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. 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 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, emphasized the need tore form 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 Engineering 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, Engineering Sector Skills Advisory Committee (SSAC), expert workers and all those who participated in the development of this curriculum.

Prof. CHARLES M. M. ONDIEKI, PhD, FIET (K), Con. Eng. Tech.
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 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 national 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 this sector acquire competencies that will enable them to perform their work more efficiently.

DR. LAWRENCE GUANTAI M'ITONGA, PhD

COUNCIL SECRETARY/CEO

TVET CDACC

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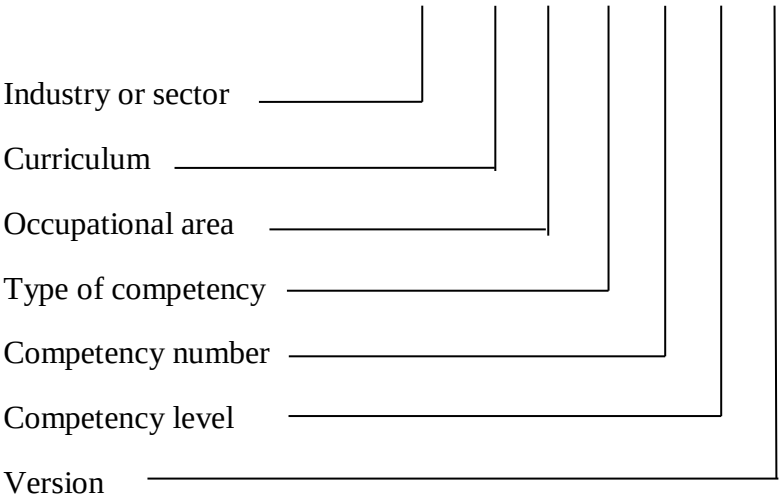
ACRONYMNS AND ABBREVIATIONS

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



COURSE OVERVIEW

The Agricultural Machinery and Equipment qualification consists of competencies that an individual must achieve to enable him/her to operate, service and maintain agricultural machinery and equipment. The units of competency comprising Agricultural Machinery and Equipment Level 4 qualification include the following basic, common, and core competencies:

(a) ***Basic Competencies***

Unit of Learning Code	Unit of Learning Title	Duration in Hours	Credit Factor
ENG/CU/AME/BC/01/ 4	Communication skills	**20**	**2**
ENG/CU/AME/BC/02/ 4	Numeracy skills	**30**	**3**
ENG/CU/AME/BC/03/ 4	Digital literacy	**30**	**3**
ENG/CU/AME/BC/04/ 4	Entrepreneurial skills	**60**	**6**
ENG/CU/AME/BC/05/4	Employability skills	**30**	**3**
ENG/CU/AME/BC/06/ 4	Environmental literacy	**20**	**2**
ENG/CU/AME/BC/07/ 4	Occupational safety and health practices	**20**	**2**
Total Hours/Credits		**210**	**21**

b) Common competencies

Unit of Learning Code	Title/description of competency	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 Hours/Credits		**110**	**11**

c) Core Competencies

Unit of Learning Code	Title/description of competency	Duration in hours	Credit Factor
ENG/CU/AME/CR/01/4	Farm tractor	**100**	**10**
ENG/CU/AME/CR/02/4	Calibration of field equipment	**100**	**10**
ENG/CU/AME/CR/03/4	Agricultural digital systems	**60**	**6**
ENG/CU/AME/CR/04/4	Hydraulic systems	**80**	**8**
ENG/CU/AME /CR/05/4	Agricultural pneumatic systems	**50**	**5**
	Industrial attachment	**300**	**30**
Total Hours/Credits		**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:

a) Agricultural Machinery and Equipment Level 3

Or

b) Kenya Certificate of Secondary Education (KCSE)- Mean Grade D-

Or

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

Provision for 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.

Attachment/Internship:

Attachment (Internship) is an opportunity for a learner to integrate career related experience by participating in planned, supervised work. This curriculum anticipates at least 480 hours of attachment as integral part of the training. In addition, the training comprises practical learning activities (estimated to be >60% of the time) which are meant to reinforce trainees' smooth access to employment or self-employment.

