

**THE REPUBLIC OF KENYA**

**NATIONAL OCCUPATIONAL STANDARDS**

**FOR**

**COMPETENCY BASED CURRICULUM**

**AGRICULTURAL MACHINERY AND EQUIPMENT**

**LEVEL 4**

A close up of a logo

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TVET CDACC

P.O BOX 15745-00100

NAIROBI

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**Council Secretary/CEO**

**TVET Curriculum Development, Assessment and Certification Council**

**P.O. Box 15745–00100 Nairobi, Kenya**

**Email:** [**info@tvetcdacc.go.ke**](mailto:info@tvetcdacc.go.ke)

# 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 in 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 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 programmes.

These reforms demand that Industry takes a leading role in curriculum development to ensure the curriculum addresses its competence needs. It is against this background that these Occupational Standards were developed for the purpose of developing a competency-based curriculum for Agricultural Machinery and Equipment Level 4. These Occupational Standards will also be the basis for assessment of an individual for competence certification.

It is my conviction that these Occupational Standards 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 these occupational standards. These standards will be the basis for development of competency-based curriculum for Agricultural Machinery and Equipment Level 4.

The occupational standards are designed and organized with clear performance criteria for each element of a unit of competency. These standards also outline the required knowledge and skills as well as evidence guide.

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 these occupational standards.

**CHAIRPERSON**

**TVET CDACC**

# ACKNOWLEDGEMENT

These occupational standards have 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 these standards 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 these standards.

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

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

**CHAIRPERSON**

**AGRICULTURE SECTOR SKILLS ADVISORY COMMITTEE**

# TABLE OF CONTENTS

[FOREWORD II](#_Toc67568656)

[PREFACE III](#_Toc67568657)

[ACKNOWLEDGEMENT IV](#_Toc67568658)

[TABLE OF CONTENTS V](#_Toc67568659)

[ABBREVIATIONS AND ACRONYMNS VI](#_Toc67568660)

[KEY TO UNIT CODE VII](#_Toc67568661)

[COURSE OVERVIEW VIII](#_Toc67568662)

[BASIC UNITS OF COMPETENCY 1](#_Toc67568663)

[DEMONSTRATE COMMUNICATION SKILLS 2](#_Toc67568664)

[DEMONSTRATE NUMERACY SKILLS 6](#_Toc67568665)

[DEMONSTRATE DIGITAL LITERACY 12](#_Toc67568666)

[DEMONSTRATE ENTREPRENEURIAL SKILLS 16](#_Toc67568667)

[DEMONSTRATE EMPLOYABILITY SKILLS 21](#_Toc67568668)

[DEMONSTRATE ENVIRONMENTAL LITERACY 26](#_Toc67568669)

[DEMONSTRATE OCUPATIONAL SAFETY AND HEALTH PRACTICES 31](#_Toc67568670)

[COMMON UNITS OF COMPETENCY 35](#_Toc67568671)

[PREPARE AND INTERPRET TECHNICAL DRAWINGS 36](#_Toc67568672)

[APPLY ENGINEERING MATHEMATICS 40](#_Toc67568673)

[APPLY ENGINEERING SCIENCE PRINCIPLES 43](#_Toc67568674)

[APPLY WORKSHOP TECHNOLOGY PRINCIPLES 46](#_Toc67568675)

[CORE UNITS OF COMPETENCY 50](#_Toc67568676)

[OPERATE AND MAINTAIN FARM TRACTOR 51](#_Toc67568677)

[CALIBRATE FIELD EQUIPMENT 55](#_Toc67568678)

[APPLY DIGITAL SKILLS IN AGRICULTURAL SYSTEMS 59](#_Toc67568679)

[MAINTAIN HYDRAULIC SYSTEMS 63](#_Toc67568680)

[MAINTAIN AGRICULTURAL PNEUMATIC SYSTEMS 67](#_Toc67568681)

# ABBREVIATIONS AND ACRONYMNS

CAD Computer Aided Design

CDACC Curriculum Development, Assessment and Certification Council

EHS Environment Health and Safety

IAC Industry Advisory Committee

KEBS Kenya Bureau of Standards

KEFEP Kenya Education for Employment

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 Title** |
| ENG/OS/AME/BC/01/ 4/A | Demonstrate Communication Skills |
| ENG/OS/AME/BC/02/ 4/A | Demonstrate Numeracy Skills |
| ENG/OS/AME/BC/03/ 4/A | Demonstrate Digital Literacy |
| ENG/OS/AME/BC/04/ 4/A | Demonstrate Entrepreneurial Skills |
| ENG/OS/AME/BC/05/4/A | Demonstrate Employability Skills |
| ENG/OS/AME/BC/06/ 4/A | Demonstrate Environmental Literacy |
| ENG/OS/AME/BC/07/ 4/A | Demonstrate Occupational Safety and Health Practices |

**COMMON UNITS OF COMPETENCY**

|  |  |
| --- | --- |
| **Unit Code** | **Unit Title** |
| ENG/OS/AME/CC/01/4/A | Technical Drawing |
| ENG/OS/AME/CC/02/4/A | Apply Engineering Mathematics |
| ENG/OS/AME/CC/03/4/A | Apply Engineering Science Principles |
| ENG/OA/AME/CC/04/4/A | Apply Workshop Technology Principles |

**CORE UNITS OF COMPETENCY**

|  |  |
| --- | --- |
| **Unit Code** | **Unit Title** |
| ENG/OS/AME/CR/01/4/A | Operate And Maintain Farm Tractor |
| ENG/OS/AME/CR/02/4/A | Calibrate Field Equipment |
| ENG/OS/AME/CR/03/4/A | Apply Digital Skills In Agricultural Systems |
| ENG/OS/AME/CR/04/4/A | Maintain Hydraulic Systems |
| ENG/OS/AME /CR/05/4/A | Maintain Agricultural Pneumatic Systems |

# BASIC UNITS OF COMPETENCY

# DEMONSTRATE COMMUNICATION SKILLS

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

**UNIT DESCRIPTION**

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

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms*** ***are elaborated in the Range*** |
| 1. Obtain and convey workplace information | 1. Specific and relevant information is accessed from ***appropriate sources*** based on standard procedures 2. Effective questioning, active listening and speaking skills are used to gather and convey information based on communication needs 3. Appropriate ***medium*** is used to transfer information and ideas in accordance with workplace guidelines 4. Appropriate non- verbal communication is used as per the communication needs 5. Appropriate lines of communicationwith supervisors and colleagues are identified and followed based on workplace requirements 6. Location and storage of information is undertaken according to workplace procedures    1. Personal interaction is carried out clearly and concisely according to workplace requirements |
| 1. Complete relevant work-related documents | * 1. Range of forms relating to conditions of employment are completed according to workplace procedures   2. Workplace data is recorded based on workplace requirements   3. Errors in recording information are identified and acted upon in accordance with workplace policies   4. Reporting requirements are completed according to organizational guidelines |
| 1. Communicate information about workplace processes | 1. Information sources are identified according to workplace procedures 2. ***Methods of communication*** are selected based on workplace guidelines 3. Multiple operations are communicated according to workplace structure 4. Work-related questions are asked and responded based on set protocols 5. Information is selected and organized according to workplace requirements 6. Verbal and written reporting is undertaken as per workplace requirements 7. Communication is maintained according to workplace standards |
| 1. Lead workplace discussions | 1. Response to workplace issues is sought and provided as per workplace protocol 2. Constructive contributions are made based on ***workplace discussions*** 3. Workplace objectives and action plan are communicated according to workplace requirements |
| 1. Identify and communicate issues arising in the workplace | 1. Issues and problems are identified as per workplace guidelines 2. Problems and issues in the workplace are organized according to workplace operations 3. Dialogue is initiated with appropriate personnel as per workplace structure 4. Problems and issues raised are communicated as per the workplace reporting procedures |

