

**REPUBLIC OF KENYA**

**COMPETENCY BASED CURRICULUM**

**FOR**

**AGRICULTURAL MACHINERY AND EQUIPMENT**

**LEVEL 4**



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 Kenya’s development blue print 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 in the formulation of the Policy Framework for Reforming Education and Training (Sessional Paper No. 14 of 2012).

A key feature of this policy is the radical change in the design and delivery of the Technical and Vocational Education and Training (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 Agriculture Engineering 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 (Technical and Vocational Education and Training) 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 and the Sessional Paper No. 14 of 2012 on Reforming Education and Training in Kenya, emphasized the need toreform 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 Kenyan labour force.

TVET Curriculum Development, Assessment and Certification Council (TVET CDACC), in conjunction with Agriculture 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, Agriculture Sector Skills Advisory Committee (SSAC), expert workers and all those who participated in the development of this curriculum.

**CHAIRPERSON**

 **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 organisations.

I appreciate the funding of the Government of Canada and its implementing partner Colleges and Institutes Canada (CICan) which enabled the development of this curriculum through the Kenya Education for Employment Program (KEFEP).

I also appreciate the Kitale National Polytechnic and its Canadian technical partners from Olds College who collaborated to identify industry skills gaps and develop this curriculum.

I recognize with appreciation the role of industry partners including the National Polytechnic’s Industry Advisory Committee and the Agriculture Sector Skills Advisory Committee (SSAC) in ensuring that competencies required by the industry are addressed in the curriculum. I also thank all stakeholders in the 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 Agriculture Engineering sector acquire competencies that will enable them to perform their work more efficiently.

**COUNCIL SECRETARY/CEO**

**TVET CDACC**

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# ABBREVIATIONS AND ACRONYMNS

CAD Computer Aided Design

CDACC Curriculum Development, Assessment and Certification Council

EHS Environment Health and Safety

IAC Industry Advisory Committee

KCSE Kenya Certificate of Secondary Education

KEFEP Kenya Education for Employment

KNQA Kenya National Qualification Authority

KNQF Kenya National Qualification Framework

KEBS Kenya Bureau of Standards

MHE Material handling Equipment

NEMA National Environment Management Authority

OSHA Occupational Safety and Health Act

PPE Personal Protective Equipment

SSAC Sector Skills Advisory Committee

TVET Technical and Vocational Education and Training

TVETA Technical and Vocational Education and Training Authority

# KEY TO UNIT CODE

 **ENG/CU/AME/CR/ 01 / 4/ A**

Industry or sector

Curriculum

Occupational area

Type of competency

Competency number

Competency level

Version

# COURSE OVERVIEW

Agriculture Machinery Level 4 qualification consists of competencies that an individual must achieve to enable him/her in a work place. It involves operating and maintaining farm tractor, calibrating field equipment, applying digital skills in agricultural systems, maintaining hydraulic systems and maintaining agricultural pneumatic systems.

The units of competency comprising Agriculture Machinery and Equipment Level 4 qualifications include the following.

**BASIC UNITS OF COMPETENCY**

|  |  |  |  |
| --- | --- | --- | --- |
|  **Unit Code** | **Unit o Title** | **Duration in Hours** | **Credit Factor** |
| ENG/CU/AME/BC/01/ 4/A | Communication Skills | 20 | 2 |
| ENG/CU/AME/BC/02/ 4/A | Numeracy Skills | 25 | 3 |
| ENG/CU/AME/BC/03/ 4/A | Digital Literacy | 35 | 3 |
| ENG/CU/AME/BC/04/ 4/A | Entrepreneurial Skills | 60 | 6 |
| ENG/CU/AME/BC/05/4/A | Employability Skills | 30 | 3 |
| ENG/CU/AME/BC/06/ 4/A | Environmental Literacy | 20 | 2 |
| ENG/CU/AME/BC/07/ 4/A | Occupational Safety And Health Practices | 20 | 2 |
| **Total**  | **210** | **21** |

**COMMON UNITS OF COMPETENCY**

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit Code** | **Unit Title** | **Duration in hours** | **Credit Factor** |
| ENG/CU/AME/CC/01/4 | Technical drawing | **30** | **3** |
| ENG/CU/AME/CC/02/4 | Applied Engineering Mathematics | **30** | **3** |
| ENG/CU/AME/CC/03/4 | Engineering science  | **30** | **3** |
| ENG/CU/AME/CC/04/4 | Workshop technology | **20** | **2** |
| **Total**  | **110** | **11** |

**CORE UNITS OF COMPETENCY**

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit Code** | **Unit Title** | **Duration in hours** | **Credit Factor** |
| ENG/CU/AME/CR/01/4A | Farm tractor | 100 | 10 |
| ENG/CU/AME/CR/02/4/A | Calibration of field equipment | 100 | 10 |
| ENG/CU/AME/CR/03/4/A | Agricultural digital systems | 60 | 6 |
| ENG/CU/AME/CR/04/4/A | Hydraulic systems | 80 | 8 |
| ENG/CU/AME/CR/05/4/A | Agricultural pneumatic systems | 50 | 5 |
| ENG/CU/AME/CR/06/4/A | Industrial attachment | 300 | 30 |
| Total | **690** | **69** |
| **Grand total**  | **1010** | **101** |

The total duration of the course is 1010 hours.

**Entry Requirements**

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

1. Agricultural Machinery and Equipment Level 3

 **Or**

1. Kenya Certificate of Secondary Education (KCSE)- Mean Grade D-(Minus)

**Or**

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

**Industrial attachment**

It is envisaged that the trainee will undergo an industrial attachment training and assessment

with a recognized agricultural machinery and equipment facility as a prerequisite for

Completion of this training course.

**Assessment**

The course will be assessed at two levels:

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

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

**Trainer qualification**

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

**Certification**

An individual will be awarded a Certificate of Competency on demonstration of competence

in a unit of competency. To be awarded National Certificate in Agriculture Machinery and

Equipment, an individual must demonstrate competence in all the units of competency

These certificates will be awarded by TVET CDACC in conjunction with the training provider

# BASIC UNITS OF COMPETENCY

**COMMUNICATION SKILLS**

**UNIT CODE:** ENG/CU/AME/BC/01/ 4/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Demonstrate Communication Skills

**Duration of Unit:** 20 Hours

**Unit Description**

This unit covers the competencies required demonstrate communication skills. It involves obtaining and conveying workplace information, completing relevant work-related documents, communicating information about workplace processes, leading workplace discussion and communicating workplace issues.