Assessment

Assessment is the process of gathering and judging evidence in order to decide whether a person has attained a standard of performance. The course will be assessed at two levels:

- Internal assessment is continuous and is conducted by the trainer who is monitored by an internal accredited verifier
- External assessment is the responsibility of TVET CDACC

Certification

On successful completion of a unit of learning, a trainee will be issued with a Certificate of acknowledging achievement of the competence and on successful completion of all units of learning a trainee will be awarded a National Certificate in Agricultural Machinery and Equipment. The certificate will be issued by TVET CDACC in conjunction with the training provider.

BASIC UNITS OF COMPETENCY

COMMUNICATION SKILLS

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

Relationship to Occupational Standards
This unit addresses the unit of competency: Demonstrate communication skills

Duration of Unit: 20 Hours

Unit Description
This unit describes the competencies required to lead in the dissemination and discussion of ideas, information and issues in the workplace.

Summary of Learning Outcomes

1. Communicate information about workplace processes
2. Lead workplace discussion
3. Identify and communicate issues arising in the workplace

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
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	• Observation • Interview • Portfolio

2. Lead workplace discussion	• Methods of discussion e.g.
	  ○ Coordination meetings
	  ○ Toolbox discussion
	  ○ Peer-to-peer discussion
	• Solicitation of response
		• Observation
		• Interview
		• Third party reports

3. 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	• Observation • Interview • Portfolio

Suggested Delivery Methods

- 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

Relationship to Occupational Standards:
This unit addresses the unit of competency: Demonstrate numeracy skills

Duration of Unit: 30 hours

Unit Description
This unit describes the competencies required by a worker in order to competently identify and use whole numbers and simple fractions, decimals and percentages; Identify, measure and estimate familiar quantities for work, Read and use familiar maps, plans and diagrams for work, Identify and describe common 2D and some 3D shapes for work, construct simple tables and graphs for work using familiar data, Identify and interpret 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	Suggested Assessment Methods
1. 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	• Oral • Written • Practical test • Observation

	• Using informal and some formal mathematical and general language • Record or report results	
2. 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	• Oral • Written • Practical test • Observation
3. Read and use familiar maps, plans and diagrams 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	• Oral • Written • Practical test • Observation
4. 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	• Oral • Written • Practical test • Observation

	• 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	
5. 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	• Oral • Written • Practical test • Observation

Suggested Delivery Methods

- 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

- Standard operating and/or other workplace procedures manuals
- Specific job procedures manuals
- Mathematical tables

DIGITAL LITERACY

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

Relationship to Occupational Standards
This unit addresses the unit of competency: Demonstrate digital literacy

Duration of Unit: 30 hours

Unit Description
This unit covers the competencies required to effectively demonstrate digital literacy in a working environment. It entails identifying and using digital devices such as smartphones, tablets, laptops and desktop PCs for purposes of communication and performing work related tasks at the work place.

Summary of Learning Outcomes
1. Identify computer hardware and software
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	Suggested Assessment Methods
1. Identify computer hardware and software	• Meaning of a computer • Functions of a computer • Components of a computer • Classification of computers	• Written • Oral • Observation
2. 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
3. Apply computer software in solving tasks	• Operating system • Word processing • Spread sheets • Data base	• Oral questioning • Observation • Project

4. 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 Delivery Methods

- Instructor led facilitation of theory
- Demonstration by trainer
- Practical work by trainee
- Viewing of related videos
- Project
- Group discussions

Recommended Resources

- Desk top computers
- Laptop computers
- Other digital devices
- Printers
- Storage devices
- Internet access
- Computer software

ENTREPRENEURIAL SKILLS

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

Relationship to occupational standards
This unit addresses the unit of competency: Demonstrate entrepreneurial skills