**RANGE**

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

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Methods of communication mayinclude but not limited to: | * Non-verbal gestures * Verbal * Face to face * Two-way radio * Speaking to groups * Using telephone * Written * Internet |
| 1. Workplace discussion may include but not limited to: | * Coordination meetings * Toolbox discussion * Peer-to-peer discussion |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Communication
* Active listening
* Interpretation
* Negotiation
* Writing

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Organization requirements for written and electronic communication methods
* Effective verbal communication methods
* Report writing
* Effective questioning techniques (clarifying and probing)
* Workplace etiquette

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:   1. Dealt with a range of communication/information at one time 2. Made constructive contributions in workplace issues 3. Sought workplace issues effectively 4. Responded to workplace issues promptly 5. Presented information clearly and effectively in written form 6. Used appropriate sources of information 7. Asked appropriate questions 8. Provided accurate information |
| 1. Resource Implications | 1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place 3. Materials relevant to the proposed activity or tasks |
| 1. Methods of Assessment | 1. Third-party reports 2. Portfolio 3. Interview 4. Written tests 5. Observation 6. Oral questioning |
| 1. Context of Assessment | Competency may be assessed   1. On the job 2. Off the job 3. During industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**DEMONSTRATE NUMERACY SKILLS**

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

**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.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |  |
| --- | --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function. | | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms*** ***are elaborated in the Range.*** |
| 1. Identify and use whole numbers and simple fractions, decimals and percentages for work | | 1. Simple fractions, decimals and percentages identified and interpreted as per standard operating procedures. 2. Understanding of place value by organising numbers from smallest to largest demonstrated as SOPs 3. Required numerical information located and decision made on appropriate method to solve a problem as per SOPs 4. Limited range of calculations performed using the four operations using SOPs 5. Links between operations described as per SOPs 6. Estimations made to check reasonableness of results of problem-solving process as SOPs 7. Numerical information recorded, and the result of the task communicated using informal and some formal language and symbolism as per workplace procedures |
| 1. Identify, measure and estimate familiar quantities for work | 1. Measurement information in workplace tasks and texts identified and interpreted as per workplace procedures. 2. Familiar units of measurement needed for tasks is identified as per measurements manuals/charts 3. Familiar and simple amounts estimated as per workplace procedures. 4. Appropriate measuring equipment selected as per SOPs 5. ***Simple measuring equipment*** graduated in familiar units to measure relevant quantities is used as per graduation manuals. 6. Calculation done using familiar units of measurement as per SOPs 7. Measurements and results checked against estimates as per job specifications. 8. Results are recorded or reported as per workplace procedures 9. Results relevant to the workplace task are communicated using informal and some formal mathematical and general language as per workplace procedures. |
| 1. Read and use familiar maps, plans and diagrams for work | 1. Items and places are in familiar maps, plans and diagrams as per SOPs 2. Common symbols and keys recognised in familiar maps, plans and diagrams as per SOPs 3. Understanding of direction and location demonstrated by describing the location of objects, or route to familiar places as per SOPs 4. Instructions to locate familiar objects or places are given and followed as per SOPs 5. Informal and some formal oral mathematical language and symbols are used as per SOPs |
| 1. Identify and describe common 2D and some 3D shapes for work | 1. ***Common 2D shapes and some common 3D shapes*** in familiar situations are identified and named as per job requirements 2. Common 2D shapes and designs are compared and classified as per SOPs 3. Informal and some formal language used to describe common two-dimensional shapes and some common three-dimensional shapes in accordance with workplace procedures. 4. Simple items used to draw or construct common 2D shapes as per workplace procedures. 5. Common 3D shapes matched to their 2D sketches or nets as per SOPs |
| 1. Construct simple tables and graphs for work using familiar data | 1. Common types of graphs are identified and named as per SOPs 2. Familiar data to be collected is determined in accordance with job specifications. 3. A method to collect data is selected in accordance with workplace procedures. 4. A small amount of simple familiar data is collected as per workplace procedures 5. One or two variables determined from the data collected as per SOPs. 6. Data ordered and collated as per standard operating procedures. 7. A table is constructed and data entered as per SOPs 8. Graphs are constructed using data from table as per job specifications 9. Results are promptly checked as per workplace procedures 10. Graph information related to work is reported or discussed using informal and some formal mathematical and general language as per workplace procedures |
| 1. Identify and interpret information in familiar tables, graphs and charts for work | 1. Simple tables are identified in familiar texts and contexts in accordance with workplace procedures 2. Title, headings, rows and columns located in familiar tables as per SOPs 3. Information and data in simple tables identified and interpreted as per workplace procedures. 4. Information is related in accordance with workplace tasks 5. Familiar graphs and charts are identified in familiar texts and contexts as per SOPs 6. Title, labels, axes, scale and key from familiar graphs and charts are located as per SOPs 7. Information and data in familiar graphs and charts are identified and interpreted as per job requirements 8. Information is related to relevant workplace tasks as per job requirements. |

**RANGE**

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

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Simple measuring equipment may include but not limited to: | * Rulers * Watches/clocks * Scales * Thermometers * AVO meter |
| 1. Common 2D shapes and common 3D shapes may include but not limited to: | * Round * Square * Rectangular * Triangle * Sphere * Cylinder * Cube * Polygons * Cuboids |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Measuring
* Logical thinking
* Computing
* Drawing of graphs
* Applying mathematical formulas
* Analytical

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Types of common shapes
* Differentiation between two dimensional shapes / objects
* Formulae for calculating area and volume
* Types and purpose of measuring instruments
* Units of measurement and abbreviations
* Fundamental operations (addition, subtraction, division, multiplication)
* Rounding techniques
* Types of fractions
* Different types of tables and graphs
* Meaning of graphs, such as increasing, decreasing, and constant value
* Preparation of basic data, tables & graphs

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:   * 1. Simple fractions, decimals and percentages are correctly identified and interpreted   2. Performed a limited range of calculations using the 4 operations   3. Performed calculations using familiar units of measurement   4. Recognised common symbols and keys in familiar maps, plans and diagrams   5. Constructed simple tables and graphs using familiar data   6. Identified and interpret information in familiar tables, graphs and charts |
| 1. Resource Implications | 1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place 3. Materials relevant to the proposed activity or tasks |
| 1. Methods of Assessment | Competency may be assessed through:   1. Written Test 2. Interview 3. Oral Questioning |
| 1. Context of Assessment | Competency may be assessed   1. On the job 2. Off the job 3. During industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**DEMONSTRATE DIGITAL LITERACY**

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

**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.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms*** ***are elaborated in the Range*** |
| 1. Identify computer software and hardware | * 1. ***Appropriate computer software*** is identified according to manufacturer’s specification   2. ***Appropriate computer hardware*** is identified according to manufacturer’s specification |
| 1. Apply security measures to data, hardware, software | * 1. ***Data security and privacy are classified*** in accordance with the technological situation   2. ***Security and control measures*** are applied in accordance with laws governing protection of ICT   3. Computer threats and crimes are detected as per information security management guidelines.   4. Protection against computer crimes is undertaken in accordance with laws governing protection of ICT |
| 1. Apply computer software in solving tasks | * 1. Basic word processing concepts are applied in resolving workplace tasks   2. Word processing utilities are applied in accordance with workplace procedures   3. Data is manipulated on worksheet in accordance with office procedures |
| 1. Apply internet and email in communication at workplace | * 1. Electronic mail is applied in workplace communication in accordance with office procedures   2. Office internet functions are defined and executed in accordance with office procedures   3. Network configuration and uses are determined in accordance with office operations procedures |