**Summary of Learning Outcomes**

1. Obtain and convey workplace information
2. Complete relevant work-related documents
3. Communicate information about workplace processes
4. Lead workplace discussions
5. Identify and communicate issues arising in the workplace

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Methods of Assessment** |
| 1. Obtain and convey workplace information
 | * Communication process
* Modes of communication
* Medium of communication
* Effective communication
* Barriers to communication
* Flow of communication
* Sources of information
* Types of questions
* Organizational policies
* Workplace etiquette
* Ethical work practices in handling communication
 | * Interview
* Third party reports
 |
| 1. Complete relevant work-related documents
 | * Types and purposes of workplace documents and forms
* Methods used in filling forms and documents
* Recording workplace data
* Process of distributing workplace forms and documents
* Report writing
* Types of workplace reports
 | * Interview
* Third party reports
 |
| 1. Communicate information about workplace processes
 | * Communication process
* Modes of communication
* Medium of communication
* Effective communication
* Barriers to communication
* Flow of communication
* Sources of information
* Organizational policies
* Organization requirements for written and electronic communication methods
* Report writing
* Effective questioning techniques (clarifying and probing)
* Workplace etiquette
* Ethical work practices in handling communication
 | * Interview
* Portfolio
 |
| 1. Lead workplace discussion
 | * Methods of discussion e.g.
	+ Coordination meetings
	+ Toolbox discussion
	+ Peer-to-peer discussion
* Solicitation of response
 | * Interview
* Third party reports
 |
| 1. Identify and communicate issues arising in the workplace
 | * Identification of problems and issues
* Organizing information on problems and issues
* Relating problems and issues
* Communication barriers affecting workplace discussions
 | * Interview
* Portfolio
 |

**Suggested Methods of Instruction**

* Direct instruction
* Demonstration
* Practice assignment
* Discussion
* Role play
* Brainstorming

**Recommended Resources**

* Desktop computers/laptops
* Internet connection
* Projectors
* Telephone
* Report writing templates

**NUMERACY SKILLS**

**UNIT CODE:** ENG/CU/AME/BC/02/ 4/A

**Relationship to Occupational Standards:**

This unit addresses the Unit of Competency: Demonstrate Numeracy Skills

**Duration of Unit:** 25hours

**Unit Description**

This unit covers the competencies required to demonstrate numeracy skills. It involves identifying and using whole numbers and simple fractions, decimals and percentages for work, identifying, measuring and estimating familiar quantities for work, reading and using familiar maps, plans and diagrams for work, identifying and describing common 2D and some 3D shapes for work, constructing simple tables and graphs for work using familiar data and identifying and interpreting information in familiar tables, graphs and charts for work.

**Summary of Learning Outcomes**

1. Identify and use whole numbers and simple fractions, decimals and percentages for work
2. Identify, measure and estimate familiar quantities for work
3. Read and use familiar maps, plans and diagrams for work
4. Identify and describe common 2D and some 3D shapes for work
5. Construct simple tables and graphs for work using familiar data
6. Identify and interpret information in familiar tables, graphs and charts for work

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Methods of Assessment** |
| 1. Identify and use whole numbers and simple fractions, decimals and percentages for work
 | * Whole numbers
* Simple fractions
* Decimals
* Percentages
* Sizes
* Problem solving methods
* Calculations using the 4 operations
* Recording and communicating numerical information
 | * Written
* Practice assignments

  |
| 2. Identify, measure and estimate familiar quantities for work | * Measurement information
* Units of measurement
* Estimate familiar and simple amounts
* Selection of appropriate measuring equipment
* Calculate using familiar units of measurement
* Check measurements and results against estimates
* Using informal and some formal mathematical and general language
* Record or report results
 | * Written
* Practice assignments
 |
| 3. Read and use familiar maps, plans and diagrams for work | * Maps, plans and diagrams
* Locate items and places in familiar maps, plans and diagrams
* Recognize common symbols and keys in familiar maps, plans and diagrams
* Direction and location of objects, or route or places
* Use of informal and some formal oral mathematical language and symbols
 | * Practical test
* Written
 |
| 4. Identify and describe common 2D and some 3D shapes for work | * Common 2D shapes and 3D shapes
* Classification of common 2D shapes and designs
* Description of Use informal and some formal language to describe common two-dimensional shapes and some common three-dimensional shapes
* Construction of common 2D shapes
* Match common 3D shapes to their 2D sketches or nets
 | * Written
* Practical test
 |
| 5. Construct simple tables and graphs for work using familiar data | * Types of graphs
* Determination of data to be collected
* Selection of data collection method
* Collection of data
* Determination of variables from the data collected
* Order and collate data
* Construct a table and enter data
* Construct a graph using data from table
* Check results
* Report or discuss graph information related to work using informal and some formal mathematical and general language
 | * Written
* Practical test
 |
| 6. Identify and interpret information in familiar tables, graphs and charts for work | * Tables construction and labeling
* i.e. title, headings, rows and columns
* Interpreting information and data in simple tables
* Relaying information of relevant workplace tasks on/in a table
* Identify familiar graphs and charts in familiar texts and contexts
* Locate title, labels, axes, scale and key from familiar graphs and charts
* Identify and interpret information and data in familiar graphs and charts
* Relate information to relevant workplace tasks
 | * Written
* Practical test
 |

**Suggested Methods of Instruction**

* Instructor led facilitation of theory
* Practical demonstration of tasks by trainer
* Practice by trainees/ role play
* Discussion
* Observations and comments and corrections by trainers

**Recommended Resources**

* Computers
* Stationery
* Charts
* Video clips
* Audio tapes
* LCD projectors
* Standard operating and/or other workplace procedures manuals
* Specific job procedures manuals
* Projectors
* Writing boards
* Mathematical tables

**DIGITAL LITERACY**

**UNIT CODE:** ENG/CU/AME/BC/03/ 4/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Demonstrate Digital Literacy

**Duration of Unit:** 35 hours

**Unit Description**

This unit covers the competencies required to demonstrate digital literacy in a working environment. It entails identifying computer software and hardware, applying security measures to data, hardware, software, applying computer software in solving task sand applying internet and email in communication at workplace.

**Summary of Learning Outcomes**

1. Identify computer software and hardware
2. Apply security measures to data, hardware and software
3. Apply computer software in solving tasks
4. Apply internet and email in communication at workplace

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Methods of Assessment** |
| 1. Identify computer hardware and software
 | * Meaning of a computer
* Functions of a computer
* Components of a computer
* Classification of computers
 | * Written tests
* Oral
* Observation
 |
| 1. Apply security measures to data, hardware and software
 | * Data security and control
* Security threats and control measures
* Types of computer crimes
* Detection and protection against computer crimes
 | * Written tests
* Oral presentation
* Observation
* Projects
 |
| 1. Apply computer software in solving tasks
 | * Operating system
* Word processing
* Spread sheets
* Data base
 | * Oral questioning
* Observation
* Project
 |
| 1. Apply internet and email in communication at workplace
 | * Computer networks
* Uses of internet
* Electronic mail (e-mail) concept
 | * Oral questioning
* Observation
* Oral presentation
* Written report
 |

**Suggested Methods of Instruction**

* Instructor led facilitation of theory
* Demonstration by trainer
* Practical assignment
* Viewing of related videos
* Project
* Group discussions

**Recommended Resources**

* Desktop computers
* Laptop computers
* Other digital devices
* Printers
* Storage devices
* Internet access
* Computer software

**ENTREPRENEURIAL SKILLS**

**UNIT CODE:** ENG/CU/AME/BC/04/ 4/A

**Relationship to occupational standards**

This unit addresses the Unit of Competency: Demonstrate Entrepreneurial Skills

**Duration of unit:** 60 hours

**Unit description**

This unit covers the competencies required for creating and maintaining small scale business, establishing small business customer base, managing and growing a micro/small-scale business.