Duration of unit: 60 hours
Unit description
This unit describes the competencies critical to demonstration of entrepreneurial skills. It includes creating and maintaining small scale business, establishing small scale business customer base, managing and growing a small 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	Suggested assessment methods
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	• Observation • Case studies • Individual/group assignments • Projects • Written • Oral

	• 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	
2. 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	• Observation • Case studies • Individual/group assignments • Projects • Written • Oral
3. Manage small scale business	• Organization of a small business • Small business' business plan • Marketing for small businesses • Managing finances for small business	• Oral • Observation • Case studies • Individual/group assignments • Projects • Written

	• 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	
4. 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	• Observation • Case studies • Individual/group assignments • Projects • Written

Suggested Delivery Methods

- 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

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 competencies for exuding self-awareness and ability to deal with everyday life challenges; applying critical safe work habits and working harmoniously in a team; participating in planning and organizing work activities; applying learning, creativity and innovativeness in workplace functions; pursuing professional growth and managing time effectively in the workplace.

Summary of Learning Outcomes

1. Develop self-awareness and ability to deal with life challenges
2. Demonstrate critical safe work habits for employees
3. Demonstrate workplace teamwork
4. Plan and organize work activities
5. Maintain professional growth and development in the workplace.
6. Demonstrate learning, creativity and innovativeness in the workplace

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Develop self-awareness and ability to deal with life challenges	• Formulating personal goals and objectives • Acquiring and maintaining a positive self-image • Ways for overcoming life challenges • Self esteem • Handling emotions • Emotional intelligence	• Observation • Written • Oral/interview • Third party report

	• Expressing personal feelings and beliefs • Methods of sharing personal feelings • Monitoring and evaluating one's performance • Setting performance targets • Asserting one-self • Articulating ideas • Accountability	
2. Demonstrate critical safe work habits for employees	• Stress and stress management • Punctuality and time consciousness • Safety in the workplace • Integrating personal objectives into organizational objectives • Resources utilization • Setting work priorities • Developing relationships • Leisure • HIV and AIDS • Drug and substance abuse • Dealing with emerging issues	• Observation • Written • Oral interview • Third party report
3. Demonstrate workplace teamwork	• Determination of team roles and objectives • Identifying Team parameters and relationships • Team work • Identifying individual responsibilities in a team • Conflicts and their resolution • Communication • Complementing team activities • Gender	• Observation • Oral interview • Written • Third party report

	• Human rights protocols • Relationships • Group dynamics	
4. Plan and organize work activities	• Making work schedules • Time concept • Time management • Identifying work goals/objectives and deliverables • Maintaining work records • Resource utilization • Decision making • Problem solving • Negotiation	• Observation • Oral interview • Written • Third party report
5. Maintain professional growth and development in the workplace	• Identifying training needs • Training and career opportunities • Licenses and certifications for professional growth and development • Pursuing personal and organizational goals • Managing work priorities and commitments • Recognizing of career advancement	• Observation • Oral interview • Written • Third party report
6. Demonstrate learning, creativity and innovativeness in the workplace	• Managing own learning • Networking • Variety of learning context • Application of learning • Safe use of technology • Taking initiative/proactivity • Flexibility • Identifying opportunities • Workplace innovation • Performance improvement	• Observation • Oral interview • Written • Third party report

Suggested Methods of Delivery

- Instructor lead facilitation of theory
- Demonstrations
- Simulation/Role play
- Group Discussion
- Presentations
- Projects
- 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

Relationship to Occupational Standards
This unit addresses the unit of competency: Demonstrate environmental literacy

Duration of Unit: 20 hours

Unit Description
This unit describes the competencies required to control environmental hazard, control environmental pollution, comply with workplace sustainable resource use and evaluate current practices in relation to resource usage.