**RANGE**

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

|  |  |
| --- | --- |
| **Range** | **Variable** |
| 1. Appropriate computer software may include but not limited to: | * Operating system * MS office * Web browser * Media players |
| 1. Appropriate computer hardware may include but not limited to: | * Computer Case * Monitor * Keyboard * Mouse * Hard Disk Drive * Motherboard * Video Card |
| 1. Data security and privacy may include but not limited to: | * Confidentiality * Cloud computing * Confidentiality * Cyber terrorism * Integrity -but-curious data serving |
| 1. Security and control measures may include but not limited to: | * Countermeasures and risk reduction * Cyber threat issues * Risk management |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Analytical
* Interpretation
* Typing
* Communication
* Computing

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Input and output devices
* Central processing Unit (CPU)
* Peripherals
* Storage Media
* Software concept
* Types of concept
* Function of computer software
* Data security and privacy
* Security threats and control measures
* Computer crimes
* Detection and protection of computer crimes
* Laws governing protection of ICT
* Word processing;
* Functions and concepts of word processing.
* Documents and tables creation and manipulations
* Mail merging
* Word processing utilities
* Spread sheet;
* Meaning, formulae, function and charts, uses, layout, data manipulation and application to cell
* Networking and Internet;
* Meaning, functions and uses of networking and internet.
* Electronic mail and world wide web
* Emerging trends and issues in ICT;
* Identify and apply emerging trends and issues in ICT
* Challenges posed by emerging trends and issues

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Identified input, output, CPU and storage media devices of computers in accordance to computer specification   2. Identified concepts, types and functions of computer software according to operation manual   3. Identified and controlled security threats   4. Detected and protected computer crimes   5. Applied word processing in office tasks   6. Prepared work sheet and applied data to the cells in accordance to workplace procedures   7. Used Electronic Mail for office communication as per workplace procedure   8. Applied internet and World Wide Web for office tasks in accordance with office procedures   9. Applied laws governing protection of ICT |
| 1. Resource Implications | * 1. Access to relevant workplace where assessment can take place   2. Appropriately simulated environment where assessment can take place   3. Materials relevant to the proposed activity or tasks |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Written tests   2. Practical assignment   3. Interview   4. Oral Questioning   5. Observation |
| 1. Context of Assessment | Competency may be assessed   1. On the job 2. Off the job 3. During industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**DEMONSTRATE ENTREPRENEURIAL SKILLS**

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

**UNIT DESCRIPTION**

This unit covers the competencies required demonstrate entrepreneurial skills. It involvescreating and maintaining small scale business, establishing small scale business customer base, managing small scale business and growing/ expanding small scale business.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the **key outcomes** which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Create and maintain small scale business | 1. Generation and evaluation of business ideas is undertaken in accordance with the existing procedure 2. Competencies are matched with business opportunities in accordance with business practices. 3. Procedure for starting a small business is identified as per the legal requirements 4. SWOT/ PESTEL analysis and or industrial survey is carried out according to office procedures 5. ***Business operations*** are monitored and controlled following established procedures. 6. Quality assurance measures are implemented in accordance with the business practices. 7. Good relations are maintained with staff/workers as per the workplace policies. 8. Policies and procedures on occupational safety and health and environmental concerns are constantly observed as per the workplace policies |
| 1. Establish small scale business customer base | 1. Good customer relations are maintained in accordance with office procedures 2. New customers and markets are identified, explored and reached out to according to the marketing plan 3. Promotions/Incentives are offered to loyal customers in accordance with office procedures 4. Additional products and services are evaluated and tried in accordance with marketing strategy 5. Customer record is maintained in accordance with office procedures |
| 1. Manage small scale business | 1. Enterprise is built up and sustained in line with judicious control of cash flows. 2. Profitability of enterprise is ensured as per the internal controls. 3. Unnecessary or lower-priority expenses and purchases are avoided as per the marketing strategy 4. Basic cost-benefit analysis are undertaken in accordance with office procedures 5. Basic financial management are undertaken in accordance with office procedures 6. Basic financial accounting in undertaken in accordance with office procedures 7. Business ***internal controls*** are implemented in accordance with office procedure 8. Setting business priorities and strategies is carried out according to office procedures 9. Preparation and interpretation of basic financial statements is undertaken in accordance with set procedures 10. Preparation of business plansfor small business is undertaken in accordance with ***business strategy*** 11. Business Social Responsibility is maintained in accordance with Standard Operations Procedures (SOP) |
| 1. Grow/ expand small scale business | 1. Prepared business growth strategy for small sale business in accordance with office procedures 2. Incorporated technology in small scale business growth in accordance with technological trends 3. Emerging issues and trends are considered in accordance with business growth strategy 4. Built audience interest in product/service according to growth strategy 5. Boosted cooperate communication according to business ***communication strategy*** |

**RANGE**

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

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Business operations may include but not limited to: | * Purchasing * Accounting/administrative * Work production/operations/sales * Marketing |
| 1. Internal control may include but not limited to: | * Accounting systems * Financial statements/reports * Cash management * Human resource management |
| 1. Business Strategy may include but not limited to: | * Management of wastages * Environmental Conservation |
| 1. Communication strategy may include but not limited to: | * Blue print of exchange of information * Technology and exchange of information |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Marketing
* Advertising
* Basic bookkeeping
* Accounting
* Communication

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Generation and evaluation of business ideas
* Legal requirements for starting a small business
* SWOT/ PESTEL analysis
* Occupational Safety and Health
* Public relations concepts
* Business plan
* Business financing
* Marketing strategies
* Business management and control
* Production/ operation process
* Product promotion strategies
* Market and feasibility studies
* Business ethics
* Building customer relations
* Business models and strategies
* Types and categories of businesses
* Business internal controls
* Relevant national and local legislation and regulations
* Basic quality control and assurance concepts
* Building relations with customer and employees
* Building competitive advantage of the enterprise
* Business growth strategies

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |  |
| --- | --- | --- |
| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:   |  | | --- | | 1. Demonstrated entrepreneurial skills 2. Demonstrate competencies to create a small-scale business 3. Demonstrated ability to conceptualize and plan a micro/small business 4. Grew customer base for the small-scale business 5. Demonstrated ability to manage/operate a micro/small-scale business 6. Demonstrated competencies to grow a micro/small-scale business | |
| 1. Resource Implications | |  | | --- | | The following resources should be provided: |  1. Assessment location 2. Case studies on micro/small-scale enterprises 3. Assessment materials |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   |  |  | | --- | --- | | 1. Written tests 2. Observation 3. Oral questioning 4. Portfolio 5. Projects |  | |
| 1. Context of Assessment | Competency may be assessed   1. On the job 2. Off the job 3. During industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**DEMONSTRATE EMPLOYABILITY SKILLS**