**Summary of Learning Outcomes**

1. Create and maintain small scale business
2. Establish small scale business customer base
3. Manage small scale business
4. Grow/expand small scale business

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Methods of Assessment** |
| 1. Create and maintain small scale business
 | * Starting a small business
* Legal regulatory requirements in starting a small business
* SWOT/ PESTEL analysis
* Conducting market/industry survey
* Generation and evaluation of business ideas
* Matching competencies with business opportunities
* Forms of business ownership
* Location of a small business
* Legal and regulatory requirement
* Resources required to start a small business
* Common terminologies in entrepreneurship
* Entrepreneurship in national development
* Self-employment
* Formal and informal employment
* Entrepreneurial culture
* Myths associated with entrepreneurship
* Types, characteristics, qualities & role of entrepreneurs
* History, development and importance of entrepreneurship
* Theories of entrepreneurship
* Quality assurance for small businesses
* Policies and procedures on occupational safety and health and environmental concerns
 | * Individual/group assignments
* projects
* Written
* Oral
 |
| 1. Establish small scale business customer base
 | * Good staff/workers and customer relations
* Marketing strategy
* Identifying and maintain new customers and markets
* Product/ service promotions
* Products / services diversification
* SWOT / PESTEL analysis
* Conducting a business survey
* Generating Business ideas
* Business opportunities
 | * Individual/group assignments
* projects
* Written
* Oral
 |
| 1. Manage small scale business
 | * Organization of a small business
* Small business’ business plan
* Marketing for small businesses
* Managing finances for small business
* Production/ operation process for goods/services
* Small business records management
* Book keeping and auditing for small businesses
* Business support services
* Small business resources mobilization and utilization
* Basic business social responsibility
* Management of small business
* Word processing concepts in small business management
* Computer application software
* Monitoring and controlling business operations
 | * Oral
* Individual/group assignments
* projects
* Written
 |
| 1. Grow/expand small scale business
 | * Methods of growing small business
* Resources for growing small business
* Small business growth plan
* Computer software in business development
* ICT and business growth
 | * Individual/group assignments
* projects
* Written
 |

**Suggested Methods of Instruction**

* Instructor led facilitation of theory
* Demonstration by trainer
* Practice by trainee
* Role play
* Case study

**Recommended Resources**

* Case studies for small businesses
* Business plan templates
* Lap top/ desk top computer
* Internet
* Telephone
* Writing materials

**EMPLOYABILITY SKILLS**

**UNIT CODE:** ENG/CU/AME/BC/05/ 4/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Demonstrate Employability Skills

**Duration of Unit:** 30 hours

**Unit Description**

This unit covers competencies required to demonstrate employability skills. It involves conducting self-management, demonstrating critical safe work habits, demonstrating workplace learning and workplace ethics.

**Summary of Learning Outcomes**

1. Conduct self-management
2. Demonstrate critical safe work habits
3. Demonstrate workplace learning
4. Demonstrate workplace ethics

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Methods of Assessment** |
| 1. Conduct self-management
 | * Self-awareness
* Formulating personal vision, mission and goals
* Strategies for overcoming life challenges
* Emotional intelligence
* Assertiveness
* Expressing personal thoughts, feelings and beliefs
* Developing and maintaining high self-esteem
* Developing and maintaining positive self-image
* Articulating ideas and aspirations
* Accountability and responsibility
* Good work habits
* Self-awareness
* Self-development
* Financial literacy
* Healthy lifestyle practices
 | * Written tests
* Oral questioning
* Portfolio of evidence
* Third party report
 |
| 1. Demonstrate critical safe work habits
 | * Stress and stress management
* Punctuality and time consciousness
* Interpersonal communication
* Sharing information
* Leisure
* Integratingpersonal objectives into organizational objectives
* Resources utilization
* Setting work priorities
* HIV and AIDS
* Drug and substance abuse
* Handling emerging issues
 | * Written tests
* Oral questioning
* Portfolio of evidence
* Third party report
 |
| 1. Demonstrate workplace learning
 | * Personal training needs identification and assessment
* Managing own learning
* Contributing to the learning community at the workplace
* Cultural aspects of work
* Variety of learning context
* Application of learning
* Safe use of technology
* Identifying opportunities
* Workplace innovation
* Performance improvement
* Handling emerging issues
* Future trends and concerns in learning
 | * Written tests
* Oral questioning
* Portfolio of evidence
* Third party report
 |
| 1. Demonstrate workplace ethics
 | * Meaning of ethics
* Ethical perspectives
* Principles of ethics
* Values and beliefs
* Ethical standards
* Organization code of ethics
* Common ethical dilemmas
* Organization culture
* Corruption, bribery and conflict of interest
* Privacy and data protection
* Diversity, harassment and mutual respect
* Financial responsibility/accountability
* Etiquette
* Personal and professional integrity
* Commitment to jurisdictional laws
* Emerging issues in ethics
 | * Written tests
* Oral questioning
* Portfolio of evidence
* Third party report
 |

**Suggested Methods of Instruction**

* Simulation/Role play
* Group Discussion
* Presentations
* Q&A
* Case studies
* Assignments

**Recommended Resources**

* Computers
* Stationery
* Charts
* Video clips
* Audio tapes
* Radio sets
* TV sets
* LCD projectors

**ENVIRONMENTAL LITERACY**

**UNIT CODE:** ENG/CU/AME/BC/06/ 4/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Demonstrate Environmental Literacy

**Duration of Unit:** 20hours

**Unit Description**

This unit specifies the competencies required to demonstrate environmental literacy. It involves controlling environmental hazard, controlling environmental pollution, demonstrating sustainable resource use and evaluating current practices in relation to resource usage.