Summary of Learning Outcomes
1. Control environmental hazard
2. Control environmental Pollution
3. Demonstrate sustainable resource use
4. Evaluate current practices in relation to resource usage

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
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 questions • Oral questions • Observation of work procedures

2. Control environmental Pollution control	• 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 questions • Oral questions • Observation of work procedures • Role play
3. 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 questions • Oral questions • Observation of work procedures • Role play
4. 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	• Written questions • Oral questions • Observation of work procedures • Role play

	• Identification of areas for improvement	
5. 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 questions • Oral questions • Observation of work procedures

Suggested Delivery Methods

- 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

- Standard operating and/or other workplace procedures manuals
- Specific job procedures manuals
- Solid Waste Act
- Environmental Management and Coordination Act 1999
- Machine/equipment manufacturer's specifications and instructions
- Personal Protective Equipment (PPE)

OCCUPATIONAL SAFETY AND HEALTH PRACTICES

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

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

Duration of Unit: 20 hours

Unit Description
This unit describes the competencies required to practice safety and health and comply with OSH requirements relevant to work.

Summary of Learning Outcomes
1. Observe 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	Suggested assessment Methods
1. Observe 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 questions • Observation of work procedures
2. 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	• Oral questions • Written tests • Practical test • Observation of practical work by trainees

	• 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	

Suggested delivery methods

- 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

- 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 boots
    - 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

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 competencies to select, use and maintain drawing equipment and materials. It also involves producing plain geometry drawings, solid geometry drawings, pictorial and orthographic drawings of components.

Summary of Learning Outcomes

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

Learning Outcomes, Content and Suggested Assessment Methods:

Learning outcome	Content	Suggested assessment methods
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

2. 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
3. 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
4. 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 delivery

- 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

Relationship to Occupational Standards

This unit addresses the unit of competency: Apply Engineering Mathematics

Duration of Unit: 30 hours

Unit Description

This unit describes the competencies required by an individual in order to apply a wide range of engineering mathematics in their work. It includes using concepts of basic arithmetic in solving work problems. It also involves using formulae and algebraic expressions for solving work problems and applying geometrical calculations for solving work problems. It also involves applying statistics to solve work problems

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

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
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
2. Use formulae and algebraic expressions for solving work problems	• Solve simple algebraic equations • Form simple algebraic equations • Represent linear equations	• Written tests • Oral questioning • Assignments • Supervised exercises.

	• Solve simple simultaneous equations	
3. 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.
4. 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 Delivery Methods

- 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

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 describes the competencies required by an individual in order to apply a wide range of engineering science principles in their work. It includes carrying out measurements, determining force, work, energy and power. It also involves solving simple problems on friction and identification of characteristics of light and sound. It also involves applying of 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	Suggested assessment methods
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
2. 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

3. 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
4. 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
5. 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 Delivery Methods

- 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

Relationship to Occupational Standards:
This unit addresses the unit of competency: Apply workshop technology principles

Duration of Unit: 20 hours

Unit description:
This unit describes the competencies required by an individual in order to interpret working drawings, choosing of appropriate tools and materials. It also involves marking out of the work pieces and producing components as per the drawing. It also involves 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	Suggested assessment methods
1. Interpreting working drawings	• Reading and extraction of information (dimensions, tolerances, BS/ANSI drawing standards, geometric iso symbols & abbreviations) • Development of working procedure/ operational plan	• Administration of written and oral tests • Assessment of worksheet/ operation plans
2. Choosing of 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.	• Observation of correct selection of tools for specific operation • Observation of inspection and/or recalibration of tools

	• Selection of material for the given component	• Observation of appropriate handling of tools • Administration of oral and written questions
3. Marking out of work piece(s)	• Use of marking out tools • Laying out work piece(s) • Transfer of dimensions onto the work piece(s)	• Observation of laying out of work piece(s) • Assessment of transferred dimensions • Administration of oral and written questions

4. Producing components as per the drawing	• 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
		• Practical
		• Assessment of the produced component

5. Performing finishing processes	• Finishing • Polishing • Filing • Grinding • De-burring • Painting of components	• Observation of degree of surface finish • Assessment of finished surface(s) using inspection tools • Assessment of finished surface(s) visually

Suggested Delivery Methods

- Demonstration by trainer
- Discussions

- Practical work by trainee(s)
- Exercises
- Industrials visits
- Internet.
- Simulation