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

**UNIT DESCRIPTON**

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.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Conduct self-management | 1. Personal vision, mission and goals are formulated based on potential and in relation to organization objectives 2. Emotional intelligence is demonstrated as per workplace requirements. 3. Individual performance is evaluated and monitored according to the agreed targets. 4. Assertiveness is developed and maintained based on the requirements of the job. 5. Accountability and responsibility for own actions are demonstrated based on workplace instructions. 6. Self-esteem and a positive self-image are developed and maintained based on values. 7. Time management, attendance and punctuality are observed as per the organization policy. 8. Goals are managed as per the organization’s objective 9. Self-strengths and weaknesses are identified based on personal objectives |
| 1. Demonstrate critical safe work habits | 1. Stress is managed in accordance with workplace policy. 2. Punctuality and time consciousness is demonstrated in line with workplace policy. 3. Personal objectives are integrated with organization goals based on organization’s strategic plan. 4. ***Resources*** are utilized in accordance with workplace policy. 5. Work priorities are set in accordance to workplace goals and objectives. 6. Leisure time is recognized and utilized in line with personal objectives. 7. ***Drugs and substances of abuse*** are identified and avoided based on workplace policy. 8. HIV and AIDS prevention awareness is demonstrated in line with workplace policy. 9. Safety consciousness is demonstrated in the workplace based on organization safety policy. 10. ***Emerging issues*** are identified and dealt with in accordance with organization policy. |
| 1. Demonstrate workplace learning | * 1. Learning opportunities are sought and managed based on job requirement and organization policy.   2. Improvement in performance is demonstrated based on courses attended.   3. Application of learning is demonstrated in both technical and non-technical aspects based on requirements of the job   4. Time and effort is invested in learning new skills based on job requirements   5. Initiative is taken to create more effective and efficient processes and procedures in line with workplace policy.   6. New systems are developed and maintained in accordance with the requirements of the job.   7. Awareness of personal role in workplace ***innovation*** is demonstrated based on requirements of the job. |
| 1. Demonstrate workplace ethics | 1. Policies and guidelines are observed as per the workplace requirements 2. Self-worth and professionalism is exercised in line with personal goals and organizational policies 3. Code of conduct is observed as per the workplace requirements 4. Integrity is demonstrated as per legal requirement |

**RANGE**

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

|  |  |
| --- | --- |
| **Range** | **Variable** |
| 1. Personal objectives may include but not limited to: | * Long term * Short term * Broad * Specific |
| 1. Feedback may include but not limited to: | * Verbal * Written * Informal * Formal |
| 1. Team may include but not limited to: | * Small work group * Staff in a section/department * Inter-agency group |
| 1. Drug and substance abuse may include but not limited to: | * Alcohol * Tobacco * Miraa * Over-the-counter drugs * Cocaine * Bhang * Glue |
| 1. Emerging issues may include but not limited to: | * Terrorism * Social media * National cohesion * Open offices |
| 1. Range of media for learning may include but not limited to: | * Mentoring * peer support and networking * IT and courses |
| 1. Innovation may include but not limited to: | * New ideas * Original ideas * Different ideas * Methods/procedures * Processes * New tools |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Communication
* Interpersonal
* Critical thinking
* Observation
* Organizing
* Record keeping
* Problem solving
* Decision Making
* Resource utilization

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Work values and ethics
* Company policies
* Company operations, procedures and standards
* Occupational Health and safety procedures
* Fundamental rights at work
* Personal hygiene practices
* Workplace communication
* Concept of time
* Time management
* Decision making
* Types of resources
* Work planning
* Record keeping
* Workplace problems and how to deal with them
* Assertiveness
* Team work
* HIV and AIDS
* Drug and substance abuse
* Safe work habits
* Professional growth and development
* Technology in the workplace
* Emerging issues
  + Social media
  + Terrorism
  + National cohesion

EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:   * 1. Conducted self-management   2. Demonstrated critical safe work habits   3. Demonstrated workplace learning   4. Demonstrated workplace ethics |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Oral questioning 2. Portfolio of evidence 3. Third Party Reports 4. Written tests |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. Off-the –job 3. During Industrial attachment |
| 1. Guidance information for assessment | | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**DEMONSTRATE ENVIRONMENTAL LITERACY**

UNIT CODE: ENG/OS/AME/BC/06/ 4/A

**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.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms*** ***are elaborated in the Range*** |
| 1. Control environmental hazard | * 1. Storage methods for environmentally hazardous materials are followed according to environmental regulations and OSHS.   2. Disposal methods of hazardous wastes are followed according to environmental regulations and OSHS.   3. ***PPE*** is used according to OSHS. |
| 1. Control environmental pollution | * 1. ***Environmental pollution*** ***control measures*** are compiled following standard protocol.   2. Procedures for solid waste management are observed according Environmental Management and Coordination Act 1999   3. Methods for minimizing noise pollution complied following environmental regulations. |
| 1. Demonstrate sustainable use of resource s | * 1. Methods for minimizing wastage are complied with.   2. ***Waste management procedures*** are employed following principles of 3Rs (Reduce, Reuse, Recycle)   3. Methods for economizing or reducing resource consumption are practiced. |
| 1. Evaluate current practices in relation to resource usage | * 1. Information on resource efficiency ***systems and procedures*** are collected and provided as per work groups/sector   2. ***Current resource usage*** is measured and recorded as per work group/sector   3. Current purchasing strategies are analyzed and recorded according to industry procedures.   4. Current work processes to access information and data is analyzed following enterprise protocol. |
| 1. Identify environmental legislations/conventions for environmental concerns | 1. Environmental legislations/conventions and local ordinances are identified according to the different environmental aspects/impact 2. Industrial standard/environmental practices are described according to the different environmental concerns |

**RANGE**

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

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. PPE may include but are not limited to: | * Masks * Gloves * Goggles * Safety hat * Overall * Hearing protector * Safety boots |
| 1. Environmental pollution control measures may include but are not limited to: | * Methods for minimizing or stopping spread and ingestion of airborne particles * Methods for minimizing or stopping spread and inhaling gases and fumes * Methods for minimizing or stopping spread and ingestion of liquid wastes |
| 1. Waste management procedures may include but are not limited to: | * Sorting * Storing of items * Recycling of items * Disposal of items * Handling * Transport |
| 1. Current resources usage may include but are not limited to: | * Electric * Water * Fuel * Telecommunications * Supplies * Materials |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Measuring
* Recording
* Analytical
* Monitoring
* Writing
* Communication

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Storage methods of environmentally hazardous materials
* Disposal methods of hazardous wastes
* Usage of PPE Environmental regulations
* OSHS
* Types of pollution
* Environmental pollution control measures
* Different solid wastes
* Solid waste management
* Different noise pollution
* Methods of minimizing noise pollution
* Solid Waste Act
* Methods of minimizing wastage
* Waste management procedures
* Economizing of resource consumption
* Principle of 3Rs
* Types of resources
* Techniques in measuring current usage of resources
* Calculating current usage of resources
* Types of workplace environmental hazards
* Environmental regulations
* Environmental regulations applying to the enterprise.
* Procedures for assessing compliance with environmental regulations.
* 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 current work processes to access information and data Analysis of data and information

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   1. Controlled environmental hazards 2. Controlled environmental pollution 3. Demonstrated sustainable resource use 4. Evaluated current practices in relation to resource usage |
| 1. Resource Implications | The following resources should be provided:   * 1. Workplace with storage facilities   2. Tools, materials and equipment relevant to the tasks (e.g. cleaning tools, cleaning materials, trash bags, etc.)   3. PPEs   4. Manuals and references   5. Legislation, policies, procedures, protocols and local ordinances relating to environmental protection   6. Case studies/scenarios relating to environmental Protection |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Observation 2. Oral questioning 3. Written tests 4. Third party reports 5. Portfolio |
| 1. Context of Assessment | Competency may be assessed:   1. On the job 2. Off the job 3. During industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**DEMONSTRATE OCUPATIONAL SAFETY AND HEALTH PRACTICES**