**Summary of Learning Outcomes**

1. Control environmental hazard
2. Control environmental pollution
3. Demonstrate sustainable use of resources
4. Evaluate current practices in relation to resource usage

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Methods of Assessment** |
| 1. Control environmental hazard
 | * Purposes and content of Environmental Management and Coordination Act 1999
* Purposes and content of Solid Waste Act
* Storage methods for environmentally hazardous materials
* Disposal methods of hazardous wastes
* Types and uses of PPE in line with environmental regulations
* Occupational Safety and Health Standards (OSHS)
 | * Written tests
* Oral questions
* Observation of work procedures
 |
| 1. Control environmental Pollution
 | * Types of pollution
* Environmental pollution control measures
* Types of solid wastes
* Procedures for solid waste management
* Different types of noise pollution
* Methods for minimizing noise pollution
 | * Written tests
* Oral questions
* Observation of work procedures
* Role play
 |
| 1. Demonstrate sustainable resource use
 | * Types of resources
* Techniques in measuring current usage of resources
* Calculating current usage of resources
* Methods for minimizing wastage
* Waste management procedures
* Principles of 3Rs (Reduce, Reuse, Recycle)
* Methods for economizing or reducing resource consumption
 | * Written tests
* Oral questions
* Observation of work procedures
 |
| 1. Evaluate current practices in relation to resource usage
 | * Collection of information on environmental and resource efficiency systems and procedures,
* Measurement and recording of current resource usage
* Analysis and recording of current purchasing strategies.
* Analysis of current work processes to access information and data
* Identification of areas for improvement
 | * Written tests
* Oral questions
* Observation of work procedures
 |
| 1. Identify Environmental legislations/conventions for environmental concerns
 | * Environmental issues/concerns
* Environmental legislations /conventions and local ordinances
* Industrial standard /environmental practices
* International Environmental Protocols (Montreal, Kyoto)
* Features of an environmental strategy
 | * Written tests
* Oral questions
* Observation of work procedures
 |

**Suggested Methods of Instruction**

* Instructor led facilitation of theory
* Practical demonstration of tasks by trainer
* Practice by trainees/ role play
* Discussion
* Observations and comments and corrections by trainers

**Recommended Resources**

* Computers
* Stationery
* Charts
* Video clips
* Audio tapes
* Radio sets
* TV sets
* LCD projectors
* Standard operating and/or other workplace procedures manuals
* Specific job procedures manuals
* Machine/equipment manufacturer’s specifications and instructions
* Personal Protective Equipment (PPE)

**OCCUPATIONAL SAFETY AND HEALTH PRACTICES**

**UNIT CODE:** ENG/CU/AME/BC/07/ 4/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Demonstrate Occupational Safety and Health Practices

**Duration of Unit:** 20 hours

**Unit Description**

This unit specifies the competencies required to practice safety and health and comply with OSH requirements relevant to work. It involves adhering to workplace procedures for hazards and risk prevention and participating in arrangements for workplace safety and health maintenance.

**Summary of Learning Outcomes**

1. Adhere to workplace procedures for hazards and risk prevention
2. Participate in arrangements for workplace safety and health maintenance

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Methods of Assessment** |
| 1. Adhere to workplace procedures for hazards and risk prevention
 | * Arrangement of work area and items in accordance with Company housekeeping procedures
* Adherence to work standards and procedures
* Application of preventive and control measures, including use of safety gears/PPE
* Study and apply standards and procedures for incidents and emergencies.
 | * Oral questions
* Written tests
* Portfolio of evidence
* Third party report
 |
| 1. Participate in arrangements for workplace safety and health maintenance
 | * Participating in orientations on OSH requirements/regulations of tasks
* Providing feedback on health, safety, and security concerns to appropriate personnel as required in a sufficiently detailed manner
* Practice workplace procedures for reporting hazards, incidents, injuries and sickness
* OSH requirements/ regulations and workplace safety and hazard control procedures are reviewed, and compliance reported to appropriate personnel
* Identification of needed OSH-related trainings are proposed to appropriate personnel
 | * Oral questions
* Written tests
* Portfolio of evidence
* Third party report
 |

**Suggested Methods of Instruction**

* Assigments
* Discussion
* Q&A
* Role play
* Viewing of related videos

**Recommended Resources**

* Computers
* Stationery
* Charts
* Video clips
* Audio tapes
* Radio sets
* TV sets
* LCD projectors
* Standard operating and/or other workplace procedures manuals
* Specific job procedures manuals
* Machine/equipment manufacturer’s specifications and instructions
* Personal Protective Equipment (PPE) e.g.
* Mask
* Face mask/shield
* Safety bootsn
* Safety harness
* Arm/Hand guard, gloves
* Eye protection (goggles, shield)
* Hearing protection (ear muffs, ear plugs)
* Hair Net/cap/bonnet
* Hard hat
* Face protection (mask, shield)
* Apron/Gown/coverall/jump suit
* Anti-static suits
* High-visibility reflective vest

# COMMON UNITS OF COMPETENCY

# TECHNICAL DRAWING

**UNIT CODE:** ENG/CU/AME/CC/01/4/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Prepare and interpret technical drawings

**Duration of Unit:** 30 hours

**Unit Description**

This unit covers the competencies required to prepare and interpret technical drawings. It involves using and maintaining drawing equipment and materials, producing plane geometry drawings, producing solid geometry drawings, producing solid pictorial drawings and producing orthographic drawings.

**Summary of Learning Outcomes**

1. Use and maintain drawing equipment and materials
2. Produce plane geometry drawings
3. Produce solid geometry drawings
4. producing solid pictorial drawings
5. Produce orthographic drawings.

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

|  |  |  |
| --- | --- | --- |
| **Learning outcome** | **Content** | **Methods of Assessment** |
| 1. Use and maintain drawing equipment and materials
 | * Identification and care of drawing equipment
* Identification and care of drawing materials
* Reference to manufacturer’s instructions and work place procedures on use and maintenance of drawing equipment and materials
* Reference to relevant environmental legislations
* Use of personal protective equipment (PPEs)
 | * Observation
* Oral questioning
* Written tests
 |
| 1. Produce plane geometry drawings
 | * Types of lines in drawings
* Construction of geometric forms e.g. Squares, circles
* Construction of different angles
* Measurement of different angles
* Bisection of different angles and lines
* Standard drawing conventions
 | * Oral questioning
* Practical tests
* Observation
 |
| 1. Produce solid geometry drawings
 | * Interpretation of sketches and drawings of patterns e.g. Cylinders, prisms and pyramids
* Sectioning of solids e.g. Prisms, cones
* Development and interpenetrations of solids e.g. Cylinder to cylinder and cylinder to triangular, prism
 | * Observation
* Practical tests
* Oral questioning
 |
| 1. Produce orthographic drawings
 | * Meaning of pictorial and orthographic drawings
* Meaning of sectioning
* Meaning of symbols and abbreviations
* Drawing and interpretation of orthographic elevations
* Dimensioning of orthographic elevations
* Sectioning of views
 | * Observation
* Practical tests
* Oral questioning
 |

**Suggested methods of instruction**

* Projects
* Demonstration by trainer
* Practice by the trainee
* Discussions

**Recommended Resources**

* Drawing room
* Drawing instruments e.g. T-squares, set squares, drawing sets
* Drawing tables
* Pencils, papers, erasers
* Masking tapes

# ENGINEERING MATHEMATICS

**UNIT CODE:** ENG/CU/AME/CC/02/4/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Apply Engineering Mathematics

Duration of Unit: 30 hours

**Unit Description**

This unit covers the competencies required to apply engineering mathematics. It involves using concepts of basic arithmetic in solving work problems, using formulae and algebraic expressions for solving work problems, applying geometrical calculations for solving work problems, applying statistics to solve work problems and carrying out business calculations.

**Summary of Learning Outcomes**

1. Use concepts of basic arithmetic in solving work problems
2. Use formulae and algebraic expressions for solving work problems
3. Apply geometrical calculations for solving work problems
4. Apply statistics to solve work problems
5. Carry out business calculations

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Methods of Assessment** |
| 1. Use concepts of basic arithmetic in solving work problems
 | * Identify various kinds of numbers
* Carry out arithmetical operations accurately
* Use indices in multiplication and division
 | * Written tests
* Oral questioning
* Assignments
* Supervised exercises
 |
| 1. Use formulae and algebraic expressions for solving work problems
 | * Solve simple algebraic equations
* Form simple algebraic equations
* Represent linear equations
* Solve simple simultaneous equations
 | * Written tests
* Oral questioning
* Assignments
* Supervised exercises.
 |
| 1. Apply geometrical calculations for solving work problems
 | * Calculate areas of selected shapes
* Calculate surface areas of selected shapes
* Calculate volumes of selected shapes
* Apply Pythagoras theorem
 | * Assignments
* Oral questioning
* Supervised exercises
* Written tests.
 |
| 1. Apply statistics to solve work problems
 | * Data collection
* Data organization
* Data representation
* Median
* Charts
* Interpretation of data
 | * Assignments
* Oral questioning
* Observation
* Supervised exercises
* Written tests
 |

**Suggested methods of instruction**

* Group discussions
* Demonstration by trainer
* Online videos
* Power point presentation
* Exercises by trainee

**Recommended Resources**

* Scientific Calculators
* Relevant reference materials
* Stationeries
* Internet

# ENGINEERING SCIENCE PRINCIPLES

**UNIT CODE:** ENG/CU/AME/CC/03/4/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Apply Agricultural Engineering Science Principles

Duration of Unit: 30 hours

**Unit Description**

This unit covers the competencies required to apply engineering science principles. It involves carrying out measurements, determining force, work, energy and power, solving simple problems on friction, identifying characteristics of light and sound and applying general chemistry in experiments.

**Summary of Learning Outcomes**

1. Carry out measurements
2. Determine force, work, energy and power
3. Solve simple problems on friction
4. Identify characteristics of light and sound
5. Apply general chemistry in experiments

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

|  |  |  |
| --- | --- | --- |
| **Learning outcome** | **Content** | **Methods of Assessment** |
| 1. Carry out measurements
 | * Select appropriate units of measurements
* Convert units from one form to another
* Carry out simple measurements
 | * Written tests
* Oral questioning
* Assignments
* Supervised exercises
 |
| 1. Determine force, work, energy and power
 | * Define force, work, energy and power
* Describe forms of energy
* Convert energy from one form to another
* Solve simple calculations on force, work, energy and power
 | * Written tests
* Oral questioning
* Assignments
* Supervised exercises.
* Practical tests
 |
| 1. Solve simple problems on friction
 | * State meaning of friction
* Identify the advantages and disadvantages of friction
* Solve simple problems on friction
 | * Assignments
* Oral questioning
* Supervised exercises
* Written tests.
* Practical tests
 |
| 1. Identify characteristics of light and sound
 | * Identify sources of light and sound
* State the laws of reflection and refraction
* Determine the characteristics of images formed by mirrors
* Solve simple problems involving location of images
* Describe propagation of sound in a given medium
* State the properties of sound
 | * Assignments
* Oral questioning
* Practical tests
* Observation
* Supervised exercises
* Written tests
 |
| 1. Apply general chemistry in experiments
 | * State the classification of matter
* Describe the strength of chemical bonds
* State the properties of elements and compounds
* State the properties of acids and bases
* Prepare salts from acids and bases
 | * Assignments
* Supervised exercises
* Written tests
* Practical test
 |

**Suggested methods of instruction**

* Group discussions
* Demonstration by trainer
* Online videos
* Power point presentation
* Exercises by trainee

**Recommended Resources**

* Scientific Calculators
* Relevant reference materials
* Stationeries
* Relevant practical materials
* Laboratories
* Internet

# WORKSHOP TECHNOLOGY PRINCIPLES

**UNIT CODE:** ENG/CU/AME/CC/04/4/A

**Relationship to Occupational Standards:**

This unit addresses the unit of competency: Apply workshop technology principles

**Duration of Unit**: 20 hours

**Unit description:**

This unit covers the competencies required to apply workshop technology principles. It involves interpreting working drawings, choosing of appropriate tools and materials, marking out of work piece(s), producing components as per the drawing and performing finishing processes.

**Summary of Learning Outcome**

1. Interpreting working drawings
2. Choosing of appropriate tools and materials.
3. Marking out of the work pieces
4. Producing components as per the drawing
5. Performing finishing processes

**Learning Outcomes, Content and suggested assessment methods**

|  |  |  |
| --- | --- | --- |
| **Learning outcome** | **Content** | **Methods of Assessment** |
| 1. Interpret working drawings
 | * Reading and extraction of information (dimensions, tolerances, BS/ANSI drawing standards, geometric iso symbols & abbreviations)
* Development of working procedure/ operational plan
 | * Written tests
* Oral questioning
* Assignments
* Supervised exercises
 |
| 1. Choose appropriate tools and materials
 | * Types of hand tools
* Using hand tools.
* Using machine tools
* Selection of tools as per the specific operation
* Inspection and/or recalibration of tools
* Demonstration of correct handling of tools.
* Selection of material for the given component
 | * Written tests
* Oral questioning
* Assignments
* Supervised exercises
 |
| 1. Mark out of work piece(s)
 | * Use of marking out tools
* Laying out work piece(s)
* Transfer of dimensions onto the work piece(s)
 | * Written tests
* Oral questioning
* Assignments
* Supervised exercises
 |
| 1. Produce components
 | * Secure work piece on work holding device securely.
* Perform suggested operations but not limited to:
	+ Tapping
	+ Drilling
	+ Boring
	+ Filing
	+ Grinding
	+ Sawing
	+ Turning
	+ Soldering/brazing
	+ Welding
 | * Written tests
* Oral questioning
* Assignments
* Supervised exercises
 |
| 1. Perform finishing processes
 | * Finishing
* Polishing
* Filing
* Grinding
* De-burring
* Painting of components
 | * Written tests
* Oral questioning
* Assignments
* Supervised exercises
 |

**Suggested methods of instruction**

* Demonstration by trainer
* Discussions
* Practical work by trainee(s)
* Exercises
* Industrials visits
* Internet.
* Simulation

**List of Recommended Resources**

* Welding
* Drilling machines
* Vices
* Burnishing machine
* Cutting tools
* Combination square
* Centre punch
* Centre lathe
* scribers
* calipers
* Dies and taps
* Surface plate
* V-blocks
* Dial gauge
* Die stock
* Engineer’s square
* File card
* Assorted Files
* Assorted hand tools
* Hammers
* Measuring tools
* Drill bits
* Assorted inspection tools and equipment
* Jigs and fixture
* Pliers
* Rotary disc abrasive grinder
* Reamers
* Saw
* Screwdrivers
* Tap wrench
* V-block
* Workbenches
* Mops/ Brooms and buckets
* Firefighting equipment
* First Aid kit

# CORE UNITS OF COMPETENCY

# FARM TRACTOR

**UNIT CODE:** ENG/CU/AME/CR/01/4/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Operate and maintain farm tractor

**Duration of the unit**: 100 hours

**Unit description:**

This unit covers the competencies required to operate and maintain farm tractor**.** It involves performing safe operation of farm tractors operating tractor systems, performing maintenance on selected systems of farm tractors, evaluating the performance of tractor systems and performing adjustments to tractor components and systems.