List of Recommended Resources

Tools and equipment suggested but not limited to:

- 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

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 specifies the competencies required performing safe operation of farm tractors and the operation tractor systems. It also involves maintenance of selected systems of farm tractors and evaluation of the performance of tractor systems. This unit involves 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	Suggested assessment methods

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
		• Observation
		• Practical exercises
		• Oral
		• Written
		• Third party report

	○ Transmission system ○ Hydraulic system ○ Lubrication system ○ Fuel system ○ Steering system • Perform safe driving of tractor	
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	• Observation • Practical exercises • Oral • Written • Third party report

	○ Steering system ○ Hitches • Identify common malfunctions of selected tractor systems • Interpret results of the diagnostic tests of selected tractor systems	
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 Delivery

- Presentations and practical demonstrations by trainer;
- Guided learner activities and research to develop underpinning knowledge;
- Supervised activities and projects in a workshop;

The delivery may also be supplemented and enhanced by the following, if the opportunity allows:

- Visiting lecturer/trainer from the Agricultural Machinery service and repair sector;
- Industrial visits.

Recommended Resources

Tools Comprehensive set of hand tools for tractors maintenance and repair.
Equipment ● 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.

Materials and supplies Consumables for maintaining agricultural machinery and equipment including: ● Lubricants ● Fluids ● Replacement parts ● Cleaning materials
Reference materials • Manufacturers service manuals for tractors that are being serviced; • Appropriate agricultural engineering text books available on numerous websites e.g. ○ Tractor Construction and Use Regulations; ○ Aftermarket manufacturers manuals

CALIBRATION OF FIELD EQUIPMENT

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

Relationship to Occupational Standards
This unit addresses the unit of competency: Calibrate Field Equipment
Duration of Unit: 100 hours
Unit Description:
This unit specifies competencies required to assess the condition of field equipment. It also involves, operating selected farm machines and equipment and maintenance of selected agricultural equipment. Additionally, learners will engage in the calibration of 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. Maintain 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	Suggested assessment methods

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

2. 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
		• Written
		• Third party report

3. Maintain 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

4. 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 Delivery

- Presentations and practical demonstrations by trainer;
- Guided learner activities and research to develop underpinning knowledge;
- Supervised activities and projects in a workshop;

The delivery may also be supplemented and enhanced by the following, if the opportunity allows:

- Visiting lecturer/trainer from the Agricultural Machinery service and repair sector;
- Industrial visits.

Recommended Resources

Tools Comprehensive set of hand tools for agricultural machinery and equipment maintenance and repair.
Equipment ● 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.
Materials and supplies Consumables for maintaining agricultural machinery and equipment including: ● Lubricants; ● Fluids ● Replacement parts: ● Cleaning materials;
Reference materials ● Manufacturers service manuals for tractors and agricultural machines and equipment that are being serviced; ● Appropriate agricultural engineering text books available on numerous websites

AGRICULTURAL MACHINERY DIGITAL SYSTEMS

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

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 specifies the competencies required to apply theoretical knowledge related to Agricultural Digital Systems **and** performing troubleshooting procedures on electronic components and systems. It also involves operating electronic diagnostic control tools and performing maintenance operations on Agricultural Digital Systems. It also involves 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	Suggested assessment methods
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
2. 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.	● Written tests ● Oral presentation ● Observation ● Project

	● Different troubleshooting codes in electronic diagnostics	
3. 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
4. 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
5. 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 Delivery

- 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

The delivery may also be supplemented and enhanced by the following, if the opportunity allows:

- Visiting lecturer/trainer from the Agricultural Machinery service and repair sector;
- Industrial visits.

Recommended Resources

Tools Comprehensive set of hand tools for agricultural machinery and equipment maintenance and repair.
Equipment ● A fully equipped agricultural machinery and equipment maintenance workshop; ● 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.
Materials and supplies Consumables for maintaining agricultural digital systems including: • 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 • Replacement parts: • Cleaning materials
Reference materials

- Manufacturers service manuals for tractors and agricultural machines and equipment that are being serviced;
- Appropriate agricultural engineering text books available on numerous websites

HYDRAULIC SYSTEMS

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

Relationship to Occupational Standards

This unit addresses the unit of competency: Maintain Hydraulic System

Duration of the unit: 80 hours

Unit description:
This unit specifies the competencies required to interpret agricultural hydraulic systems and perform trouble shooting of hydraulic systems. It also involves performing service and maintenance of hydraulic systems. It also involves calibration of hydraulic systems and optimization of the operations of the hydraulic systems.

Summary of Learning Outcomes:

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

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	Suggested Assessment Methods
1. Interpret 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;	● Practical exercises ● Oral questioning ● Learner portfolio of evidence

	• 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 • Identified Hydraulic systems components • Interpreted schematic representations of hydraulic systems • Use of technical data in servicing and repairing components.	
2. 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
3. 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	• Practical exercises • Oral questioning • Written tests • Learner portfolio of evidence.

	• 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	
4. 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 • Learner portfolio of evidence. • Observation
5. 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 • Learner portfolio of evidence

Suggested Methods of Delivery

- Presentations and practical demonstrations by trainer;
- Guided learner activities and research to develop underpinning knowledge;
- Supervised activities and projects in a workshop;

The delivery may also be supplemented and enhanced by the following, if the opportunity allows:

- Visiting lecturer/trainer from the workshop service and repair sector;
- Industrial visits.

Recommended Resources

Tools Comprehensive set of hand tools for the service and repair of agricultural equipment hydraulic systems
Equipment ● 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; ● Specialist tools and diagnostic equipment appropriate for the different makes and types of agricultural equipment and implements that are being maintained; ● 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.
Materials and supplies ● 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

Reference materials

- Manufacturers service manuals for the hydraulic systems that are being serviced;
- Appropriate agricultural mechanics text books available on numerous websites

AGRICULTURAL MACHINERY PNEUMATIC SYSTEMS

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

Relationship to Occupational Standards

This unit addresses the unit of competency: Maintain Agricultural machinery Pneumatic Systems

Duration of the unit: 50 hours

Unit Description

This unit specifies the competencies required to demonstrate knowledge of agricultural pneumatic systems and diagnosis of malfunction of agricultural pneumatic systems.

It also involves performing service and maintenance of agricultural pneumatic systems and performing adjustments to agricultural pneumatic systems. It also involves 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	Suggested assessment methods
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)	• Practical exercises • Oral questioning • Learner portfolio of evidence

	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.	
2. 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
3. Perform service and maintenance of agricultural pneumatic systems	• Perform service and maintenance procedures on pneumatic system circuits	• Practical exercises • Oral questioning

	• 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	• Written tests • Learner portfolio of evidence.
4. 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 • Learner portfolio of evidence. • Observation
5. 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 • Learner portfolio of evidence

Suggested Methods of Delivery

- Presentations and practical demonstrations by trainer;
- Guided learner activities and research to develop underpinning knowledge;
- Supervised activities and projects in a workshop;

The delivery may also be supplemented and enhanced by the following, if the opportunity allows:

- Visiting lecturer/trainer from the workshop service and repair sector;

- Industrial visits

Recommended Resources

Tools Comprehensive set of hand tools for the service and repair of agricultural equipment pneumatic systems
Equipment ● 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; ● Specialist tools and diagnostic equipment appropriate for the different makes and types of agricultural equipment and implements that are being maintained; ● 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.
Materials and supplies ● Digital instructional material including DVDs and CDs; ● Consumables for service and repair of pneumatic systems including; a) Oil seals and gaskets; b) Coolants; c) Cleaning materials; d) Hand cleaner;

e) Dusters.

- Pneumatic and Hydraulic fluids
- Separate parts and components of several different pneumatic systems

Reference materials

- Manufacturers service manuals for the agricultural implements and machines that are being serviced;
- Appropriate agricultural mechanics engineering text books available on numerous websites