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

**UNIT DESCRIPTION**

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

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms*** ***are elaborated in the Range*** |
| 1. Adhere to workplace procedures for hazards and risk prevention | 1. Arrangement of work area and items in accordance with workplace procedures requirements 2. Work standards and procedures are followed based on instructions 3. ***Prevention and control measures*** are applied based on instructions |
| 1. Participate in arrangements for workplace safety and health maintenance | 1. Orientations on ***OSH requirements and regulations*** is undertaken in line with policy. 2. Feedback on occupational health and safety are provided as per workplace instructions. 3. Workplace procedures for reporting hazards, incidents, injuries and sickness are adhered to as per workplace policy. 4. ***OSH-related training needs*** are identified and proposed as per workplace policy. |

**RANGE**

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

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Prevention and control measures may include but are not limited to: | * Eliminate the hazard * Isolate the hazard * Substitute the hazard with a safer alternative * Use administrative controls to reduce the risk * Use engineering controls to reduce the risk * Use personal protective equipment * Safety, Health and Work Environment Evaluation * Periodic and/or special medical examinations of workers |
| 1. Safety gears /PPE (Personal Protective Equipment’s) may include but are not limited to: | * 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 |
| 1. Incidents and emergencies may include but are not limited to: | * Chemical spills * Equipment/vehicle accidents * Explosion * Fire * Gas leak * Injury to personnel * Structural collapse * Toxic and/or flammable vapors emission. |
| 1. OSH requirements / regulations may include but are not limited to: | * Building code * Permit to Operate |
| 1. OSH-related trainings may include but are not limited to: | * Safety Orientations relevant to tasks * Safe and Correct Operation of Tools and Equipment * Health Orientations/trainings * Prevention and Control of OSH Hazards in the workplace * Chemical Handling * Safety Trainings * Prevention and Control of Work-related Injuries and Illness * Basic First-aid Trainings * Emergency Response Trainings * Trainings on use of fire-extinguisher |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Communication
* Knowledge management
* Collaborating
* Interpersonal
* Troubleshooting
* Critical thinking
* Observation

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* General OSH principles and legislations
* Principles of good housekeeping (5S)
* Company/workplace policies/ guidelines
* Standards and safety requirements of work process and procedures
* Standard Workplace emergency plan and procedures
* Safety and health requirements of tasks
* Workplace guidelines on providing feedback on OSH and security concerns
* OSH regulations
* Hazard control procedures
* OSH trainings relevant to work

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   1. Arranged work area and items in accordance with 2. workplace procedures requirements 3. Followed work standards and procedures based on instructions 4. Applied ***Prevention and control measures*** based on instructions 5. Undertook orientations on ***OSH requirements and regulations*** in line with policy. 6. Provided feedback on occupational health and safety as per workplace instructions. 7. Adhered to workplace procedures for reporting hazards, incidents, injuries and sickness to as per workplace policy. 8. Identified and proposed ***OSH-related training needs*** as per workplace policy. |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Oral questioning 2. Portfolio of evidence 3. Third Party Reports 4. Written tests |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. Off-the –job 3. During Industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# COMMON UNITS OF COMPETENCY

# PREPARE AND INTERPRET TECHNICAL DRAWINGS

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

**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.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms*** ***are elaborated in the Range*** |
| 1. Use and maintain drawing equipment and materials | 1. ***Drawing equipment*** are identified and gathered according to task requirements 2. ***Drawing materials*** are identified and gathered according to task requirements 3. Drawing equipment are used and maintained as per manufacturer’s instructions 4. Drawing materials are used as per workplace procedures 5. Waste materials are disposed in accordance with workplace procedures and environmental legislations 6. ***Personal Protective Equipment*** is used according to occupational safety and health regulations |
| 1. Produce plane geometry drawings | 1. Different types of lines used in drawing and their meanings are identified according to standard drawing conventions 2. Different types of ***geometric forms*** are constructed according to standard conventions 3. Different types of angles are constructed according to principles of geometry 4. Different types of angles are measured using appropriate measuring tools 5. Angles are bisected according to standard conventions 6. Freehand sketching of different types of geometric forms, tools, equipment, diagrams is conducted |
| 1. Produce solid geometry drawings | 1. Drawings of patterns are interpreted according to standard conventions 2. Patterns are developed in accordance with standard conventions 3. Patterns are assembled as per standard conventions 4. Pattern assembly is interpreted as per standard conventions |
| 1. Produce solid pictorial drawings | 1. Free hand sketches are drawn according to standard conventions 2. Isometric drawings are done according to standard conventions 3. Oblique drawings are done according to standard conventions |
| 1. Produce orthographic drawings | 1. Symbols and abbreviations are identified and their meaning interpreted according to standard drawing conventions 2. First and third angle orthographic drawings are produced and interpreted in accordance with the standard conventions 3. Orthographic elevations are dimensioned in accordance with standard conventions 4. Isometric drawings are produced and interpreted in accordance with standard conventions 5. Assembly drawing is produced and interpreted in line with the operating standards |

**RANGE**

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

|  |  |
| --- | --- |
| **VARIABLE** | **RANGE** |
| 1. Drawing equipment and materials may include but not limited to: | * Drawing tables * Drawing sets * Drawing papers * Pencils * Erasers * T-squares * Templates |
| 1. Geometrical forms may include but not limited to: | * Circles * Triangles * Squares * Rectangles |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate ability related to:

* + Communication
  + Team work
  + Problem solving
  + Planning and organizing
  + Self-management
  + Measurement
  + Use of drawing tools and equipment

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Types of Technical drawing tools, and equipment
* National legislation and regulations
* Safe working practices and procedures to be followed when drawing
* Safety and environmental hazards associated with Technical drawing
* Basic maintenance and servicing of Technical drawing tools and equipment

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| * 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   1. Used and maintained drawing equipment and materials 2. Produced plane geometry drawings 3. Produced solid geometry drawings 4. Produced solid pictorial drawings 5. Produced orthographic drawings |
| * 1. Resource Implications | The following resources must be provided:   1. Drawing tables 2. Drawing sets 3. Drawing papers 4. Pencils 5. Erasers 6. T squares 7. Templates |
| * 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Observation (performance checklist) 2. Oral 3. Written 4. Third party report 5. Practicals |
| * 1. Context of Assessment | Competency may be assessed:  4.1 On-the-job  4.2 Off-the –job  4.3 During Industrial attachment |
| * 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# APPLY ENGINEERING MATHEMATICS

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

**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.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms*** ***are elaborated in the Range*** |
| 1. Use concepts of basic arithmetic in solving work problems | 1.1 Identify various kinds of ***numbers***  1.2 Carry out arithmetical operations accurately   * 1. Use indices in multiplication and division |
| 1. Use formulae and algebraic expressions for solving work problems | 2.1 Solve simple algebraic equations  2.2 Form simple algebraic equations  2.3 Represent linear equations   * 1. Solve simple ***simultaneous equations*** |
| 1. Apply geometrical calculations for solving work problems | 3.1 Calculate areas of ***selected shapes***  3.2 Calculate surface areas of selected shapes  3.3 Calculate volumes of selected shapes   * 1. Apply Pythagoras theorem |
| 1. Apply statistics to solve work problems | 4.1 Collection of Data  4.2 Organization of Data  4.3 Representation of Data  4.4 Calculate Median  4.5 Draw ***Charts***  4.6 Interpretation of data |
| 1. Carry out business calculations | 5.1 Calculation of Profit and loss  5.2 Calculation of Discount and commission  5.3 Determine Rates and taxes  5.4 Compute Simple and compound interest |