**Summary of Learning Outcomes:**

1. Perform safe operation of farm tractors

2. Operate tractor systems

3. Perform maintenance on selected systems of farm tractors

4. Evaluate the performance of tractor systems

5. Perform adjustments to tractor components and systems

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

|  |  |  |
| --- | --- | --- |
| **Learning outcome** | **Content** | **Methods of Assessment** |
| 1. Perform safe operation of farm tractors | * The observance of Kenyan regulations concerned with health, safety and the environment;
* The use of personal protective equipment and clothing (PPE) used throughout work activities;
* Potential safety hazards in the work environment
* Pre-operation checks on;
	+ Cooling system
	+ Electrical system
	+ Transmission system
	+ Hydraulic system
	+ Lubrication system
	+ Fuel system
	+ Steering system
* Perform safe driving of tractor
 | * Observation
* Practical exercises
* Oral
* Written
* Third party report
 |
| 2. Operate tractor systems | * Identify selected tractor systems
	+ Cooling system
	+ Electrical system
	+ Transmission system
	+ Hydraulic system
	+ Power take-off (PTO)
	+ Lubrication system
	+ Fuel system
	+ Steering system
	+ Hitches
* Test selected tractor systems
* Perform operation of selected tractor systems
 | * Observation
* Practical exercises
* Oral
* Written
* Third party report
 |
| 3. Perform maintenance on selected systems of farm tractors | * Select appropriate tools and equipment for maintenance of selected tractor systems
* Perform maintenance procedures for selected tractor systems
	+ - Cooling system
		- Electrical system
		- Transmission system
		- Hydraulic system
		- Power take-off (PTO)
		- Lubrication system
		- Fuel system
		- Steering system
		- Hitches
* Perform routine service on selected tractor systems
 | * Observation
* Practical exercises
* Oral
* Written
* Third party report
 |
| 4. Evaluate the performance of tractor systems | * Perform basic diagnostics on selected tractor systems
	+ Cooling system
	+ Electrical system
	+ Transmission system
	+ Hydraulic system
	+ Power take-off (PTO)
	+ Lubrication system
	+ Fuel system
	+ Steering system
	+ Hitches
* Identify common malfunctions of selected tractor systems
* Interpret results of the diagnostic tests of selected tractor systems
 | * Observation
* Practical exercises
* Oral
* Written
* Third party report
 |
| 5. Perform adjustments to tractor components and systems | * Perform adjustments for optimal performance of selected tractor systems
* Cooling system
* Electrical system
* Transmission system
* Hydraulic system
* Power take-off (PTO)
* Lubrication system
* Fuel system
* Steering system
* Hitches
* Perform tests of selected tractor systems to validate adjustments
 | * Observation
* Practical exercises
* Oral
* Written
* Third party report
 |

**Suggested Methods of Instruction**

* Presentations and practical demonstrations by trainer;
* Guided learner activities and research to develop underpinning knowledge;
* Supervised activities and projects in a workshop;
* Visiting lecturer/trainer from the Agricultural Machinery service and repair sector;
* Industrial visits.

**Recommended Resources**

* A fully equipped agricultural machinery and equipment maintenance workshop;
* Fully operational tractor
* Internet access to manufacturers’ technical information;
* Personal protective equipment (PPE) and suitable coverings to protect vehicles;
* Facilities for the disposal of waste oil and used parts;
* Customer database and systems for recording maintenance records.
* Lubricants
* Fluids
* Replacement parts
* Cleaning materials

# CALIBRATION OF FIELD EQUIPMENT

**UNIT CODE:** ENG/CU/AME/CR/02/4/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Calibrate Field Equipment

**Duration of Unit:** 100 hours

**Unit Description:**

This unit covers the competencies required to calibrate field equipment**.** It involves assessing the condition of field equipment, operating selected farm machines and equipment, performing maintenance and servicing procedures on selected agricultural equipment, calibrating selected farm equipment and testing the operation of field equipment and carrying out final adjustments.

**Summary of Learning Outcomes:**

1 Assess the condition of field equipment

2. Operate selected farm machines and equipment

3. Perform maintenance and service procedures on selected agricultural equipment

4. Calibrate selected farm equipment

5. Test the operation of field equipment and carry out final adjustments

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

|  |  |  |
| --- | --- | --- |
| **Learning outcome** | **Content** | **Methods of Assessment** |
| 1. Assess the condition of field equipment
 | * The observance of Kenyan regulations concerned with health, safety and the environment;
* The use of personal protective equipment and clothing (PPE) used throughout work activities;
* Potential safety hazards in the work environment
* Pre-operation checks on;
	+ Tillage implements
	+ Planting equipment
	+ Spraying equipment
	+ Harvesting equipment
* Processing equipment
 | * Observation
* Practical exercises
* Oral
* Written
* Third party report
 |
| 1. Operate selected farm machines and equipment
 | * Identification of farm machines and equipment
	+ Tillage implements
	+ Planting equipment
	+ Spraying equipment
	+ Harvesting equipment
* Processing equipment
* Functions of the farm machines and equipment
* Components of farm machines and equipment
* Operate farm implements and equipment
* Hooking up and unhooking of farm implements
 | * Observation
* Practical exercises
* Oral Questions
* Written Test
* Third party report
 |
| 1. Perform maintenance and service procedures on selected agricultural equipment
 | * The importance of using appropriate technical information as a guide for maintenance;
* Cleaning of components to facilitate inspection and assessment of components;
* Selection of appropriate tools and equipment
* Diagnosis and servicing of;
	+ Tillage implements
	+ Planting equipment
	+ Spraying equipment
	+ Harvesting equipment
* Processing equipment
* Correct methods and procedures for dismantling farm machines and equipment;
* Using visual and measurement methods and procedures for inspecting and assessing components for:
	+ Damage
	+ Wear
	+ Corrosion
	+ Fracture
	+ Distortion
 | * Observation
* Practical exercises
* Oral
* Written
* Third party report
 |
| 1. Calibrate selected farm equipment
 | * Calibration methods
* Identification of farm equipment;
	+ Planting equipment
		- Precision planter
		- Seed drill
	+ Spraying equipment
		- Boom sprayer
		- Knap sack sprayer
	+ Harvesting equipment
		- Pick-up hay baler
	+ Processing equipment
		- Hammer mill
* Selection of desired application or operation rates
* Selection of appropriate measurement tool
* Application of the appropriate mathematical units
* Application of the required mathematical principles to calculate the application or operation rate
* Performing adjustment to the required rate of application or operation.
 | * Observation
* Practical exercises
* Oral
* Written
* Third party report
 |
| 5. Test the operation of field equipment and carry out final adjustments | * Performing field test of the adjustment to the application or operation rate
* Comparing the actual application or operation rate to the desired application or operation rate
* Evaluating whether further
* Adjustment is needed and making recommendations
 | * Observation
* Practical exercises
* Oral
* Written
* Third party report
 |

**Suggested Methods of Instruction**

* Presentations and practical demonstrations by trainer;
* Guided learner activities and research to develop underpinning knowledge;
* Supervised activities and projects in a workshop;
* Visiting lecturer/trainer from the Agricultural Machinery service and repair sector;
* Industrial visits.

**Recommended Resources**

* A fully equipped agricultural machinery and equipment maintenance workshop;
* Tillage implements
* Planting equipment
* Spraying equipment
* Harvesting equipment
* Fully operational tractor
* Internet access to manufacturers’ technical information;
* Personal protective equipment (PPE) and suitable coverings to protect vehicles;
* Facilities for the disposal of waste oil and used parts;
* Customer database and systems for recording maintenance records.
* Lubricants;
* Fluids
* Replacement parts:
* Cleaning materials;

# AGRICULTURAL MACHINERY DIGITAL SYSTEMS

**UNIT CODE:** ENG/CU/AME/CR/03/4/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Apply Digital Skills in Agricultural Systems

**Duration of Unit:** 60 hours

**Unit Description**

This unit covers the competencies required to apply digital skills in agricultural systems**.** It involves applying theoretical knowledge related to agricultural digital systems, performing troubleshooting procedures on electronic components and systems, operating electronic diagnostic control tools, performing service and maintenance operations on agricultural digital systems and evaluating the operations of agricultural digital systems.

**Summary of Learning Outcomes**

1. Apply theoretical knowledge related to Agricultural Digital Systems
2. Perform troubleshooting procedures on electronic components and systems
3. Operate electronic diagnostic control tools
4. Perform service and Maintenance operations on agricultural digital systems
5. Evaluate the Operations of agricultural digital systems

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

|  |  |  |
| --- | --- | --- |
| **Learning outcome** | **Content** | **Methods of Assessment** |
| 1. Apply theoretical knowledge related to agricultural digital systems
 | * Concepts of magnetism
* Principles of electricity
* Functions of electricity and magnetism within electrical and electronic components and systems
* Principles of agricultural digital systems
* Computer control theory with respect to agricultural digital systems
 | * Written tests
* Oral presentation
* Observation
 |
| 1. Perform troubleshooting procedures on electronic components and systems
 | * Selection of PPE according to specific context and policy
* Connection of electronic diagnostic tools with agricultural equipment.
* Different troubleshooting codes in electronic diagnostics
 | * Written tests
* Oral presentation
* Observation
* Project
 |
| 1. Operate electronic diagnostic control tools
 | * Levels of access to electronic diagnostic tools
* Selection of electronic equipment calibration at operator level
* Description of electronic calibration of equipment at the service center level.
 | * Oral questioning
* Observation
* Project
 |
| 1. Perform service and maintenance operations on agricultural digital systems
 | * Care and maintenance of electronic networking diagnostic control tools
* Performance of software updates on electronic diagnostic control tools
 | * Oral questioning
* Observation
* Oral presentation
* Written report
 |
| 1. Evaluate the operations of agricultural digital systems
 | * Selection of PPE according to specific context and policy
* Identification of electronic diagnostic control tools
* Connection of selected electronic diagnostic tools with agricultural equipment.
* Interpretation of results from selected electronic diagnostic tools
 | * Oral questioning
* Observation
* Oral presentation
* Written report
* Project
 |

**Suggested Methods of Instruction**

* Presentations and practical demonstrations by trainer;
* Guided learner activities and research to develop underpinning knowledge;
* Supervised activities and projects in a workshop
* Instructor lead facilitation of theory
* Demonstrations
* Simulation/Role play
* Group Discussion
* Projects
* Presentations
* Case studies
* Assignments

**Recommended Resources**

* Computers
* TV sets
* LCD projectors
* Internet access to manufacturers’ technical information;
* Personal protective equipment (PPE) and suitable coverings to protect vehicles;
* Facilities for the disposal of waste oil and used parts;
* Customer database and systems for recording maintenance records**.**
* Stationery
* Charts
* Video clips
* Audio tapes
* Radio set
* Digital multi-meters
* Test lights
* Laptop diagnostic systems
* On-board diagnostic systems
* Batteries
* Sensors
* Regulators
* Heaters
* LED
* Printed circuit boards
* Communication plugs
* Circuit tests
* Component tests
* Service code diagnostics

# HYDRAULIC SYSTEMS

**UNIT CODE:** ENG/CU/AME/CR/04/4/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Maintain Hydraulic System

**Duration of the unit:** 80 hours

**Unit description:**

This unit covers the competencies required to apply digital skills in agricultural systems**.** It involves demonstrating understanding of agricultural hydraulic systems, performing trouble shooting of hydraulic systems, performing service and maintenance of hydraulic systems, calibrating hydraulic systems and optimizing the operations of the hydraulic systems.

**Summary of Learning Outcomes:**

* + - 1. Interpret agricultural hydraulic systems
			2. Perform trouble shooting of hydraulic systems
			3. Perform service and maintenance of hydraulic systems
			4. Calibrate hydraulic systems
			5. Optimize the operations of the hydraulic systems

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Methods of Assessment** |
| 1. Demonstrate understanding of agricultural hydraulic systems
 | * The observance of Kenyan regulations concerned with health, safety and the environment;
* Demonstrate disposal of faulty components
* Use personal protective equipment and clothing (PPE) throughout work activities;
* Identify components of hydraulic system
* Select tools and equipment for servicing Hydraulic system
* Dismantle the hydraulic system for service.
* Identify hydraulic systems are
* Describe working principles of hydraulic systems
* Compare hydraulic systems
* IdentifiedHydraulic systems components
* Interpreted schematic representations of hydraulic systems
* Use of technical data in servicing and repairing components.
 | * Practical exercises
* Oral questioning
 |
| 1. Perform trouble shooting of hydraulic systems
 | * Select appropriate tools and equipment
* Apply appropriate safety protocols to evaluation of hydraulic systems
* Identify common malfunctions of hydraulic systems
* Test for malfunction and performance of hydraulic systems
* Demonstrate understanding of principles of operation of the pump
* Demonstrate understanding of Structure of the pump
* Perform service and fitting of the pump
* Demonstrate precautions when handling hydraulic pump.
* Use flow controls and dividers
 | * Observation
* Practical
* Projects
 |
| 1. Perform service and maintenance of hydraulic systems
 | * Perform service and maintenance procedures on hydraulic system circuits
* Generate service and maintenance reports on hydraulic systems to industry standards
* Hydraulic reservoirs
* Hydraulic filters
* System and machine plumbing
* Air dryers and lubricants
* Principle of operation of the relief and unloading pressure control valves
* Types and Structure of valves
* Fluid power actuators
* Accumulators
* High- and low-pressure pipes
* Intensifiers
 | * Practical exercises
* Oral questioning
* Written tests
 |
| 1. Calibrate hydraulic systems
 | * Tools and equipment for testing
* Manufacturer’s specification in setting pressure and voltage
* Identify appropriate tools and equipment for calibration
* Perform adjustments on hydraulic systems according to factory specifications
* Perform calibration of hydraulic systems
 | * Practical exercises
* Oral questioning
* Observation
 |
| 1. Optimize the operations of the hydraulic systems
 | * Apply appropriate safety protocols to evaluation of hydraulic systems
* Perform tests on hydraulic system circuits
* Analyze results of tests of hydraulic system circuits
* Field-test the operation of hydraulic systems
 | * Practical exercises
* Oral questioning
* Written tests
 |

**Suggested Methods of Instruction**

* Presentations and practical demonstrations by trainer;
* Guided learner activities and research to develop underpinning knowledge;
* Supervised activities and projects in a workshop;
* Visiting lecturer/trainer from the workshop service and repair sector;
* Industrial visits.

**Recommended Resources**

* + Hydraulic system Instructional models;
	+ A fully equipped agricultural equipment maintenance workshop;
	+ Fully functional tractor(s)
	+ Functional hydraulic system;
	+ Hydraulic system components and units;
	+ Vehicle lift/inspection pit;
	+ Internet access to manufacturers’ technical information;
	+ Torque setting tools;
	+ Personal protective equipment (PPE) and suitable coverings to protect vehicles;
	+ Facilities for the disposal of waste oil and used parts;
	+ Customer database and systems for recording maintenance records.
	+ Digital instructional material including DVDs and CDs;
	+ Consumables for service and repair of hydraulic systems including;
	+ Oil seals and gaskets;
	+ Coolants;
	+ Cleaning materials;
	+ Hand cleaner;
	+ Dusters.
	+ Hydraulic fluids
	+ Separate parts and components of several different hydraulic systems

# AGRICULTURAL MACHINERY PNEUMATIC SYSTEMS

**UNIT CODE:** ENG/CU/AME/CR/05/4/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Maintain Agricultural machinery PneumaticSystems

**Duration of the unit:** 50 hours

**Unit Description**

This unit covers the competencies required to apply digital skills in agricultural systems**.** It involves demonstrating knowledge of agricultural pneumatic systems, diagnosing malfunction of agricultural pneumatic systems, performing service and maintenance of agricultural pneumatic systems, performing adjustments to agricultural pneumatic systems and optimizing the operations of the agricultural pneumatic systems.

**Summary of Learning Outcomes:**

* + - 1. Demonstrate knowledge of agricultural pneumatic systems
			2. Diagnose malfunction of agricultural pneumatic systems
			3. Perform service and maintenance of agricultural pneumatic systems
			4. Perform adjustments to agricultural pneumatic systems
			5. Optimize the operations of the agricultural pneumatic systems

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

|  |  |  |
| --- | --- | --- |
| **Learning outcome** | **Content** | **Methods of Assessment** |
| 1. Demonstrate knowledge of agricultural pneumatic systems
 | * The observance of Kenyan regulations concerned with health, safety and the environment;
* Disposal of faulty components
* The use of personal protective equipment and clothing (PPE) used throughout work activities;
* Components of pneumatic system
* Tools and equipment for servicing pneumatic system
* Dismantling of pneumatic system.
* Pneumatic ***systems*** are identified
* Working principles of pneumatic systems are described
* Pneumatic systems are compared
* Pneumatic ***system components*** are identified
* Schematic representations of pneumatic systems are interpreted
* Use of technical data in servicing and repairing components.
 | * Practical exercises
* Oral questioning
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| 1. Diagnose malfunction of agricultural pneumatic systems
 | * Select appropriate tools and equipment
* Apply appropriate safety protocols to evaluation of pneumatic systems
* Identify common malfunctions of pneumatic systems
* Test for malfunction and performance of pneumatic systems
* Principle of operation of the pump
* Structure of the pump
* Servicing and fitting of the pump
* Precautions when handling pneumatic pump.
* Flow controls and dividers
 | * Observation
* Practical
* Projects
 |
| 1. Perform service and maintenance of agricultural pneumatic systems
 | * Perform service and maintenance procedures on pneumatic system circuits
* Generate service and maintenance reports on pneumatic systems to industry standards
* Pneumatic reservoirs
* Pneumatic filters
* System and machine plumbing
* Air dryers and lubricants
* Principle of operation of the relief and unloading pressure control valves
* Types and structure of valves
* Fluid power actuators
* Accumulators
* High- and low-pressure pipes
* Intensifiers
 | * Practical exercises
* Oral questioning
* Written tests
 |
| 1. Perform adjustments to agricultural pneumatic systems
 | * Tools and equipment for testing
* Perform adjustments on pneumatic systems according to factory specifications
* Perform calibration of pneumatic systems
 | * Practical exercises
* Oral questioning
* Observation
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| 1. Optimize the operations of the agricultural pneumatic systems
 | * Apply appropriate safety protocols to evaluation of pneumatic systems
* Perform tests on pneumatic system circuits
* Analyze results of tests of pneumatic system circuits
* Field-test the operation of pneumatic systems
 | * Practical exercises
* Oral questioning
* Written tests
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**Suggested Methods of Instruction**

* Presentations and practical demonstrations by trainer;
* Guided learner activities and research to develop underpinning knowledge;
* Supervised activities and projects in a workshop;
* Visiting lecturer/trainer from the workshop service and repair sector;
* Industrial visits

**Recommended Resources**

* Pneumatic systems Instructional models;
* A fully equipped agricultural equipment maintenance workshop;
* Fully functional tractor(s) and agricultural equipment and implements equipped with pneumatic systems
* Pneumatic system components and units;
* Vehicle lift/inspection pit;
* Internet access to manufacturers’ technical information;
* Torque setting tools;
* Personal protective equipment (PPE) and suitable coverings to protect vehicles;
* Facilities for the disposal of waste oil and used parts;
* Customer database and systems for recording maintenance records.
* Digital instructional material including DVDs and CDs;
* Consumables for service and repair of pneumatic systems including;
	+ Oil seals and gaskets;
	+ Coolants;
	+ Cleaning materials;
	+ Hand cleaner;
	+ Dusters.
* Pneumatic and Hydraulic fluids
* Separate parts and components of several different pneumatic systems