forests.
* Computer.

## FOREST INVENTORY AND VALUATION

**UNIT CODE:** FO/CU/EN/CR/05/6/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Conduct Forest Inventory And Valuation.

**Duration of Unit:** 120 hours.

**Unit Description**

This unit covers the competencies required in conducting forest inventory and valuation. Competencies includes: Assembling forest mensuration and inventory equipment, determining forest mensuration methods, determining forest inventory methods, quantifying forest resources, determining the value of ecosystems goods and services.

**Summary of Learning Outcomes**

1. Assemble forest mensuration and inventory equipment.
2. Determine forest mensuration and inventory methods.
3. Quantify forest resources.
4. Determine the value of ecosystems goods and services.

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Assemble forest mensuration and inventory equipment. | * Introduction to forest mensuration tools and equipment. * Introduction to forest inventory tools and equipment. * Uses of forest mensuration and inventory tools and equipment. * Maintenance of forest mensuration and inventory tools and equipment. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview |
| 1. Determine forest mensuration and inventory methods. | * Definition of terms. * Mensuration. * Sample. * Sampling. * Measurement principles. * Measurement systems. * Theory of tree measurements: diameter, height, crown. * Tree measurements. * Single tree measurements. * Stand measurements. * Volume estimation. * Forest sampling methods Data collection Plan for forest inventory and mensuration * Processing and analysis of inventory data. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report * Project |
| 1. Quantify forest resources. | * Definition of terms. e.g. * Timber products * NTFPs. * Categories of NTFPs. * Timber Inventory * Survey of NTFPs. * Extraction and utilization of Timber NTFPs. * Extraction and utilization of Timber * Processing and analysis of data on use of NTFPs. and timber * Prepare an inventory report | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Determine the value of ecosystems goods and services. | * Definition of terms. * Ecosystem goods. * Ecosystem services. * Scope and extent of ecosystem to be valued * Goods and services derived from the ecosystem. * Ecosystem valuation methods. * Ecosystem goods and services report | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |

**Suggested Methods of Instruction**

* On job training
* Field trips
* Group discussions
* Instructor led facilitation of theory

**Recommended Resources**

* Data projector.
* Reference materials.
* White board.
* White board maker.
* Computer.
* Forest inventory and mensuration tools and equipment.
* Chalk board.
* Chalk.
* Stationery.

## FOREST ENGINEERING

**UNIT CODE:** FR/CU/EN/CR/06/6/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Manage Forest Engineering Operations.

**Duration of Unit:** 120 hours.

**Unit Description**

This unit covers the competencies required in managing forest engineering operations. Competencies include: Assembling forest engineering operations tools, surveying forest engineering needs, planning forest engineering operations, implementing forest engineering operations and maintaining forest infrastructure.

**Summary of Learning Outcomes**

1. Assemble forest engineering operation tools.
2. Survey needs and plan forest engineering operations.
3. Implement forest engineering operations
4. Maintain forest infrastructure.

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Assemble forest engineering operation tools. | * Definition of terms. * Forest engineering. * Introduction to forest engineering operation tools. * Uses of forest engineering operation tools. * Maintenance of forest engineering operation tools. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview |
| 1. Survey needs and plan forest engineering operations. | * Scope of forest engineering. * Forest road building. * Harvesting and processing. * Mechanised logging. * Transportation. * Buildings. * Standards for different infrastructure. * Building code. * Kenya Roads Act. * Needs assessment for forest engineering operations * Site selection for different infrastructure development. * Roads works. * Buildings. * Bridges. * Acquisition and interpretation of infrastructural plans and drawings. * Budgeting for infrastructure development | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Implement forest engineering operations. | * Simulated mobilization of tools and documents for forest infrastructure * Procedure of procuring construction and building equipment and materials. * Hiring and managing skilled and unskilled labour. * Enforcement of standards for different infrastructure. * Registration of assets i.e. Buildings, roads, bridges. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Maintain forest infrastructure. | * Assessment of damaged and dilapidated infrastructure * Prepare a maintenance plan * Rehabilitation and repair of infrastructure. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report * Project |

**Suggested Methods of Instruction**

* On job training
* Field trips
* Group discussions
* Instructor led facilitation of theory
* Demonstration by trainer.

**Recommended Resources**

* Data projector.
* Reference materials.
* White board.
* White board maker.
* Computer.
* Chalk board.
* Chalk.
* Stationery.
* Forest engineering operation tools and equipment.

## FOREST PESTS AND DISEASES MANAGEMENT

**UNIT CODE:** FO/CU/EN/CR/07/6/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Manage Forest Pests and Diseases.

**Duration of Unit:** 80 hours.

**Unit Description**

This unit covers the competencies required in managing forest pests and diseases. Competencies includes: Identify common forests pests and diseases, identify plant disease signs and symptoms, identify pest and disease control methods, monitor forest pest and disease incidences, report forest pest and disease incidences.

**Summary of Learning Outcomes**

1. Survey common forests pests, diseases and plant disease signs and symptoms.
2. Implement pest and disease control methods.
3. Monitor forest pest and disease incidences.

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Survey common forests pests, diseases and plant disease signs and symptoms. | * Definition of terms. * Parasite. * Saprophyte. * Pathogens. * Symbiosis. * Forest pests. * Forest diseases. * Signs and symptoms associated with common pest(s). * Signs and symptoms associated with common plant disease(s). | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Implement pest and disease control methods. | * Effects of common pests on roots, stem and leaves. * Effects of common diseases on roots, stem and leaves. * Pest control methods. * Disease control methods. * Tools, equipment and materials used in pest and disease control. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Monitor and report forest pest and disease incidences. | * Preparation of monitoring schedule for pests. * Preparation of monitoring schedule for diseases. * Pest and disease surveillance. * Documentation of pest and disease occurrence. * Software use in monitoring of pests and diseases. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |

**Suggested Methods of Instruction**

* On job training
* Field trips
* Group discussions
* Instructor led facilitation of theory

**Recommended Resources**

* Data projector.
* Reference materials.
* White board.
* White board maker.
* Computer.
* Chalk board.
* Chalk.
* Stationery.
* Tool, equipment, materials and supplies for pest and disease control.
* Pest and disease monitoring software.

## FOREST HARVESTING AND LOGGING

**UNIT CODE:** FO/CU/EN/CR/08/6/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Manage Forest Harvesting And Logging.

**Duration of Unit:** 100 hours.

**Unit Description**

This unit covers the competencies required in managing forest harvesting and logging. Competencies includes: Assembling forest harvesting and logging tools, surveying forest logging area, executing appropriate logging methods, supervising harvesting of NTFPs.

**Summary of Learning Outcomes**

1. Survey forest logging area.
2. Assemble forest harvesting and logging tools.
3. Execute appropriate logging methods
4. Supervise harvesting of NTFPs

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Survey forest logging area. | * Objectives of forest logging. * Selection of logging site. * Logging operations. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Assemble forest harvesting and logging tools. | * Definition of terms. * Logging. * Timber. * NTFPs/NWFPs, MAPs. * Introduction to forest harvesting and logging tools. * Uses of forest harvesting and forest logging tools and equipment. * Maintenance of forest harvesting and forest logging tools and equipment. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview |
| 1. Execute appropriate logging methods. | * Forest logging methods. * Clearing. * Felling. * Debranching. * Cross cutting. * Yarding. * Loading. * Hauling. * Post logging activities * Clearing. * Transportation of forest products. * Impacts of logging and post logging activities. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report * Project |
| 1. Supervise harvesting of NTFPs. | * Categories of Non-timber forest products. * Non-timber forest products harvesting and extraction procedures. * Documentation of harvesting of non-timber forest products. * Post-harvest handling of NTFPs/NWFPs. * Utilization of NTFPs. * Trade and marketing of NTFPs/NWFPs. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |

**Suggested Methods of Instruction**

* On job training
* Field trips
* Group discussions
* Instructor led facilitation of theory

**Recommended Resources**

* Data projector.
* Reference materials.
* White board.
* Presentation pointer.
* White board maker.
* Computer.
* Chalk board.
* Chalk.
* Stationery.
* Tool, equipment and materials for forest harvesting and logging.

## **WOOD UTILIZATION AND PROCESSING**

**UNIT CODE:** FO/CU/EN/CR/09/6/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Undertake Wood Utilization and Processing.

**Duration of Unit:** 120 hours

**UNIT DESCRIPTION.**

This unit covers the competencies required in undertaking wood utilization and processing. Competencies include processing forest end products and by products, ensuring standard compliance in production, applying knowledge of value addition on forest products, applying knowledge of chain of product distribution.

**Summary of Learning Outcomes**

1. Processing forest end products and by products.
2. Ensuring standard compliance in production.
3. Applying knowledge of value addition on forest products.
4. Applying knowledge of chain of product distribution.

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Process forest end products and by-products. | * Definition of terms. * Timber. * Non-timber forest products. * Classification of forest materials/products. * Uses of timber; domestic and industrial uses. * Forest processing tools and machines. * Efficient wood processing techniques. * Saw milling and operations. * Planning. * Grooving. * Rebating. * Timber products and by-products. * Plywood. * Sawdust. * Composite boards. * Pulp and paper. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report * Project |
| 1. Ensure standard compliance in processing. | * Gross and minute structure of wood. * Mechanical and physical properties of wood. * Timber defects. * Natural defects and other defects. * Grading of timber. * Methods of timber processing. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Apply knowledge of value addition on forest products. | * Definition of terms. * Value addition. * Post-harvesting technology. * Importance of value addition. * Prospecting of NTFPs. * Harvest and post-harvest treatment. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Apply knowledge of chain of product distribution. | * National, regional and global consumption of forest products. * Demand and supply of forest products. * Market structure and forest value chains. * Challenges facing marketing of forest products. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |

**Suggested Methods of Instruction**

* On job training.
* Field trips.
* Group discussions
* Instructor led facilitation of theory
* Demonstration.

**Recommended Resources**

* Data projector.
* Reference materials.
* White board.
* White board maker.
* Computer.
* Chalk board.
* Chalk.
* Stationery.
* Tool and machines for forest utilization and processing

## FOREST EXTENSION

**UNIT CODE:** FO/CU/EN/CR/10/6/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Conduct Forest Extension.

**Duration of Unit:** 100 hours.

**Unit Description**

This unit covers the competencies required in conducting forest extension and agroforestry. Competencies includes: Identifying forest extension beneficiaries, coordinating forest extension services, generating information and technologies to disseminate, identifying dissemination methods, establishing extension feedback mechanisms and performing agroforestry activities.

**Summary of Learning Outcomes**

1. Identify forest extension beneficiaries.
2. Coordinate forest extension services.
3. Identify dissemination methods.
4. Perform agroforestry activities.

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Identify forest extension beneficiaries. | * Definition of terms. * Forest extension. * Participation. * Gender mainstreaming. * Empowerment. * Community. * Principles of extension education. * Scope of extension in forestry. * Importance of community participation. * Levels of participation. * Concepts of gender and gender mainstreaming in forest extension. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Coordinate forest extension services. | * Approaches in forestry extension. * Individual methods. * Group methods. * Mass methods. * Advantages and disadvantages of extension methods. * Roles and qualities of forest extension workers. * Stakeholders and partnerships analysis. * Steps in planning for extension. * Situation analysis. * Work plan. * Implementation of plan. * Monitoring and evaluation. * Review of the plan. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Disseminate information on forestry needs. | * Importance of communication in forest extension. * Types of communication methods.; advantages and disadvantages. * Modes of communication. * Print. * Audio-visual. * Broadcasting. * Barazas. * Types of teaching aids. * Brochures. * Poster. * Film. * Evaluation in forest extension. * Definition of evaluation. * Importance of evaluation. * Types of evaluation. * Components of an evaluation plan. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Perform agroforestry activities. | * Definition of terms. * Agroforestry. * Farm forestry development. * Dryland forestry. * Commercial forestry. * Agroforestry practices. * Alternative tree planting techniques. * Relationships with forestry and agriculture. * Importance of agroforestry. * Agroforestry systems and classification. * Criteria of agroforestry classification. * Species selection for agroforestry. * Role of indigenous and exotic trees. * Design of agroforestry projects. * Definition of terms; project, biophysical and socio-economic data. * Objectives of a project. * Factors to consider when developing an agroforestry project. * Problem tree and objective tree analysis. * Biophysical data. * Socio-economic data. * Case studies of completed agroforestry projects. * Techniques and management practices in agroforestry systems. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |

**Suggested Methods of Instruction**

* On job training
* Field trips
* Group discussions
* Instructor led facilitation of theory

**Recommended Resources**

* Data projector.
* Reference materials; journals, publication, textbooks.
* White board.
* White board maker.
* Computer.
* Chalk board.
* Chalk.
* Stationery.

## AGROFORESTRY SYSTEMS

**UNIT CODE:** FO/CU/EN/CR/11/6/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Manage Agroforestry Systems.

**Duration of Unit:** 100 hours.

**Unit Description**

This unit covers the competencies required in managing agroforestry systems. Competencies includes: Identifying appropriate agroforestry systems, designing agroforestry systems, coordinate agroforestry practices, generating agroforestry information and technologies to disseminate, identifying dissemination methods, establishing extension feedback mechanisms.

**Summary of Learning Outcomes**

1. Identify appropriate agroforestry systems.
2. Design agroforestry systems.
3. Coordinate agroforestry practices.
4. Disseminate information on agroforestry.

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Identify appropriate agroforestry systems. | * Definition of terms. * Agroforestry. * Farm forestry development. * Dryland forestry. * Commercial forestry. * Forest extension. * Participation. * Gender mainstreaming. * Empowerment. * Community * Agroforestry practices. * Relationships with forestry and agriculture. * Importance of agroforestry. * Agroforestry systems and classification. * Concepts of gender and gender mainstreaming in agroforestry. * Criteria of agroforestry classification. * Species selection for agroforestry | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview |
| 1. Design agroforestry systems. | * Species selection for agroforestry. * Role of indigenous and exotic trees. * Design of agroforestry projects. * Definition of terms; project, biophysical and socio-economic data. * Objectives of a project. * Factors to consider when developing an agroforestry project. * Problem tree and objective tree analysis. * Biophysical data. * Socio-economic data. * Case studies of completed agroforestry projects. * Techniques and management practices in agroforestry systems. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Coordinate agroforestry practices. | * Approaches in forestry extension. * Individual methods. * Group methods. * Mass methods. * Advantages and disadvantages of extension methods. * Roles and qualities of agroforesters. * Stakeholders and partnerships analysis. * Steps in planning for agroforestry. * Situation analysis. * Work plan. * Implementation of plan. * Monitoring and evaluation. * Review of the plan. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Disseminate information on agroforestry. | * Importance of communication in agroforestry practices. * Types of communication methods.; advantages and disadvantages. * Modes of communication. * Print. * Audio-visual. * Broadcasting. * Barazas. * Types of teaching aids. * Brochures. * Poster. * Film. * Evaluation in agroforestry. * Definition of evaluation. * Importance of evaluation. * Types of evaluation. * Components of an evaluation plan. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |

**Suggested Methods of Instruction**

* On job training
* Field trips
* Group discussions
* Instructor led facilitation of theory

**Recommended Resources**

* Data projector.
* Reference materials; journals, publication, textbooks.
* White board.
* White board maker.
* Computer.
* Chalk board.
* Chalk.
* Stationery.

## **FOREST LAW AND POLICY**

**UNIT CODE:** FO/CU/EN/CR/12/6/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Enforce Forest Law and Policy

**Duration of Unit:** 100 hours

**Unit Description**

This unit covers the competencies required in enforcing forest policy and law. Competencies include interpreting relevant forest law and policy, implementing forest law and policy conducting training on forest law and policy, sensitizing stakeholders on forest law and policy, following up on compliance of forest laws and policy and implementing administrative procedures.

**Summary of Learning Outcomes**

1. Interpret and implement forest law and policy
2. Conduct training on forest law and policy.
3. Sensitize stakeholders on forest law and policy.
4. Implement administrative procedures.

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Interpret and implement forest law and policy. | * Definition of terms. * Constitution. * Law. * Policy. * Regulations. * Law and policy formulation process. * History of forest policy development in Kenya. * Introduction and objectives of major forest policies. * History of development of Forest Law in Kenya. * Forestry rules, regulations and guidelines. * Major shift in forest policy in Kenya. * Legal procedures. * Charge sheets preparation and case filling procedures. * International treaties and conventions related to the forest and biodiversity sector. * Multilateral Environmental Agreements. * Other Environmental Law and Regulations. * County forest laws/regulations. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Conduct training on forest law and policy. | * Role of community in forest law and policy enforcement. * Training approaches. * Modes of communication. * Types of teaching/training aids; brochures, leaflets. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Sensitize stakeholders on forest law and policy. | * Role of stakeholders in forest law and policy enforcement. * Training approaches. * Modes of communication. * Types of teaching/training aids; brochures, leaflets. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Implement administrative procedures. | * Definition of terms. * Budget. * Expenditure. * Objectives of budgeting. * Formulation of budget and its execution. * Components of a procurement plan. * Government procurement procedure. * Objectives of inventory/ asset management. * Classification of inventory goods. * Financial rules and procedures. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |

**Suggested Methods of Instruction**

* On job training
* Group discussions
* Instructor led facilitation of theory

**Recommended Resources**

* Data projector.
* Reference materials.
* White board.
* White board maker.
* Computer.
* Chalk board.
* Chalk.
* Stationery.

## **FOREST LAND SURVEY AND MAPPING**

**UNIT CODE:** FO/CU/EN/CR/13/6/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Conduct Forest Land Survey and Mapping**.**

**Duration of Unit:** 120 hours.

**UNIT DESCRIPTION**

This unit covers the competencies required in conducting forest land survey and mapping. Competencies includes: preparing forest land map(s), demarcating forest land boundaries, preparing forest zonation maps and storing forest land and zonation maps.

**Summary of Learning Outcomes**

1. Prepare forest land map(s).
2. Demarcate forest land boundaries.
3. Prepare forest zonation maps.

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Prepare forest land map(s). | * Definition of terms. * Forest surveying. * Map and mapping. * Object and scope of survey in forestry. * Principles of survey. * Types of maps and their uses. * Survey and mapping tools and equipment. * GPS Survey. * Basic components of GPS. * Fundamentals of GPS. * GPS errors. * Differential GPS. * Integration of GPS and GIS. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Demarcate forest land boundaries. | * System of measurements and units’ scales. * Methods of representing scales. * Linear measurements. * Methods of chaining on sloping ground. * Ranging. * Offsets. * Obstacles in chaining and raging. * Errors and mistakes in linear measurements. * Survey techniques and their application. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report * Project |
| 1. Prepare forest zonation maps. | * Mapping resource locations. * Mapping resource quantities. * Mapping resource densities. * GPS Survey. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |

**Suggested Methods of Instruction**

* On job training
* Field trips
* Group discussions
* Instructor led facilitation of theory

**Recommended Resources**

* Data projector.
* Reference materials.
* White board.
* White board maker.
* Computer.
* Chalk board.
* Chalk.
* Stationery.

## FOREST FIRES

**UNIT CODE:** FO/CU/EN/CR/14/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Manage forest fires.

**Duration of Unit:** 100 hours.

**Unit Description**

This unit covers the competencies required in managing forest fires. Competencies include preparing to respond to fire, proceeding to fire, obtaining firefighting equipment and extinguishing media, combating wildfire, reacting to wildfire and weather conditions, participating in mop-up, patrol activities and support operations and conducting wildfire recovery process.

**Summary of Learning Outcomes**

1. Prepare to respond to fire.
2. Proceed to the location of fire.
3. Obtain firefighting equipment and extinguishing medium.
4. Combat forest fire.
5. React to forest fire and weather conditions.
6. Engage in mop-up, patrol activities and support operation.
7. Conduct wildfire recovery process.

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Prepare to respond to fire. | * Meaning of terms. * Fire. * Wildfire. * Extinguishing media. * Firefighting tools and equipment. * Prepare fire plan. * Causes and types of fire. * Fire risk assessment. * Personal Protective Equipment. * Food and Fluid Requirements. * Safety procedures during wildfire. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Proceed to the location of fire. | * Definition of terms. * Type of fuel. * Evidence relevant to fire. * Indicators of fire behaviour. * Location of the fire and type of fuel. * Access to the location of wildfire. * Evidence relevant to the wildfire. * Indicators of wildfire behaviour. * Observation and communication. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Assemble firefighting equipment and extinguishing medium. | * Definition of terms. * Extinguishing medium. * Firefighting equipment. * Selection of extinguishing medium and firefighting equipment. * Use of selected extinguishing mediums and firefighting equipment. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Combat forest fire. | * Firefighting team management. * Firefighting strategies and tactics. * Suppression techniques, equipment and extinguishing media. * Firefighting control lines. * Positioning of firefighting equipment. * Combating wildfire. * Wildfire hazards. * Evidence of cause of fire and origin of fire. * Communication during wildfire. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. React to forest fire and weather conditions. | * Observations of conditions at the fire and their effect on fire behaviour. * Observation of weather conditions and changes to fire behaviour. * Escape routes during a wildfire. * Safety zones. * Communication. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Engage in mop-up, patrol activities and support operation. | * Definition of terms. * Mop-up. * Patrol activities. * Support operations. * Types of mop-up activities. * Patrol activities. * Firefighting support operations. | * Observation * Oral questioning * Written test * Portfolio of Evidence * Interview * Third party report |
| 1. Conduct wildfire recovery process. | * Definition of wildfire recovery process. * Recovery process of equipment and consumables. * Methods of storing equipment. * Process of cleaning and maintaining equipment. | * Written tests * Oral questions * Assignments. |

**Suggested Methods of Instruction**

* On job training
* Demonstration by trainer
* Practice by the trainee
* Field trips
* Discussions
* Instructor led facilitation of theory.

**Recommended Resources.**

* Data projector.
* Reference materials.
* Journals.
* Charts.
* Stationery.
* White board.
* White board maker.
* Firefighting equipment.
* Fire extinguishing media.
* First aid kit.