**RANGE**

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

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Numbers may include but not limited to: | * Counting * Positive * Negative integers * Rational and irrational * Real numbers * Absolute values of numbers |
| 1. Simultaneous equations may include but not limited to: | * Substitution * Elimination |
| 1. Selected shapes may include but not limited to: | * Parallelogram * Trapezium * Circle * Sector * Annulus |
| 1. Charts may include but not limited to: | * Pie chart * Bar chart * Pictograms |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate ability related to:

* Communication
* Team work
* Problem solving
* Planning and organizing
* Self-management
* Measurement
* Use of mathematical tools and equipment

**Required Knowledge**

* The individual needs to demonstrate knowledge of:
* Types of mathematical tools, and equipment
* National legislation and regulations
* Safe working practices and procedures to be followed when doing mathematics
* Safety and environmental hazards associated with mathematical tools, and equipment
* Using mathematical tools, and equipment
* Basic maintenance and servicing of mathematical tools, and equipment

**EVIDENCE GUIDE**

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   1. Used concepts of basic arithmetic in solving work problems 2. Used formulae and algebraic expressions for solving work problems 3. Applied geometrical calculations for solving work problems 4. Applied statistics to solve work problems 5. Carried out business calculations |
| 1. Resource Implications | The following resources must be provided:   1. Mathematical tools and equipment 2. A functional well-equipped classroom |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Observation (performance checklist) 2. Oral 3. Written 4. Third party report 5. Practicals |
| 1. Context of Assessment | Competency may be assessed:   * 1. On-the-job   2. Off-the –job   3. During Industrial attachment. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and rang

# APPLY ENGINEERING SCIENCE PRINCIPLES

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

**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.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms*** ***are elaborated in the Range*** |
| 1. Carry out measurements | 1.1 Select appropriate ***units of measurements***  1.2 Convert units from one form to another  1.3 Carry out simple measurements |
| 1. Determine force, work, energy and power | 2.1 Define force, work, energy and power  2.2 Describe ***forms of energy***  2.3 Convert energy from one form to another  2.4 Solve simple calculations on force, work, energy and power |
| 1. Solve simple problems on friction | 3.1 State meaning of friction  3.2 Identify the advantages and disadvantages of friction  3.3 Solve simple problems on friction |
| 1. Identify characteristics of light and sound | 4.1 Identify sources of light and sound  4.2 State the laws of reflection and refraction  4.3 Determine the characteristics of images formed by mirrors  4.4 Solve simple problems involving location of images  4.5 Describe propagation of sound in a given medium  4.6 State the properties of sound |
| 1. Apply general chemistry in experiments | 5.1 State the classification of matter  5.2 Describe the strength of chemical bonds  5.3 State the properties of elements and compounds  5.4 State the properties of acids and bases  5.6 Prepare salts from acids and bases |

**RANGE**

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

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Units of measurements may include but not limited to: | * Kilograms * Metres |
| 1. Forms of energy include may include but not limited to: | * Kinetic energy * Potential energy |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate ability related to:

* Communication
* Team work
* Problem solving
* Planning and organizing
* Self-management
* Measurement
* Use of chemicals in laboratory

**Required Knowledge**

The individual needs to demonstrate knowledge of:

1. Types of chemicals and equipment used in a science laboratory
2. National legislation and regulations
3. Safe working practices and procedures to be followed when in a science laboratory
4. Safety and environmental hazards associated with practicals in a science laboratory
5. Basic maintenance and servicing of science laboratory equipment

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   1. Carried out measurements 2. Determined force, work, energy and power 3. Solved simple problems on friction 4. Identified characteristics of light and sound 5. Applied general chemistry in experiments |
| 1. Resource Implications | The following resources must be provided:   1. A well-equipped science laboratory |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * Observation (performance checklist) * Oral * Written * Third party report * Practicals |
| 1. Context of Assessment | Competency may be assessed:  4.1 On-the-job  4.2 Off-the –job  4.3 During Industrial attachment. |
| 1. Guidance Information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# APPLY WORKSHOP TECHNOLOGY PRINCIPLES

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

**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.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms*** ***are elaborated in the Range*** |
| 1. Interpret working drawings | 1.1 Reading and extraction of***information*** (dimensions, tolerances, BS/ANSI Drawing Standards, geometric ISO symbols & abbreviations)  1.2 Development of working procedure/ operational plan |
| 1. Choose appropriate tools and materials | 2.1 Select ***PPE*** according to specific context  2.2 Types of hand tools  2.3 Using hand tools.  2.4 Using ***machine tools***  2.5 Selection of tools as per the specific operation  2.6 Inspection and/or recalibration of tools  2.7 Demonstration of correct handling of tools.  2.8 Selection of material for the given component |
| 1. Mark out of work piece(s) | 3.1 Use of marking out tools  3.2 Laying out work piece(s)  3.3 Transfer of dimensions onto the work piece(s) |
| 1. Produce components | 4.1 Set up work piece on ***work holding device*** securely.  4.2 Perform suggested ***operation*** |
| 1. Perform finishing processes | 5.1 Finishing ***processes*** |

**RANGE**

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

|  |  |
| --- | --- |
| **Variable** | **Range** |
| * + - 1. PPE (personal protective equipment) include but not limited to: | * Dust coats/overalls * Gloves * Eye shields * Boots, * Helmets/hats * Masks |
| * + - 1. Information: include but not limited to: | * Dimensions, * Tolerances, * BS/ANSI drawing standards, * Geometric iso symbols & abbreviations) |
| * + - 1. Machine tools include but not limited to: | * Drilling machines * Grinders |
| * + - 1. Work holding devices include but not limited to: | * Vices * Chucks * Clamps |
| * + - 1. Operations include but not limited to: | * Tapping * Drilling * Boring * Filing * Grinding * Soldering/brazing * Welding |
| 1. Processes include but not limited to: | * Polishing * Filing * Grinding * De-burring * Painting of components |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate ability related to:

* Communication
* Team work
* Problem solving
* Planning and organizing
* Self-management
* Measurement
* Use of tools and equipment

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Types of tools, equipment and PPE
* National legislation and regulations
* Safe working practices and procedures to be followed when working in an engineering workshop
* Safety and environmental hazards associated with workshop tools and equipment
* Using workshop tools and equipment
* Basic maintenance and servicing of workshop tools, equipment and machines

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   1. Interpreted working drawings 2. Chose appropriate tools and materials 3. Marked out of work piece(s) 4. Produced components 5. Performed finishing processes |
| 1. Resource Implications | The following resources must be provided:   1. Tools and equipment 2. A functional agricultural engineering workshop |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Observation (performance checklist) 2. Oral 3. Written 4. Third party report 5. Practicals |
| 1. Context of Assessment | Competency may be assessed:  4.1 On-the-job  4.2 Off-the –job  4.3 During Industrial attachment. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# CORE UNITS OF COMPETENCY

# OPERATE AND MAINTAIN FARM TRACTOR

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

**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.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms*** ***are elaborated in the Range*** |
| 1. Perform safe operation of farm tractors | * 1. Identify and gather appropriate ***PPE*** as per job requirements   2. Identify characteristics of a safe environment for the operation of farm tractors as per job requirements   3. Perform pre-operation check on selected farm tractors as per job requirements   4. Perform safe driving of tractor as per job requirements |
| 2. Operate tractor systems | * 1. Identify selected ***tractor system******s*** as per job requirements   2. Test selected tractor systems as per job requirements   3. Perform operation of selected tractor systems as per job requirements |
| 3. Perform maintenance on selected systems of farm tractors | 1. Select appropriate ***tools and equipment*** for maintenance of selected tractor systems as per manufacturer’s instruction. 2. Perform maintenance procedures for selected tractor systems as per manufacturer’s instruction 3. Perform routine service on selected tractor systems as per work place policies |
| 4. Evaluate the performance of tractor systems | 1. Perform basic diagnostics on selected tractor systems 2. Identify common malfunctions of selected tractor systems 3. Interpret results of the diagnostic tests of selected tractor systems |
| 5. Perform adjustments to tractor components and systems | 1. Perform adjustments for optimal performance of selected tractor systems 2. Perform tests of selected tractor systems to validate adjustments |

**RANGE**

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

|  |  |
| --- | --- |
| **Variable** | **Range** |
| * + - 1. PPE (personal protective equipment) may include but not limited to: | * Dust coats/overalls * Gloves * Eye shields * Boots, * Helmets/hats * Masks |
| * + - 1. Tractor systems may include but not limited to: | * Cooling system * Electrical system * Transmission system * Hydraulic system * Power take-off (PTO) * Lubrication system * Fuel system * Steering system * Hitches |
| * + - 1. Tools and equipment may include but not limited to: | * Hand tools * Measuring, testing and diagnostic equipment * Power tools |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate ability related to:

* Communication
* Team work
* Problem solving
* Planning and organizing
* Self-management
* Measurement
* Use of tools and equipment

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Types of tools, equipment and PPE
* National legislation and regulations
* Safe working practices and procedures to be followed when operating and servicing farm implements
* Safety and environmental hazards associated with farm machinery and implements
* Operating farm machines and implements
* Basic maintenance and servicing of farm implements and machines

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| * + - 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   1. Performed safe operation of farm tractors 2. Operated tractor systems 3. Performed maintenance on selected systems of farm tractors 4. Evaluated the performance of tractor systems 5. Performed adjustments to tractor components and systems |
| * + - 1. Resource Implications | The following resources must be provided:   1. Tractor 2. Land 3. Farm implements 4. Tools and equipment 5. A functional agriculture machinery workshop |
| * + - 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Observation (performance checklist) 2. Oral questions 3. Written 4. Third party report |
| * + - 1. Context of Assessment | Competency may be assessed:  4.1 On-the-job  4.2 Off-the –job  4.3 During Industrial attachment. |
| * + - 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# CALIBRATE FIELD EQUIPMENT

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

**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.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms*** ***are elaborated in the Range*** |
| 1. Assess the condition of field equipment | 1. PPE are identified and gathered as per job requirements 2. Identify and address potential safety hazards in the work environment 3. Perform a pre-operation check on selected farm equipment |
| 1. Operate selected farm machines and equipment | 1. Demonstrate procedures for hooking up and unhooking farm implements 2. Operate selected ***farm implements*** |
| 1. Perform maintenance and service procedures on selected agricultural equipment | 1. Select appropriate ***tools and equipment*** for application 2. Remove components to access repair or adjustment area 3. Perform service procedures on selected farm implements |
| 1. Calibrate selected farm equipment | * 1. Identify the ***farm equipment***   2. Identify desired application or operation rates   3. Select appropriate measurement tool   4. Apply the appropriate mathematical units   5. Apply the required mathematical principles to calculate the application or operation rate   6. Perform adjustment to the required rate of application or operation. |
| 1. Test the operation of field equipment and carry out final adjustments | 1. Perform field test of the adjustment to the application or operation rate 2. Compare the actual application or operation rate to the desired application or operation rate 3. Evaluate whether further adjustment is needed |

**RANGE**

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

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. PPE (personal protective equipment)may include but not limited to: | * Dust coats/overalls * Gloves * Eye shields * Boots, * Helmets/hats * Masks |
| 1. Farm equipment may include but not limited to: | * Tillage implements * Planting equipment * Spraying equipment * Harvesting equipment * Processing equipment |
| 1. Tools and equipment may include but not limited to: | * Hand tools * Measuring, testing and diagnostic equipment * Power tools |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate ability related to:

* Communication
* Team work
* Problem solving
* Planning and organizing
* Self-management
* Measurement
* Use of tools and equipment

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Types of tools, equipment and PPE
* National legislation and regulations
* Safe working practices and procedures to be followed when operating and servicing farm implements
* Safety and environmental hazards associated with farm machinery and implements
* Operating farm machines and implements
* Basic maintenance and servicing of farm implements and machines

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   1. Assessed the condition of field equipment 2. Operated selected farm machines and equipment 3. Performed maintenance and service procedures on selected agricultural equipment 4. Calibrated selected farm equipment 5. Optimized the operation of field equipment |
| 1. Resource Implications | The following resources must be provided:   1. Tractor 2. Land 3. Tillage implements 4. Planting equipment 5. Application equipment 6. Harvesting equipment 7. Tools and equipment 8. A functional agriculture machinery workshop |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Observation (performance checklist) 2. Oral 3. Written 4. Third party report |
| 1. Context of Assessment | Competency may be assessed:   * 1. On-the-job   2. Off-the –job   3. During Industrial attachment |
| 1. Guidance Information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# APPLY DIGITAL SKILLS IN AGRICULTURAL SYSTEMS

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

**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.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms*** ***are elaborated in the Range*** |
| 1. Apply theoretical knowledge related to Agricultural Digital Systems | 1. Describe principles of magnetism. 2. Describe principles of electricity 3. Identify the function of electricity and magnetism within ***electrical and electronic components*** and systems 4. Identify principles of Agricultural Digital Systems. 5. Apply computer control theory as it pertains to Agricultural Digital Systems |
| 1. Perform troubleshooting procedures on electronic components and systems | 1. Select ***PPE*** according to specific context and policy 2. Identify electronic diagnostic control tools for specific contexts 3. Connect selected electronic ***diagnostic tools*** with agricultural equipment 4. Differentiate troubleshooting codes in electronic ***diagnostics*** |
| 1. Operate electronic diagnostic control tools | * 1. Identify ***levels of access*** to electronic diagnostic tools   2. Perform selected electronic calibration of equipment at the operator level   3. Describe selected electronic calibration of equipment at the service center level |
| 1. Perform service and maintenance operations on agricultural digital systems | * 1. Describe care and maintenance of ***electronic networking diagnostic control tools***   2. Perform software updates on electronic diagnostic control tools |
| 1. Evaluate the operations of agricultural digital systems | * 1. Select PPE according to specific contexts and policy   2. Identify electronic diagnostic control tools   3. Connect selected electronic diagnostic tools with agricultural equipment   4. Interpret results from selected electronic diagnostic tools |

**RANGE**

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

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. PPE may include but not limited to: | * Fire extinguishing equipment * First aid stations * Eye wash stations * Aprons * Cloves * Goggles * First aid kit * Masks * Safety boots |
| 1. Electrical and electronic components may include but not limited to: | * Batteries * Sensors * Regulators * Heaters * Led * Printed circuit boards * Communication plugs |
| 1. Diagnostics may include but not limited to: | * Circuit tests * Component tests * Service code diagnostics |
| 1. Levels of access may include but not limited to: | * Operator * Service center * Manufacturer |
| 1. Electronic networking communication tools and testing equipment may include but not limited to | * Digital multi-meters * Test lights * Laptop diagnostic systems * Onboard diagnostic systems |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Safety skills
* Numeracy skills
* Typing skills
* Computing skills
* Interpretation skills
* Communication skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Safe working practices and procedures
* Identify different farm machinery and implement
* Safety requirements and precautions
* Use and care of farm tools
* Use of calculator
* Basic use of computer

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   1. Applied theoretical knowledge related to Agricultural Digital Systems 2. Performed troubleshooting procedures on electronic components and systems 3. Operated electronic diagnostic control tools 4. Performed service and maintenance operations on agricultural digital systems 5. Evaluated the operations of agricultural digital systems |
| 1. Resource Implications | The following resources must be provided:   * 1. A functional workshop with basic digital networking, tools, equipment, materials and supplies.   2. References and manuals including working drawing   3. Personal protective equipment |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Observation 2. Oral questions 3. Written 4. Third party report |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. Off-the –job 3. During Industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# MAINTAIN HYDRAULIC SYSTEMS

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

**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.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms*** ***are elaborated in the Range*** |
| 1. Demonstrate understanding of agricultural hydraulic systems | * 1. Identify ***hydraulic systems***   2. Describe the working principles of hydraulic systems   3. Compare hydraulic systems by type   4. Identify ***hydraulic systems components***   5. Interpret schematic representations of hydraulic systems |
| 1. Perform trouble shooting of hydraulic systems | * 1. Select appropriate ***tools and equipment***   2. Apply appropriate safety protocols to evaluation of hydraulic systems   3. Identify common malfunctions of hydraulic systems   4. Test for malfunction and performance of hydraulic systems |
| 1. Perform service and maintenance of hydraulic systems | * 1. Perform service and maintenance procedures on ***hydraulic system circuits***   2. Generate service and maintenance reports on hydraulic systems to industry standards |
| 1. Calibrate hydraulic systems | 4.1 Identify appropriate ***tools and equipment*** for calibration  4.2 Perform adjustments on hydraulic systems according to factory specifications  4.3 Perform calibration of hydraulic systems |
| 1. Optimize the operations of the hydraulic systems | * 1. Apply appropriate safety protocols to evaluation of hydraulic systems   2. Perform tests on hydraulic system circuits   3. Analyze results of tests of hydraulic system circuits   4. Field-test the operation of hydraulic systems |

**RANGE**

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

|  |  |
| --- | --- |
| **VARIABLE** | **RANGE** |
| 1. Hydraulic systems may include but not limited to: | * Open center * Closed center |
| 1. Hydraulic system components may include but not limited to: | * Pumps, rock-shafts/three-point hitch, cylinders, motors, actuators, fluids, controllers, wiring harnesses, valves |
| 1. Tools and Equipment may include but not limited to: | * Hand Tools * Power Tools * Measuring, Testing and Diagnostic Equipment * Shop Equipment * Specialty Tools and Equipment * Hoisting, Lifting and Staging Equipment * Welding and Cutting Equipment Personal Protective Equipment and Safety Equipment |
| 1. Hydraulic system circuits may include but not limited to: | * High pressure * Low pressure * Control * Lubrication |

**REQUIRED SKILLS AND KNOWLEDGE**

**Required Skills**

The individual needs to demonstrate the following skills:

* Interpretation skills
* Report writing
* Analytical skills
* Safety skills
* Measuring skills

**Required Knowledge**

This section describes the knowledge required for this unit of competency.

The individual needs to demonstrate knowledge of:

* Safe working practices and procedures
* Identification of farm machinery and implement
* Use and care of farm tools
* Basic maintenance and servicing of farm machinery and implements
* Grades of oils and lubricants
* Methods and units of measurements

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   1. Demonstrated understanding of agricultural hydraulic systems 2. Performed trouble shooting of hydraulic systems 3. Performed service and maintenance of hydraulic systems 4. Calibrated hydraulic systems 5. Optimized the operations of the hydraulic systems |
| 1. Resource Implications | The following resources must be provided:   * 1. A functional workshop with basic hydraulic and hydrostatic tools, equipment, materials and supplies.   2. References and manuals including working drawing   3. Personal protective equipment |
| 1. Methods of Assessment | Competency in this unit may be assessed through:  3.1 Observation  3.2 Oral questions  3.3 Written  3.4 Third party report |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. Off-the –job 3. During Industrial attachment. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# MAINTAIN AGRICULTURAL PNEUMATIC SYSTEMS

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

**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.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms*** ***are elaborated in the Range*** |
| 1. Demonstrate knowledge of agricultural pneumatic systems | * 1. Select appropriate ***PPE*** for specific contexts   2. Identify characteristics of a safe work environment in specific context   3. Identify pneumatic systems   4. Identify components of pneumatic system components   5. Interpret schematic representation of pneumatic system components |
| 1. Diagnose malfunction of agricultural pneumatic systems | * 1. Verify power supply to the pneumatic system   2. Perform sensory inspection on pneumatic systems   3. Perform pre-operation check on pneumatic system   4. Detect indicators of malfunction in pneumatic system   5. Diagnose cause of malfunction in pneumatic system |
| 1. Perform service and maintenance of agricultural pneumatic systems | 1. Perform maintenance operations on agricultural pneumatic systems 2. Perform routine service on agricultural pneumatic systems in accordance with specified standards 3. Write service report on pneumatic systems according to industry standard 4. Determine required actions such as repairs, replacements or adjustments based on service report |
| 1. Perform adjustments to agricultural pneumatic systems | 1. Identify necessary adjustments to the agricultural pneumatic system in specific contexts 2. Perform adjustments indicated in agricultural pneumatic systems |
| 1. Optimize the operations of the agricultural pneumatic systems | * 1. Select appropriate ***tools and equipment*** for specific contexts   2. Perform test on pneumatic system circuits   3. Analyze test results of pneumatic system circuits   4. Perform adjustments to pneumatic system circuits as indicated by results. |

**RANGE**

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

|  |  |
| --- | --- |
| **Variable** | **Range** |
| * 1. PPE (personal protective equipment)may include but not limited to: | * Dust coats/overalls * Gloves * Eye shields * Boots, * Helmets/hats * Masks |
| * 1. Pneumatic systems components may include but not limited to: | * Compressors * Valves * Air lines * Pumps * Actuators * Attenuators * Dryers * Air bags * Air suspension * Brake pots |
| * 1. Tools and equipment may include but not limited to: | * Hand tools * Measuring, testing and diagnostic equipment * Power tools |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate ability related to:

* Communication
* Team work
* Problem solving
* Planning and organizing
* Self-management
* Measurement
* Use of tools and equipment

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Types of tools, equipment and PPEs
* National legislations and regulations
* Safe working practices and procedures to be followed when operating and servicing pneumatic systems
* Safety and environmental hazards associated with pneumatic systems
* Operating pneumatic systems
* Basic maintenance and servicing of pneumatic system

**EVIDENCE GUIDE**

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   1. Demonstrated knowledge of agricultural pneumatic systems 2. Diagnosed malfunction of agricultural pneumatic systems 3. Performed service and maintenance of agricultural pneumatic systems 4. Performed adjustments to agricultural pneumatic systems 5. Optimized the operations of the agricultural pneumatic systems |
| 1. Resource Implications | The following resources must be provided:   1. Tractor 2. Land 3. Farm implements 4. Tools and equipment 5. A functional agriculture machinery workshop |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Observation 2. Oral questions 3. Written 4. Third party report |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. Off-the –job 3. During Industrial attachment. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |