THE REPUBLIC OF KENYA

NATIONAL OCCUPATIONAL STANDARDS

FOR

AUTOMOTIVE ARTISAN

LEVEL 4

TVET CDACC
P.O BOX 15745-00100
NAIROBI

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FOREWORD

The provision of quality education and training is fundamental to the Government's overall strategy for social economic development. Quality education and training will contribute to achievement of Kenya's development blueprint, Vision 2030 and sustainable development goals.

Reforms in the education sector are necessary for the achievement of Kenya Vision 2030 and meeting the provisions of the Constitution of Kenya 2010. The education sector had to be aligned to the Constitution of Kenya 2010 and this resulted in the formulation of the Policy Framework for Reforming Education and Training (Sessional Paper No. 4 of 2016). 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 Automotive Technology 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 Engineering Sector's growth and development.

PRINCIPAL SECRETARY, VOCATIONAL AND TECHNICAL TRAINING
MINISTRY OF EDUCATION

PREFACE

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

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

The TVET Curriculum Development, Assessment and Certification Council (TVET CDACC), in conjunction with Automotive Sector Skills Advisory Committee (SSAC have developed these Occupational Standards for Automotive Artisan Level 4. These standards will be the basis for development of Competency Based Curriculum for Automotive Technology 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, Automotive SSAC, expert workers and all those who participated in the development of these Occupational Standards.

CHAIRPERSON, TVET CDACC

ACKNOWLEDGMENT

These Occupational Standards were developed through combined effort of various stakeholders from private and public organizations. I am thankful to the management of these organizations for allowing their staff to participate in this course. I wish to acknowledge the invaluable contribution of industry players who provided inputs towards the development of these Standards.

I thank TVET Curriculum Development, Assessment and Certification Council (TVET CDACC) for providing guidance on the development of these Standards. My gratitude goes to Automotive Sector Skills Advisory Committee (SSAC) members for their contribution to the development of these Standards. I thank all the individuals and organizations who participated in the validation of these Standards.

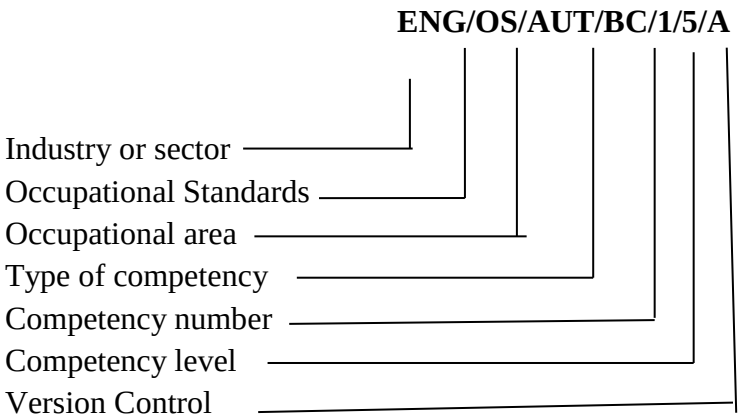
I acknowledge all other institutions which in one way or another contributed to the development of these Standards.

CHAIRPERSON,
AUTOMOTIVE SECTOR SKILLS ADVISORY COMMITTEE

ABBREVIATIONS AND ACRONYMS

AC	Air conditioning
CDACC	Curriculum Development, Assessment and Certification Council
CI	Compression ignition
CV	Constant velocity joint
DTI	Dial test indicator
FOT	Fixed orifice tube
GPS	Global positioning system
ICT	Information and Communication Technology
KPI	King Pin inclination
OBD	On-board diagnostics
PPE	Personal protective equipment
SI	Spark ignition
TVET	Technical and Vocational Education and Training
TXV	Thermal expansion valve
UJ	Universal joint

KEY TO UNIT CODE



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OVERVIEW

The Automotive Technology level 4 qualification consists of competencies that a person must achieve to enable him/her to service and maintain motor vehicles in the motorvehicle service and repair industry.

The units of competency comprising Automotive Artisan Level 4 qualifications include the following competencies:

Basic Units of Competency

Unit Code	Unit Title
ENG/OS/AUT/BC/1/4/A	Demonstrate Communication Skills
ENG/OS/AUT/BC/2/4/A	Demonstrate Digital Literacy
ENG/OS/AUT/BC/3/4/A	Demonstrate Entrepreneurial Skills
ENG/OS/AUT/BC/4/4/A	Demonstrate Employability Skills
ENG/OS/AUT/BC/5/4/A	Demonstrate Environmental Literacy
ENG/OS/AUT/BC/6/4/A	Demonstrate Occupational Safety and Health Practices

Common Units of Competency

Unit Code	Unit Title
ENG/OS/AUT/CC/1/4/A	Prepare and Interprate Geometry Drawing
ENG/OS/AUT/CC/2/4/A	Apply Basic Mathematics
ENG/OS/AUT/CC/3/4/A	Apply Basic Science Princples
ENG/OS/AUT/CC/4/4/A	Perform Workshop Technology Applications
ENG/OS/AUT/CC/5/4/A	Maintain Workshop Tools, Equipment and Measuring Devices

Core Units of Competency

Unit Code	Unit Title
ENG/OS/AUT/CR/1/4/A	Perform Vehicle Basic Maintenance
ENG/OS/AUT/CR/2/4/A	Service and Repair Vehicle Engines
ENG/OS/AUT/CR/3/4/A	Service and Repair Vehicle Fuel Systems
ENG/OS/AUT/CR/4/4/A	Service Vehicle Steering and Suspension Systems
ENG/OS/AUT/CR/5/4/A	Service Vehicle Braking Systems.

ENG/OS/AUT/CR/6/4/A	Service Vehicle Electrical Systems.

BASIC UNITS OF COMPETENCY

DEMONSTRATE COMMUNICATION SKILLS

UNIT CODE: ENG/OS/AUT/BC/1/4/A

UNIT DESCRIPTION

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

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	1.1 Specific and relevant information is accessed from ***appropriate sources*** based on standard procedures 1.2 Effective questioning, active listening and speaking skills are used to gather and convey information based on communication needs 1.3 Appropriate ***medium*** is used to transfer information and ideas in accordance with workplace guidelines 1.4 Appropriate non- verbal communication is used as per the communication needs 1.5 Appropriate lines of communication with supervisors and colleagues are identified and followed based on workplace requirements 1.6 Location and storage of information is undertaken according to workplace procedures 1.1 Personal interaction is carried out clearly and concisely according to workplace requirements
2. Complete relevant work-related documents	2.1 Range of forms relating to conditions of employment are completed according to workplace procedures 2.2 Workplace data is recorded based on workplace requirements 2.3 Errors in recording information are identified and acted upon in accordance with workplace policies 2.4 Reporting requirements are completed according to organizational guidelines
3. Communicate information about workplace processes	3.1 Information sources are identified according to workplace procedures 3.2 ***Methods of communication*** are selected based on workplace guidelines 3.3 Multiple operations are communicated according to workplace structure

	3.4 Work-related questions are asked and responded based on set protocols 3.5 Information is selected and organized according to workplace requirements 3.1 Verbal and written reporting is undertaken as per workplace requirements 3.2 Communication is maintained according to workplace standards
4. Lead workplace discussions	4.1 Response to workplace issues are sought and provided as per workplace protocol 4.2 Constructive contributions are made based on ***workplace discussions*** 4.3 Workplace objectives and action plan are communicated according to workplace requirements
5. Identify and communicate issues arising in the workplace	5.1 Issues and problems are identified as per workplace guidelines 5.2 Problems and issues in the workplace are organized according to workplace operations 5.3 Dialogue is initiated with appropriate personnel as per workplace structure 5.4 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 may include but not limited to:	• Non-verbal gestures • Verbal • Face to face • Two-way radio • Speaking to groups • Using telephone • Written • Internet
2. 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: 1.1 Dealt with a range of communication/information at one time 1.2 Made constructive contributions in workplace issues 1.3 Sought workplace issues effectively 1.4 Responded to workplace issues promptly 1.5 Presented information clearly and effectively in written form 1.6 Used appropriate sources of information 1.7 Asked appropriate questions 1.8 Provided accurate information
2. Resource Implications	2. 1Access to relevant workplace where assessment can take place 2. 2Appropriately simulated environment where assessment can take place 2. 3Materials relevant to the proposed activity or tasks
3. Methods of Assessment	3.1 Third-party reports 3.2 Portfolio 3.3 Interview 3.4 Written tests 3.5 Observation 3.6 Oral questioning
4. Context of Assessment	ompetency may be assessed 4.1 On the job 4.2 Off the job

	4.3 During industrial attachment
5. Guidance information for assessment	olistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

DEMONSTRATE DIGITAL LITERACY

UNIT CODE: ENG/OS/AUT/BC/2/4/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	1.1 ***Appropriate computer software*** is identified according to manufacturer's specification 1.2 ***Appropriate computer hardware*** is identified according to manufacturer's specification
2. Apply security measures to data, hardware, software	2.1 ***Data security and privacy are classified*** in accordance with the technological situation 2.2 ***Security and control measures*** are applied in accordance with laws governing protection of ICT 2.3 Computer threats and crimes are detected as per information security management guidelines. 2.4 Protection against computer crimes is undertaken in accordance with laws governing protection of ICT
3. Apply computer software in solving tasks	3.1 Basic word processing concepts are applied in resolving workplace tasks 3.2 Word processing utilities are applied in accordance with workplace procedures 3.3 Data is manipulated on worksheet in accordance with office procedures
4. Apply internet and email in communication at workplace	4.1 Electronic mail is applied in workplace communication in accordance with office procedures 4.2 Office internet functions are defined and executed in accordance with office procedures 4.3 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
2. Appropriate computer hardware may include but not limited to:	• Computer Case • Monitor • Keyboard • Mouse • Hard Disk Drive • Motherboard • Video Card
3. Data security and privacy may include but not limited to:	• Confidentiality • Cloud computing • Confidentiality • Cyber terrorism • Integrity -but-curious data serving
4. 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: 1.1 Identified input, output, CPU and storage media devices of computers in accordance to computer specification 1.2 Identified concepts, types and functions of computer software according to operation manual 1.3 Identified and controlled security threats 1.4 Detected and protected computer crimes 1.5 Applied word processing in office tasks 1.6 Prepared work sheet and applied data to the cells in accordance to workplace procedures 1.7 Used Electronic Mail for office communication as per workplace procedure 1.8 Applied internet and World Wide Web for office tasks in accordance with office procedures 1.9 Applied laws governing protection of ICT
2. Resource Implications	2.1 Access to relevant workplace where assessment can take place 2.2 Appropriately simulated environment where assessment can take place 2.3 Materials relevant to the proposed activity or tasks
3. Methods of Assessment	mpetency may be assessed through: 3.1 Written tests 3.2 Practical assignment 3.3 Interview 3.4 Oral Questioning 3.5 Observation

4. Context of Assessment	Competency may be assessed 4.1 On the job 4.2 Off the job 4.3 During industrial attachment
5. 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/AUT/BC/3/4/A

UNIT DESCRIPTION

This unit covers the competencies required demonstrate entrepreneurial skills. It involves creating 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. 1Generation and evaluation of business ideas is undertaken in accordance with the existing procedure 1. 2Competencies are matched with business opportunities in accordance with business practices. 1. 3Procedure for starting a small business is identified as per the legal requirements 1. 4SWOT/ PESTEL analysis and or industrial survey is carried out according to office procedures 1. 5***Business operations*** are monitored and controlled following established procedures. 1. 6Quality assurance measures are implemented in accordance with the business practices. 1. 7Good relations are maintained with staff/workers as per the workplace policies. 1. 8Policies and procedures on occupational safety and health and environmental concerns are constantly observed as per the workplace policies
2. Establish small scale business customer base	2. 1Good customer relations are maintained in accordance with office procedures 2. 2New customers and markets are identified, explored and reached out to according to the marketing plan 2. 3Promotions/Incentives are offered to loyal customers in accordance with office procedures 2. 4Additional products and services are evaluated and tried in accordance with marketing strategy

	2. 5Customer record is maintained in accordance with office procedures
3. Manage small scale business	3.1 Enterprise is built up and sustained in line with judicious control of cash flows. 3.2 Profitability of enterprise is ensured as per the internal controls. 3.3 Unnecessary or lower-priority expenses and purchases are avoided as per the marketing strategy 3.4 Basic cost-benefit analysis are undertaken in accordance with office procedures 3.5 Basic financial management are undertaken in accordance with office procedures 3.6 Basic financial accounting in undertaken in accordance with office procedures 3.7 Business ***internal controls*** are implemented in accordance with office procedure 3.8 Setting business priorities and strategies is carried out according to office procedures 3.9 Preparation and interpretation of basic financial statements is undertaken in accordance with set procedures 3.10 Preparation of business plans for small business is undertaken in accordance with ***business strategy*** 3.11 usiness Social Responsibility is maintained in accordance with Standard Operations Procedures (SOP)
4. Grow/ expand small scale business	4.1 Prepared business growth strategy for small sale business in accordance with office procedures 4.2 Incorporated technology in small scale business growth in accordance with technological trends 4.3 Emerging issues and trends are considered in accordance with business growth strategy 4.4 Built audience interest in product/service according to growth strategy 4.5 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
2. Internal control may include but not limited to:	• Accounting systems • Financial statements/reports • Cash management • Human resource management
3. Business Strategy may include but not limited to:	• Management of wastages • Environmental Conservation
4. 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: 1.1 Demonstrated entrepreneurial skills 1.2 Demonstrate competencies to create a small-scale business 1.3 Demonstrated ability to conceptualize and plan a micro/small business 1.4 Grew customer base for the small-scale business 1.5 Demonstrated ability to manage/operate a micro/small-scale business 1.6 Demonstrated competencies to grow a micro/small-scale business
2. Resource Implications	The following resources should be provided: 2.1 Assessment location 2.2 Case studies on micro/small-scale enterprises 2.3 Assessment materials
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Written tests 3.2 Observation 3.3 Oral questioning 3.4 Portfolio 3.5 Projects
4. Context of Assessment	Competency may be assessed 4.1 On the job 4.2 Off the job 4.3 During industrial attachment
5. 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/AUT/BC/4/4/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	1.1 Personal vision, mission and goals are formulated based on potential and in relation to organization objectives 1.2 Emotional intelligence is demonstrated as per workplace requirements. 1.3 Individual performance is evaluated and monitored according to the agreed targets. 1.4 Assertiveness is developed and maintained based on the requirements of the job. 1.5 Accountability and responsibility for own actions are demonstrated based on workplace instructions. 1.6 Self-esteem and a positive self-image are developed and maintained based on values. 1.7 Time management, attendance and punctuality are observed as per the organization policy. 1.8 Goals are managed as per the organization's objective 1.9 Self-strengths and weaknesses are identified based on personal objectives

2. Demonstrate critical safe work habits	2.1.Stress is managed in accordance with workplace policy. 2.2.Punctuality and time consciousness is demonstrated in line with workplace policy. 2.3.Personal objectives are integrated with organization goals based on organization's strategic plan. 2.4.***Resources*** are utilized in accordance with workplace policy. 2.5.Work priorities are set in accordance to workplace goals and objectives. 2.6.Leisure time is recognized and utilized in line with personal objectives. 2.7.***Drugs and substances of abuse*** are identified and avoided based on workplace policy. 2.8.HIV and AIDS prevention awareness is demonstrated in line with workplace policy. 2.9.Safety consciousness is demonstrated in the workplace based on organization safety policy. 2.10. ***merging issues*** are identified and dealt with in accordance with organization policy.
3. Demonstrate workplace learning	3.1 Learning opportunities are sought and managed based on job requirement and organization policy. 3.2 Improvement in performance is demonstrated based on courses attended. 3.3 Application of learning is demonstrated in both technical and non-technical aspects based on requirements of the job 3.4 Time and effort is invested in learning new skills based on job requirements 3.5 Initiative is taken to create more effective and efficient processes and procedures in line with workplace policy. 3.6 New systems are developed and maintained in accordance with the requirements of the job. 3.7 Awareness of personal role in workplace ***innovation*** is demonstrated based on requirements of the job.
4. Demonstrate workplace ethics	4.1 Policies and guidelines are observed as per the workplace requirements 4.2 Self-worth and professionalism is exercised in line with personal goals and organizational policies 4.3 Code of conduct is observed as per the workplace requirements 4.4 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
2. Feedback may include but not limited to:	• Verbal • Written • Informal • Formal
3. Team may include but not limited to:	• Small work group • Staff in a section/department • Inter-agency group
4. Drug and substance abuse may include but not limited to:	• Alcohol • Tobacco • Miraa • Over-the-counter drugs • Cocaine • Bhang • Glue
5. Emerging issues may include but not limited to:	• Terrorism • Social media • National cohesion • Open offices
6. Range of media for learning may include but not limited to:	• Mentoring • peer support and networking • IT and courses
7. 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: 1.1 Conducted self-management 1.2 Demonstrated critical safe work habits 1.3 Demonstrated workplace learning 1.4 Demonstrated workplace ethics
2. Resource Implications	The following resources should be provided: 2.1.Access to relevant workplace where assessment can take place

	2.2.Appropriately simulated environment where assessment can take place
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Oral questioning 3.2 Portfolio of evidence 3.3 Third Party Reports 3.4 Written tests
4. Context of Assessment	Competency may be assessed 4.1 On-the-job 4.2 Off-the –job **4.3** During Industrial attachment
5. 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/AUT/BC/5/4/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	1.1 Storage methods for environmentally hazardous materials are followed according to environmental regulations and OSHS. 1.2 Disposal methods of hazardous wastes are followed according to environmental regulations and OSHS. 1.3 ***PPE*** is used according to OSHS.
2. Control environmental pollution	2.1 ***Environmental pollution control measures*** are compiled following standard protocol. 2.2 Procedures for solid waste management are observed according Environmental Management and Coordination Act 1999 2.3 Methods for minimizing noise pollution complied following environmental regulations.
3. Demonstrate sustainable use of resource s	3.1 Methods for minimizing wastage are complied with. 3.2 ***Waste management procedures*** are employed following principles of 3Rs (Reduce, Reuse, Recycle) 3.3 Methods for economizing or reducing resource consumption are practiced.

4. Evaluate current practices in relation to resource usage	4.1 Information on resource efficiency ***systems and procedures*** are collected and provided as per work groups/sector 4.2 ***Current resource usage*** is measured and recorded as per work group/sector 4.3 Current purchasing strategies are analyzed and recorded according to industry procedures. 4.4 Current work processes to access information and data is analyzed following enterprise protocol.
5. 5. Identify environmental legislations/conventions for environmental concerns	5.1 Environmental legislations/conventions and local ordinances are identified according to the different environmental aspects/impact 5.2 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
2. 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

3. Waste management procedures may include but are not limited to:	• Sorting • Storing of items • Recycling of items • Disposal of items • Handling • Transport
4. 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: 1.1 Controlled environmental hazards 1.2 Controlled environmental pollution 1.3 Demonstrated sustainable resource use 1.4 Evaluated current practices in relation to resource usage
2. Resource Implications	The following resources should be provided: 2.1 Workplace with storage facilities 2.2 Tools, materials and equipment relevant to the tasks (e.g. cleaning tools, cleaning materials, trash bags, etc.) 2.3 PPEs 2.4 Manuals and references 2.5 Legislation, policies, procedures, protocols and local ordinances relating to environmental protection 2.6 Case studies/scenarios relating to environmental Protection
3 Methods of Assessment	Competency in this unit may be assessed through: 3.1 Observation 3.2 Oral questioning 3.3 Written tests 3.4 Third party reports 3.5 Portfolio
4 Context of Assessment	Competency may be assessed 4.1 On the job 4.2 Off the job 4.3 During industrial attachment

5	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/AUT/BC/6/4/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	1.1 Arrangement of work area and items in accordance with workplace procedures requirements 1.2 Work standards and procedures are followed based on instructions 1.3 ***Prevention and control measures*** are applied based on instructions
2. Participate in arrangements for workplace safety and health maintenance	2.1 Orientations on ***OSH requirements and regulations*** is undertaken in line with policy. 2.2 Feedback on occupational health and safety are provided as per workplace instructions. 2.3 Workplace procedures for reporting hazards, incidents, injuries and sickness are adhered to as per workplace policy. 2.4 ***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
2. 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
3. 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.
4. OSH requirements / regulations may include but are not limited to:	• Building code • Permit to Operate
5. 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	1.1. Assessment requires evidence that the candidate: 1.2. Arranged work area and items in accordance with 1.3. workplace procedures requirements 1.4. Followed work standards and procedures based on instructions 1.5. Applied ***Prevention and control measures*** based on instructions 1.6. Undertook orientations on ***OSH requirements and regulations*** in line with policy. 1.7. Provided feedback on occupational health and safety as per workplace instructions. 1.8. Adhered to workplace procedures for reporting hazards, incidents, injuries and sickness to as per workplace policy. 1.9. Identified and proposed ***OSH-related training needs*** as per workplace policy.
2. Resource Implications	The following resources should be provided: 2.1 Access to relevant workplace where assessment can take place

	2.2 Appropriately simulated environment where assessment can take place
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Oral questioning 3.2 Portfolio of evidence 3.3 Third Party Reports 3.4 Written tests
4. Context of Assessment	Competency may be assessed 4.1 On-the-job 4.2 Off-the –job 4.3 During Industrial attachment
5. 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 APPLIED GEOMETRY DRAWINGS

UNIT CODE: ENG/OS/AUT/CC/1/4/A

UNIT DESCRIPTION

This unit covers the competencies required to prepare and interpret applied geometry drawings. It involves selecting, using and maintaining drawing equipment and materials. It also involves printing, constructing of lines and interpreting symbols, producing plane and solid geometry drawings and producing pictorial and orthographic drawings of components.

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT	PERFORMANCE CRITERIA *(Bold and italicized terms are elaborated in the Range)*
1. Use and maintain drawing equipment and materials	1.1 ***Drawing equipment*** are identified and gathered according to task requirements 1.3 Drawing equipment are used and maintained as per manufacturer's instructions 1.4 ***Drawing materials*** are used as per workplace procedures 1.5 Drawing equipment are maintained and stored as per the work place procedures 1.5 Waste materials are disposed in accordance with workplace procedures and ***environmental legislations*** 1.6 ***Personal Protective Equipment*** is used according to occupational safety and health regulations
2. Print, construct lines and interpret symbols	***2.1*** Letters and numbers are printed as per ***standard drawing conventions*** 2.2 Different ***types of lines*** are identified and constructed as per standard drawing conventions 2.3 Different methods of bisecting lines are identified and constructed as per standard drawing conventions 2.4 Different methods of dimensioning are identified and constructed as per standard drawing conventions 2.5 Different ***symbols and abbreviations*** are identified, and interpreted according to standard drawing conventions

ELEMENT	PERFORMANCE CRITERIA *(Bold and italicized terms are elaborated in the Range)*
3. Produce plane geometry drawings	3.1 Different types of triangles are identified and constructed according to standard drawing conventions 3.2 Different types of quadrilaterals are identified and constructed as per standard drawing conventions 3.3 Different types of polygons are identified and constructed as per standard drawing conventions 3.4 Different types of circles are identified and constructed as per standard drawing conventions 3.5 Different ***types of angles*** are identified and constructed according to principles of trigonometry 3.6 Different types of angles are bisected according to standard drawing conventions 3.7 Sketches and drawings of patterns are interpreted according to standard drawing conventions 3.8 Patterns are developed in accordance with standard drawing conventions
4. Produce Solid geometry drawings	4.1 Different Surfaces of regular solids are identified and developed as per standard drawing conventions 4.2 Different surfaces of Truncated regular solids are identified and constructed as per standard drawing conventions 4.3 Different surfaces of true shapes of sections on regular solids are identified and constructed as per standard drawing conventions
5. Produce pictorial and orthographic drawings of components	5.1 Different symbols and abbreviations are identified, and their meaning interpreted according to standard drawing conventions 5.2 ***Isometric drawings*** are identified, interpreted and constructed in accordance with standard drawing conventions 5.3 ***Oblique drawings*** are identified, interpreted and constructed as per standard drawing conventions

ELEMENT	PERFORMANCE CRITERIA *(Bold and italicized terms are elaborated in the Range)*
	5.4 ***Orthographic projection drawings*** are identified, interpreted and constructed as per standard drawing conventions 5.5 5.6 First and third angle orthographic sketches and drawings are identified, interpreted and constructed in accordance with standard drawng conventions 5.7 Freehand sketching of different types of ***geometric forms***, tools, equipment, diagrams and components are constructed

RANGE

Variable	Range
1. Drawing equipment may include but is not limited to:	• Drawing boards • T-square • Set squares • Drawing set • Computers with CAD packages
2. Drawing materials may include but is not limited to:	• Drawing papers • Pencils • Erasers • Masking tapes • Paper clips
3. Types of lines may include but is not limited to:	• Boarder lines • Faint continuous lines • Broken lines • Chain lines • Centre lines • Cutting lines
4. Types of Angles may include but is not limited to:	• 30 degrees • 45 degrees • 60 degrees • 90 degrees • 180 degrees
5. Symbols and abbreviations may include but is not limited to:	• First angle • Third angle • E,g, of abbreviations Scale- 1:2

	Diameter – D20 Radius -R20
6. Isometric sketches and drawings may include but is not limited to:	• Use of 30 degrees
7. Orthographic projection drawings may include but is not limited to:	• Front view • End view • Plan view
8. Pictorial views may include but is not limited to:	• Front view • End view • Plan view
9. Oblique drawings may include but is not limited to:	• Cavallier • Cabinet
10. Environmental legislations may include but is not limited to:	• EMCA 1999 • OSHA 2007
11. Personal Protective Equipment may include but is not limited to:	• Dust coats • Closed leather shoes
12. Geometric forms may include but is not limited to:	• Circles • Triangles • Rectangles • Parallelogram • Polygons • Pyramids • Conic sections • Prisms • Loci
13. Standard drawing conventions may include but is not limited to:	• Anatomy of engineering drawing (title block, coordinate grid system, revision block, notes and legends) • Drawing scale (paper size and drawing symbols) • International drawing standards

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:

- Critical thinking
- Drawing
- Interpretation
- Drawing equipment handling
- Communication

- Inter personal

Required knowledge

The individual needs to demonstrate knowledge of:

- Drawing equipment and materials
- Freehand sketching
- Lettering
- Geometrical constructions
- Types of drawings
- Types of lines
- Isometric drawing conventions, features, characteristics, components
- Orthographic drawing conventions, features, characteristics, components
- Sketches and drawings of simple patterns

EVIDENCE GUIDE

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

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 1.1 Applied and adhered to safety procedures correctly 1.2 Used and maintained drawing equipment appropriately 1.3 Used PPEs correctly 1.4 Printed, interpreted and constructed lines and interpreted symbols correctly 1.5 Identified, interpreted and constructed plane geometry drawings correctly 1.6 Identified, interpreted and constructed solid geometry drawings correctly 1.7 Identified, interpreted and constructed pictorial and orthographic drawings correctly 1.8 Produced sketches and drawings freehands correctly 1.9 Disposed waste material correctly
2. Resource Implications	Resources the same as that of workplace are advised to be applied. 2.1 Drawing room 2.2 Drawing equipment and materials
3. Methods of Assessment	Competency may be assessed through: 3.1 Practical tests 3.2 Observation
4. Context of Assessment	Competency may be assessed individually in the actual workplace or a simulated work place setting or Industrial Attachment
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

APPLY BASIC MATHEMATICS

UNIT CODE: ENG/OS/AUT/CC/2/4/A

UNIT DESCRIPTION:

This unit describes the competencies required in order to apply basic mathematics. It also invove applying basic arithmetic, rational arithmetic, manipulative skills, mensuration, algebra and geometrical 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. Apply Basic arithmetic	1.1 Various ***types of numbers*** are identified as per concept 1.2 Arithmetic ***operations*** are carried out as per concept 1.3 Calculations of finding squares and square roots of numbers are carried ot as per the 3-figure tables 1.4 Calculations using ***indices*** in multiplication and division are carried out as per concept
2. Apply Rational arithmetic	2.1 Calculations on converting fractions to percentage are carried out as concept 2.2 Calculations on solving simple problems involving direct and inverse proportion are performed as per concept
3. Apply Manipulative skills	3.1 Calculations expressing figures to correct decimal places are performed as per the concept 3.2 Calculations distinguishing between significant and non-significant figures are carried out as per the concept 3.3 Simple estimation of quantities are made and carried out as per concept 3.4 Calculations expressing decimals into fractions and vice versa are performed as per concept 3.5 Calculations expressing numbers in standard form are performed as per the concept
4. Apply Mensuration	4.1 Various units of measurements are identified as per the ***BSI*** 4.2 Calculations on ***converting units*** from one form to another as per BSI 4.3 Calculations of areas, volumes and perimeters are performed as per the concept 4.4 Calculations expressing dimensions of regular figures using sketches are carried out as per concept

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.***
5. Apply Algebra	5.1 Calculations solving simple algebraic equations are performed as per the concept 5.2 Simple algebraic equations are formed as per concept 5.3 Calculations on representing linear equations are carried out as per concept 5.4 Simple formulae are formed as per concept 5.5 Calculations on transposing given formulae are performed as per concept 5.6 Calculations on solving simple ***simultaneous equqtions*** are carried out as per concept
6. Apply geometrical calculations	6.1 Calculations to find areas of quadrilaterals are performed as per pythagoras' theorem 6.2 Calculations to find areas of triangles are performed as per Pythagoras' theorem 6.3 Calculations to find areas of circles are performed as per Pythagoras theorem

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. Operations may include but not limited to:	• Addition • Subtraction
2. Types of numbers may include but not limited to:	• Counting • Positive • Negative • Rational and irrational • Real numbers • Absolute values
3. Indices may include but not limited to:	• Positive • Negative • Fractional • Reciprocals
4. BSI may include but not limited to:	• British standard intitution

5. Converting units may include but not limited to:	• mm to m • m to km • g to kg
6. Simultaneous equations may include but not limited to:	• Substitution • Elimination

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:

- Applying fundamental operations (addition, subtraction, division, multiplication)
- Using and applying mathematical formulas
- Logical thinking
- Problem solving
- Applying statistics
- Drawing graphs
- Using different measuring tools

Required knowledge

The individual needs to demonstrate knowledge of:

- Fundamental operations (addition, subtraction, division, multiplication)
- Calculating area and volume
- Types and purpose of measuring instruments
- Units of measurement and abbreviations
- Rounding techniques
- Types of fractions
- Types of tables and graphs
- Presentation of data in tables and graphs
- Vector operations

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: 1.1 Identified types of numbers correctly 1.2 Carried out arithmetic operations correctly

	1.3 Solved simple problems involving direct and inverse proportion correctly 1.4 Calculated areas, volumes and diameters correctly 1.5 Calculated simple algebraicequations correctly 1.6 Calculated areas using Pythagoras theorem correctly
2. Resource Implications	The following resources should be provided: 2.1 Access to relevant workplace or appropriately simulated environment where assessment can take place 2.2 Measuring equipment 2.3 Materials relevant to the proposed activity or tasks
3. Methods of Assessment	Competency in this unit may be assessed through: 1.1 Direct Observation 1.2 Demonstration with Oral Questioning 1.3 Written tests
4. Context of Assessment	Competency may be assessed individually in the actual workplace or through accredited institution or during Industrial Attachment.
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

APPLY BASIC SCIENCE PRINCIPLES

UNIT CODE: ENG/OS/AUT/CC/3/4/A

UNIT DESCRIPTION

This unit describes the competencies required in order to apply basic science principles. It involves interpreting units and measurements, resolving forces,work, energy and power, determining effect of friction in automotive, solving problems related to light and sound, general chemistry, element and compounds and distinguishing metals and alloys.

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 units and measurements	1.1 Appropriate units of measurements are identified as per the BSI 1.2 Calculations on converting units from one form to another are performed as per the concept
2. Resolve forces, work, energy and power	2.1 ***Types of forces*** are identified as per concept 1.3 Types of work, energy and power are identified as per concept 1.4 ***Forms of energy*** are described as per theorems 1.5 Determining conversion of energy from one form to another as per theorem 1.6 Resolving simple calculations on work, energy and power as per concept
3. Determine effect of friction in automotive	3.1 Friction is defined as per concept 3.2 Laws of friction are stated as per reference 3.3 Advanteges and disadvanteges of friction are identified as per concept 3.4 Effects of friction are identified as per concept 3.5 Calculations resolving simple problems on friction are carried out as per concept.
4. Solve problems related to light and sound	4.1 Source of light and sound is identified as per concept 4.2 Laws of reflection and refraction are identified as per concept 4.3 Characteristics of light images formed on plane and curved mirrors are determined as per concept 4.4 Primary and secondary colours in light are identified as per concept

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***.
	4.5 Calculations solving simple problems involving location of light images formed by plane and curved mirriors are carried out as per concept 4.6 Velocity of sound in air is determined as per concept 4.7 ***Propagation of sound*** in a given medium is described as per concept 4.8 ***Properties of sound*** are identified as per concept
5. Solve problems related to general chemistry, elements and compounds	5.1 Matter is defined as per concept 5.2 Classification of matter is stated as per concept 5.3 Structure of atoms is recognized as per concept 5.4 Strength of chemical bonds are described and identified 5.5 Properties of elements and compounds are identified as per concept 5.6 Carbon cycle is described as per concept 5.7 Properties of acids and bases are identified as per concept 5.8 Salt is prepared from acids and bases as per concept
6. Distinguish metals and alloys	6.1 Methods of extracting metals are identified as per concept 6.2 ***Composition of alloys*** is identified as per concept 6.3 Uses of alloys are identified as per concept

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. Types of forces may include but not limited to:	• Friction • Centrifugal • Centripetal • Gravitational • Inertia • Shear
2. Forms of energy may include but not limited to:	• Kinetic energy • Potential energy
3. Composition of alloys may include but not limited to:	• Brass, steel and chrome

4. Propagation of sound may include but not limited to:	• Air • Liquid • Solids
5. Properties of sound may include but not limited to:	• Reflection • Absorption • Diffraction • Interference

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:

- Apply basic automotive engineering formulas
- Use of basic mechanical machines
- Perform various unit conversions of engineering quantities
- Basic mechanical systems design
- simple machine operations
- Logical thinking
- Problem solving
- Drawing graphs
- Using different measuring tools

Required knowledge

The individual needs to demonstrate knowledge of:

- Newton's laws of motion
- Levers and pulleys
- Gear trains
- Laws of conservation of energy
- Laws of friction
- Types of forces
- Calculation of pressure and density
- Mechanical advantage and efficiency calculations
- Properties of materials
- Gas laws
- SI units of mechanical energy.
- Power transmission systems
- Operation of mechanical machines
- Mechanical calculation of power, energy, work done, torque and safety factor
- Units of measurement, conversions and abbreviations

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: 1.1 Identified units of measurements correctly 1.2 Converted units from one form to another appropriately 1.3 Identified types of forces, energy and work correctly 1.4 Identified effectof friction appropriately 1.5 Determined the light images on plane and curved mirriors correctly 1.6 Identified properties of element and components correctly 1.7 Identified composition of alloys correctly
2. Resource Implications	The following resources should be provided: 2.1 Access to relevant workplace or appropriately simulated environment where assessment can take place 2.2 Measuring tools and equipment 2.3 Sample materials to be tested
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Direct Observation 3.2 Demonstration with Oral Questioning 3.3 Case studies 3.4 Written tests
Context of Assessment	Competency may be assessed individually in the actual workplace or through accredited institution or during Industrial Attachment.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

PERFORM WORKSHOP TECHNOLOGY APPLICATIONS

UNIT CODE: ENG/OS/AUT/CC/4 /4/A

Unit description

This unit describes the competencies required to perform workshop applications. It involves using applied geometry to plan work operations, choosing appropriate tool and materials, measuring and marking out dimensions on workpieces, using hand tools to cut and file parts, assembling metal parts and sub-assemblies, polishing finished work, inspecting finished work for accuracy, maintaining of tools and equipment and performing housekeeping,

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 applied geometry to plan work operations	1.1 Applied geometry drawings and symbols are interpreted as per ***standard drawing conventions.*** 1.2 ***Operation plan*** is produced as per the applied geometry drawing 1.3 Applied geometry drawings are produced as per standard drawing conventions.
2. Choose appropriate tools and materials	2.1 Working tools, equipment and materials are selected as per the task. 2.2 The work areas are tidied up as per organization policy.
3. Measure and mark out dimensions on workpieces	3.1 ***Measuring tools*** suitable for the work are selected as per task. 3.2 Measuring tools are inspected and calibrated as per SOPs. 3.3 Dimensions are marked on the workpiece as per the working drawing.
4. Use hand tools to cut and file parts	4.1 ***Hand tools*** are selected as per task. 4.2 Workpiece is cut as per drawing specifications 4.3 Workpiece is filed as per drawing specification 4.4 Parts are produced as per drawing specifications
5. Assemble metal parts and sub-assemblies	5.1 Parts ***joined***, fitted and assembled as per drawing specifications 5.2 Final assembly inspected as per drawing specifications
6. Polish finished work	6.1 ***Polishing*** material are selected as per SOPs. 6.2 Finished work is cleaned as per workshop procedures

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***
	6.3 Finished work is polished as per drawing ***specifications***
7. Inspect finished work for accuracy	7.1 Finished work is inspected as per as per drawing specifications 7.2 Adjustments are made based on inspections results
8. Maintenan tools and equipment	8.1 Tools and equipment are lubricated as per manufacturers manual 8.2 Tools are ground as per manufacturers specification 8.3 Faults on tools are identified and reported as per workshop procedures 8.4 tools and equipment are stored as per workshop procedures
9. Perform housekeeping	9.1 Work area is cleaned as per workshop procedures. 9.2 Waste is sorted and disposed as per safety and environmental regulations.

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. Measuring tools may include but not limited to:	• Steel rule • Vernier calliper • Micrometre screw gauge • Vernier height gauge • Combination set • Bevels
2. standard drawing conventions may include but not limited to:	• ISO • BS • ANSI
3. Operation Plan may include but not limited to:	• Sequence of operations • Measuring tools • Hand tools • Cutting tools • Inspection tools

VARIABLE	RANGE
4. Hand tools may include but not limited to:	• Scribers • Dividers • Dot punch • Centre punch • Engineers square • Straight edge • Surface plate • Bench vice • V-Block • Angle plate • G-clamp • Jigs and fixtures • Hand vice • Files • Saws • Hammers • Chisels • Taps and dies
5. Polishing may include but not limited to:	• Emery cloth • Filing
6. Joining may include but not limited to:	• Riveting • Fastening • Soldering • Brazing • Welding
7. Specifications may include but not limited to:	• Dimensions • Tolerances • Geometry • Surface finish • Functionality

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:

- Technical drawing
- Using measuring and inspection tools
- Using hand tools
- Soldering and brazing

- Riveting and fastening

Required Knowledge

The individual needs to demonstrate knowledge and understanding of:

- Occupational Health and Safety Act of Kenya laws 2007 with focus on personal safety, machine safety and workplace
- National Environment Management Authority Act, Kenya 2004
- OSH act
- Equipment manuals
- Basic technical drawing complyingto ISO, ANSI & BS standards
- ISO 1101 Geometrical tolerance and where to use the norm
- Work Planning and documentation
- Measuring tools
- Hand tools
- Bench work
- Inspection and quality control
- Preventive maintenance of machine tools
- Metal cutting technology
- WIBA act (2007)
- Report writing

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 learner: 1.1 Interpreted drawings and symbols correctly 1.2 Produced applied geometry drawings correctly 1.3 Selected tools and equipment appropriately 1.4 Produced parts correctly 1.5 Assembled parts correctly 1.6 Polished workpieces correctly 1.7 Identified faults on tools and equipments correctly 1.8 Cleaned work area appropriatetly 1.9 Disposed waste appropriately
2. Resource Implications	The following resources should be provided: 2.1 Hand measuring tools 2.2 Hand marking tools 2.3 Hand tools 2.4 Inspection tools and equipment 2.5 Work benches
3. Methods of Assessment	Competency may be assessed through: 2.6 Observation 2.7 Oral 2.8 written

	2.9 Inspection of finished product 2.10 Observing housekeeping of the work area and/or machine tool
4. Context of Assessment	Competency may be assessed individually in the actual workplace or through accredited institution or during Industrial Attachment.
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

MAINTAIN WORKSHOP TOOLS, EQUIPMENT AND MEASURING DEVICES

UNIT CODE: ENG/OS/AUT/CC/5/4/A

Unit description

This unit specifies the competencies required to maintain workshop tools, equipment and measuring devices. It involves identifying workshop tools, equipment and measuring devices, assessing need to maintain and maintaining tools, equipment and measuring devices and preparing workshop tools, equipment and measuring devices maintenance reports.

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 workshop tools, equipment and measuring devices	1.1 PPEs are identified as per workshop requirements 1.2 ***Workshop tools and equipment*** are identified as per the workshop regulations 1.3 ***Measuring devices*** are identified as per the workshop regulations
2. Assess need to maintain tools, equipment and measuring devices	1.1 ***Specifications*** of tools, equipment and measuring devices to be maintained as per manufacturers specifications 1.2 ***Methods or procedure*** to be used in maintenance manufacturers specifications 1.3 Frequency or rate in which the tools, equipment and devices are used as per manufacturers manuals
3. Maintain tools, equipment and measuring devices	3.1 Tools, equipment and measuring devices are kept free from corrosion as per SOPs 3.2 Tools, equipment and measuring devices are handled with care as per workshop regulations 3.3 Tools, equipment and measuring devices are cleaned as per service manual 3.4 Faults on tools, equipment and measuring devices are identified as per SOPs
4. Prepare w/shop tools, equipment and measuring devices maintenance report	4.1 Maintenance report prepared showing ***dates and schedule*** of maintenance as per SOPs 4.2 Report prepared to show routine maintenance schedule as per SOPs

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.

Variables	Range
1. PPEs may include but not limited to:	• Overalls/apron • Safety boots • Safety glasses(clear and welding goggles) • Hand gloves • Helmet
2. Workshop tools and equipment may include but not limited to:	• Assorted spanners • Bevels • Bench vice • V-Block • Angle plate • Hand vice • Screw drivers • Pliers • Oil can • Grease gun • Jacks • Axle stands • Car hoist • Hammers
3. Measuring devices may include but not limited to:	• Steel rule • Vernier calliper • Micrometre screw gauge • Vernier height gauge • Calibrated oil cans and jars • Pressure gauges • Dial gauges • Straight edge • Compression gauges • Coolant pressure gauges
4. Specifications may include but not limited to:	• Calibrations • Settings • Coding • Replacement of components/parts
5. Method or procedure may include but not limited to:	• Oiling • Dusting • Servicing • Repairing

6. Schedule or dates may include but not limited to:	• As per pre-determined time interval

REQUIRED KNOWLEDGE AND SKILLS

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

Required Knowledge

The individual needs to demonstrate knowledge of;

- Maintenance on tools, equipment and measuring devices
- Methods of maintenance on tools, equipment and measuring devices
- Safe methods of storing tools, equipment and measuring devices

Required Skills

The individual needs to demonstrate the following skills.

- Cleaning and maintaining tools, equipment and measuring devices
- Caring and handling tools, equipment and measuring devices
- Adjusting Tools, equipment and measuring devices
- Inspecting and repairing tools, equipment and measuring devices
- Report writing
- Interpreting specifications as per the manuals

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: 1.1 Identified tools and equipment correctly 1.2 Identified measuring devices correctly 1.3 Specified the need to maintain tools, equipment and measuring devices appropriately 1.4 Used methods and procedures correctly 1.5 Identified the frequency or rate in which tools, equipment and measuring devices are used appropriately

	1.6 Handled tools, equipment and measuring devices appropriately 1.7 Cleaned tools, equipment and measuring devices appropriately 1.8 Identified faults in tools, equipment and measuring devices correctly 1.9 Prepared maintenance report correctly
2. Resources Implications	The following resources should be provided: 2.1 Workplace location 2.2 Tools, equipment and measuring devices appropriate for maintenance 2.3 Instructional materials relevant to tools, equipment and measuring devices
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Observation with questioning 3.2 Written or oral examination 3.3 Interview 3.4 Demonstration with questioning
4. Context of Assessment	Assessment may be conducted in a workplace or simulated environment or during Industrial Attachment .
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

CORE UNITS OF COMPETENCY

PERFORM VEHICLE BASIC MAINTENANCE

UNIT CODE: ENG/OS/AUT/CR/1/4/A

Unit Description

This unit specifies the competencies required to perform vehicle basic maintenance. It involves performing basic vehicle mechanical and operational assessment, basic maintenance on engine, braking system, suspension/steering system, transmission system, electrical system, Wheels and tires and preparing vehicle basic maintenance report.

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 basic vehicle mechanical and operational assessment	1.1 ***Tools, equipment*** and necessary checklists are assembled as per the tasks requirements 1.2 PPEs are used as per OSHA 2007 1.3 Health, safety, Environment and quality regulations are observed as per OSHA 2007 1.4 Assessment is undertaken in accordance with manufacturers' routine and ***periodic maintenance*** schedule 1.5 Defects are identified as per SOPs 1.6 Mechanical and operational ***job card*** is prepared as per organizations approved format
2. Perform engine basic maintenance	2.1 Engine ***Technical information*** is sourced as per service manual 2.2 Condition and performance of engine and externally attached components are inspected as per SOPs 2.3 Worn out/damaged/broken/clogged components are serviced/replaced as per service manual 2.4 Engine basic maintenance checklist is filled and shared as per the organization policy
3. Perform braking system basic maintenance	3.1 Vehicle braking system is inspected as per the SOPs 3.2 Faulty braking system parts are identified as per the SOPs 3.3 Worn out/damaged/broken braking system components are serviced/replaced as per service manual 3.4 Final adjustments are performed as per service manual 3.5 Braking system basic maintenance checklist is filled as per SOPs

4. Perform suspension/steering systems basic maintenance	4.1 Suspension steering systems inspected as per SOPs 4.2 Faulty suspension/steering system components are identified as per SOPs 4.3 Worn out/damaged/broken ***suspension/steering system components are*** serviced/replaced as per manufacturers specifications 4.4 Final adjustments are performed as per service manual 4.5 Vehicle suspension/steering system check list is filled as per workshop procedures
5. Perform transmission system basic maintenance	5.1 Transmission system is inspected as per SOPs 5.2 Faulty transmission system components are identified as per SOPs 5.3 Damaged/worn out transmission system components are replaced/serviced as per manufacturers specifications 5.4 Transmission system components are greased/oiled/adjusted as per service manual 5.5 Vehicle transmission system check list is filled as per workshop procedures
6. Perform electrical system basic maintenance	6.1 Vehicle electrical system check list is prepared as per workshop manual 6.2 Vehicle ***battery condition*** is inspected as per service manual 6.3 Vehicle battery faults are identified and serviced as per service manual 6.4 Vehicle starter motor operational condition is inspected as per service manual 6.5 Vehicle starter motor faults are identified and serviced as per service manual 6.6 Vehicle lighting system operational condition is inspected as per service manual 6.7 ***Vehicle lighting circuits*** faults are identified and serviced as per service manual 6.8 Ignition system operational condition is inspected as per service manual 6.9 Ignition system faults are identified as per service manual 6.10 .Worn out/broken/burnt ignition system components are serviced/replaced as per service manual 6.11 ***Electrical system circuits*** are tested as per manufacturers specifications 6.12 Service check list is filled as per SOPs
7. Perform Wheel and tires basic service/maintenance	7.1 Wheel and Tire to be serviced is identified and removed as per SOPs 7.2 Wheel and tire specifications are identified as per manufacturers manual

	7.3 Wheel and ***tires repair kit*** selected as per manufacturers manual 7.4 Wheel and Tire is repaired/serviced as per service manual 7.5 Wheel and tire basic/maintenance report is prepared as per SOPs
8.Prepare vehicle basic maintenance report	8.1 Vehicle interior and exterior is cleaned as per organization policy 8.2 Basic maintenance report is prepared as per organization policy 8.3 Workshop/station is cleaned as per workshop regulations 8.4 Waste is disposed as per OSHA 2007

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.

Variables	**Range**

1. Tools and Equipment may include but not limited to;	• Assorted Spanners
	• Screw drivers
	• Pliers
	• Oil can
	  • Filter wrench
	  • Feeler gauge
	  • Multi-tester
	  • DC-tester
	  • Hydrometer
	  • High-rate discharge tester
	• Grease gun
	• Jacks
	• Axle stands
	• Car hoist
	• Hammers

2. Periodic maintenance may include but not limited to;	• Brake pads/linings • Fluids leaks • Noise and vibrations • Gas leaks • Contact breaker points

3. Technical Information may include but not limited to;	• Vehicle technical data; • Manufacturers' online information; • Schedules of inspection; • Legal regulations • On-board diagnostics (OBD) displays
4. Job Card may include but not limited to;	• Date • Job card number • Customer name • Vehicle registration • Tasks/repairs/services • Person assigned work • Supervisor
5. Braking system parts may include but not limited to;	• Servo unit (booster) • Master cylinder • Calipers • Disc (rotor) • Drum • Brake pads and linings • Wheel cylinders • Brake adjusters • Actuators • ABS unit • Flexible pipes • Parking brake cable.
6. Suspension system components may include but not limited to;	• Wishbone/arms • Shock absorbers/dampers • Strut • Torsion bar • Stabilizer • Coil/leaf/rubber spring
7. Steering system components may include but not limited to;	• Steering rack • Tie rods; • Steering box • Steering column • Universal joint/coupling • Drop arm • Dust rubber boot • Steering wheel
8. Transmission system components may include but not limited to;	• Bearings • Gears • Synchromesh unit • Gearbox shafts and thrust plates • Gear selectors, sensors and linkages • Constant velocity and universal joints • Clutch assemblies release bearings

	• Automatic gearbox pump and oil strainer • Transmission unit mounting • Flywheel • Transmission drive shaft/half shaft • propeller shaft/center rubber • Input shaft • Lay shaft • Output shaft • Speed gearwheels • Synchronizer unit • Selector shafts/forks
9. Battery Conditions may include but not limited to;	• Electrolytes level • Battery discharged state • Battery charged state • Ventilation plugs • Battery cells • Cells container/housing
10. Vehicle lighting circuits may include but not limited to;	• Indicator circuit • Head lamps circuit • High beam circuit • Low beam circuit • Brakes lights circuit
11. Manufacturer's procedures may include but not limited to;	• Vehicle technical data • Manufacturer's tolerance and specification data • Approved company practices
12. Electrical system circuits may include but not limited to;	• Ignition system • Lighting system • Starting system • Battery
13. Standard operational procedures(SOPs) may include but not limited to;	• Company policy • Filling system • Record management procedures • Client satisfaction procedures
14. Tire repair kit may include but not limited to;	• Tire lever • Patches • Glue • Tubeless repair kit

REQUIRED KNOWLEDGE

The individual needs to demonstrate knowledge of:

- Organizational and legislative requirements

- Manufacturer's warranty requirements relating to routine maintenance activities for vehicle systems and components
- Service report preparation
- Check list preparation
- Technical information
- Basic vehicle electrical system defects
- Vehicle fluids and lubricants
- Vehicle systems and components
- Vehicle basic inspection
- Legal requirements relating to the vehicle maintenance activities for vehicle systems and components
- Kenyan legislation and workplace

- Recording vehicle maintenance work
- Reporting delays to the completion of work
- Documenting vehicle maintenance information
- Work timeframe
- Sharing of information at workplace
- Relationship between time and costs
- Reporting anticipated delays to relevant person(s) promptly
- Technical information
- Basic On-board diagnostic displays
- Purpose of and how to use identification codes
- Operation of vehicle systems
- Engines, cooling systems, air supply and exhaust systems, fuel systems and ignition systems operate for different vehicles
- operating specifications and tolerances for the different type(s) of vehicles
- The hazards associated with high energy electrical components
- Routine maintenance requirements

REQUIRED SKILLS

- Communications (verbal and written);
- Trouble shooting
- Proficient in ICT;
- Time management;
- Dismantling
- Assembling
- Inspection
- Problem solving;
- Decision making;
- Multitasking;
- First aid;
- Report

- Driving.
- Planning
- Writing
- Team work
- Listening

EVIDENCE GUIDE

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

1. Critical Aspects of Competency.	Assessment requires evidence that the candidate: 1.1 Assembled tools, equipment and checklist appropriately 1.2 Used PPEs appropriately 1.3 Used manufacturers' technical information correctly 1.4 Inspected engine mechanical and operational conditions correctly 1.5 Inspected and serviced engine components correctly 1.6 Inspected and serviced braking system correctly 1.7 Inspected and serviced transmission system correctly 1.8 Prepared vehicle electrical system checklist appropriately 1.9 Inspected and serviced vehicle battery correctly 1.0 Inspected and serviced starter motor correctly 2.0 Inspected and serviced lighting system correctly 3.0 Inspected and serviced ignition system correctly 4.0 Tested electrical system correctly 5.0 Repaired/serviced wheels and tires correctly 6.0 Cleaned vehicle interior and exterior correctly 7.0 Prepared vehicle basic maintenance report appropriately 8.0 Cleaned tools, equipment and workshop/station appropriately 9.0 Disposed wastes correctly
2. Resource Implications	The following resources must be provided: 2.1 A workshop that is fully equipped for maintaining motor vehicles, including a vehicle lift, specialist tools and diagnostic equipment appropriate for the different makes of vehicles that are being maintained; 2.2 Access to manufacturers' technical information; 2.3 Consumables for maintaining vehicle, including lubricants, fluids and replacement parts; 2.4 Facilities for the disposal of waste oil and replaced serviceable parts; 2.5 Personal protection equipment and suitable coverings to protect vehicles.

3. Methods of Assessment.	Competency may be assessed through: 3.1 Observation 3.2 Oral questioning 3.3 Written tests
4. Context of Assessment.	Competency may be assessed individually in an actual workplace or in work-simulated conditions within accredited institutions or during Industrial Attachment.
5. Guidance information for assessment.	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

SERVICE AND REPAIR VEHICLE ENGINES

UNIT CODE: ENG/OS/AUT/CR/2/4/A

Unit description:

This unit specifies competencies required to service and repair vehicle engine. It involves disassembling the engine, inspecting, servicing/replacing engine parts/components, assembling the engine, performing engine basic tests and preparing vehicle service/repair reports.

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These describe the key outcomes which make up Workplace functions	**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. Disassemble vehicle engine.	1.1 Personal protective equipment (PPE) are used as per OSHA 2007 1.2 Health, safety environment and quality regulations are observed as per OSH Act 2007. 1.3 Appropriate ***tools and equipment*** are assembled as per workshop procedure 1.4 Job card is referred to and required task identified 1.5 Prior inspection of vehicle engine parts is carried out as per SOPs. 1.6 Vehicle Engine is dismantled according to manufacturer's manual
2. Clean and inspect engine parts/components	2.1 Vehicle Engine ***parts/components*** are cleaned as per manufacture's manual. 2.2 Vehicle Engine parts/components are inspected as per manufacture's manual.
3. Service/replace vehicle engine parts/components	3.1 Vehicle Engine parts/components are serviced according to manufacturer's specification 3.2 Vehicle Engine defective parts/components are replaced according to manufacturer's specification

	3.3 Necessary adjustments/alignments are carried out as per manufacturers manual
4. Assemble vehicle engine	4.1 Vehicle Engine parts/components are identified and arranged as per SOPs. 4.2 Vehicle engine parts/components are assembled according to manufacturer's specification
5. Perform vehicle engine basic tests and prepare service/repair report	5.1 Vehicle Engine basic tests are performed according to manufacturer's specification. 5.2 Necessary adjustments are carried out as per manufacturers specifications 5.3 Service /repair report is prepared as per workshop procedure. 5.4 Tools and equipment are cleaned and stored as per workshop procedures 5.5 Cleaning of work area is carried out as per workshop procedures 5.6 Waste materials are disposed as per environmental regulations and OSHA 2007 5.7

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. Tools and equipment may include but is not limited to:	• Assorted spanners • Screw drivers • Hammers • Pliers • Straight edge • Dial gauge • Vernier caliper • Micrometer screw gauge • Oil pressure gauge • Coolant pressure gauge • Torque wrench • Piston ring squeezer • Piston ring expander • Compression tester

2. Parts/components may include but is not limited to:	• Seals and gaskets • Filters • Piston and piston rings • Valves, push rods and valve lifters • Camshaft • Crankshaft • Drive pulleys and tensioners • Oil sump and oil pump • Timing gears • Cylinder head • Cylinder block • water pump and thermostat • Radiator and coolant hoses
3. Basic tests/measurement/adjustments may include but is not limited to:	• Compression test • Crankshaft rotation • Engine timing • Ignition timing • Straightness/warpage • Tappet clearance • Valve seat grinding • Decarbonising • Oil pressure test • Bolts/nuts torque • Clearances

REQUIRED KNOWLEDGE AND SKILLS

The individual needs to demonstrate knowledge of:

- Legislative and organizational requirements and procedures
- Kenyan legislation and workplace procedures Legal requirements relating to the vehicles warranty and insurance policies
- Workplace procedures
- Rectification procedures
- Obtaining the correct information for rectification
- Working to agreed time frame and keeping others informed of progress
- The relationship between time, costs and profitability
- Reporting anticipated delays
- How to find, interpret and use technical information for engine service activities
- Importance of using the correct technical information
- The purpose of and how to use identification codes.

Required Skills

The individual needs to demonstrate the following skills:

- Communications (verbal and written)
- Proficient in ICT

- Time management
- Problem solving
- Decision making
- Planning
- Multitasking
- First aid
- Report writing
- Driving
- Listening
- Team work
- Dismantling
- Inspecting
- Assembling

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***: 1.1 Used Personal protective equipment (PPE) appropriately 1.2 Observed Health, safety, environmental and quality regulations correctly. 1.3 Dismantled, cleaned and inspected engine components correctly. 1.4 Replaced defective engine parts correctly 1.5 Serviced engine parts correctly 1.6 Reassembled vehicle engine parts correctly 1.7 Performed basic vehicle engine tests/adjustments correctly. 1.8 prepared vehicle engine service/repair report correctly
2. Resource Implications	***The following resources must be provided:*** 2.1 A workshop that is fully equipped for the service and repair of vehicle engines 2.2 Instruments and equipment for measuring and assessing the condition of engine components/parts 2.3 Access to manufacturers' technical information 2.4 Facilities for the disposal of waste oil and scrap parts 2.5 Customer database and systems for service records 2.6 Personal protection equipment

	2.7 Access to computers
3. Methods of Assessment.	***Competency may be assessed through:*** 3.1 Oral Questioning 3.2 Observation 3.3 Written Tests
4. Context of Assessment	Competency may be assessed individually in an actual workplace or in work-simulated conditions within accredited institutions or during Industrial Attachment
5. Guidance information for assessment.	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

SERVICE AND REPAIR VEHICLE FUEL SYSTEM

UNIT CODE: ENG/OS/AUT/CR/3/4/A

Unit description:

This unit specifies competencies required to service and repair vehicle fuel system. It involves, inspecting, removing, dismantling, and servicing/repairing/replacing fuel system components. It also involve assembling, testing and fitting fuel system components to the vehicle, carry out adjustment and testing the fuel system.

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These describe the key outcomes which make up Workplace functions	**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. Inspect and remove vehicle fuel system components.	1.1 Personal protective equipment (PPE) are used as per OSHA 2007 1.2 Health, safety environment and quality regulations are observed as per OSH Act 2007. 1.3 ***tools and equipment*** are assembled and used as per workshop procedure 1.4 Vehicle ***fuel system Components*** are identified and inspected according to ***manufacturer's manual.*** 1.5 Vehicle fuel system Components are removed from the vehicle according to manufacturer's manual.
2. Dismantle, Service/repair/replace vehicle fuel system components.	2.1 Vehicle fuel system Components are dismantled, cleaned and examined according to manufacturer's manual 2.2 Vehicle fuel system components are serviced/repaired /replaced according to manufacturer's manual
3. Assemble fuel system components and test for correct operation	***3.1*** Vehicle fuel system components parts are identified and arranged as per ***SOPs*** ***3.2*** Vehicle fuel system components are reassembled according to manufacturer's specification ***3.3*** ***Tests*** are carried out on vehicle fuel system components as per manufacturer's service manual

4. Fit fuel components, carryout adjustments and test fuel system	4.1 Vehicle fuel system components are fitted and adjustments carried out as per manufacturer's manual. 4.2 Fuel system is tested as per manufacturers manual. 4.3 Service /repair report is prepared as per workshop procedure. 4.4 Work station is cleaned as per workshop regulations 4.5 Waste is disposed as per OSHA 2007

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. Tools and equipment may include but is not limited to:	• Specialist tools relevant to specific vehicle makes and models; • General workshop equipment; • Electrical multi-meter • Fuel system pressure gauge
2. Fuel system Components may include but is not limited to:	• Fuel lift pumps • Fuel filter • Fuel tank • Fuel pipes • Fuel feed pump • Injectors • Carburetors • Rails • Pipes
3. Manufacturer's manual. may include but is not limited to:	• Vehicle technical data • Manufacturers' tolerances and specification data. • Manufacturers' specifications • Approved company practices
4. Tests may include but is not limited to:	• Injection pressure • Injection voltage • Leakage • Valve operation • Spring tension • Diaphragm • Injector pump timing
5. Standard operating procedures (SOP) may include but is not limited to:	• Company policy • Filling system

	• Record management procedures • Client satisfaction measurement procedures.

REQUIRED KNOWLEDGE AND SKILLS

The individual needs to demonstrate knowledge of:

- Legislative and organizational requirements and procedures
- Kenyan legislation and workplace procedures
- Legal requirements relating to the vehicles warranty and insurance policies
- Workplace procedures
- Rectification procedures
- Obtaining the correct information for rectification
- Working to agreed time frame and keeping others informed of progress
- The relationship between time, costs and profitability
- Reporting anticipated delays
- How to find, interpret and use technical information for engine service activities
- Importance of using the correct technical information
- The purpose of and how to use identification codes.

Required Skills

The individual needs to demonstrate the following skills:

- Communications (verbal and written)
- Proficient in ICT
- Time management
- Problem solving
- Decision making
- Planning
- Multitasking
- First aid
- Report writing
- Driving
- Listening
- Team work
- Dismantling
- Inspecting
- Assembling

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***: 1.1 Used Personal protective equipment (PPE) correctly 1.2 Observed Health, safety, environmental and quality regulations correctly. 1.3 Assembled tools and equipment appropriately 1.4 Dismantled, cleaned and inspected vehicle fuel parts/components correctly. 1.5 Replaced defective vehicle fuel parts/components correctly 1.6 Serviced vehicle fuel system parts correctly 1.7 Assembled vehicle fuel system parts correctly 1.8 Tested and adjusted vehicle fuel system correctly. 1.9 Prepared vehicle fuel system service/repair report correctly 1.10 Cleaned workshop and disposed wastes correctly
2. Resource Implications	***The following resources must be provided:*** 2.1 A workshop that is fully equipped for the service and repair of vehicle fuel system. 2.2 Instruments and equipment for measuring and assessing the condition of vehicle fuel system components/parts. 2.4 Access to manufacturers' technical information 2.5 Facilities for the disposal of waste and scrap parts 2.6 Customer database and systems for recording service records 2.7 Personal protection equipment 2.8 Access to computers
3. Methods of Assessment.	***Competency may be assessed through:*** 3.1 Oral 3.2 Observation 3.3 Written tests
4. Context of Assessment	Competency may be assessed individually in an actual workplace or in work-simulated conditions within accredited institutions or during Industrial Attachment.

5. Guidance information for assessment.	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

SERVICE VEHICLE STEERING AND SUSPENSION SYSTEMS

UNIT CODE: ENG/OS/AUT/CR/4/4/A

Unit Description:

This unit specifies competencies required to service vehicle steering and suspension systems. It involves inspecting steering and suspension system parts, removing steering and suspension systems components, dismantling, cleaning and examining the components, servicing/repairing/ replacing and assembling steering/ suspension parts, fitting steering and suspension components and carrying out adjustment and reporting.

ELEMENTS 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. Inspect steering and suspension system parts	1.1 Work area and steering and suspension units are prepared as per the workshop procedures 1.2 ***Tools and equipment*** are assembled as per job assignment 1.3 Personal protective clothing and equipment (***PPEs***) are used as per OSHA 2007 1.4 Vehicle steering and suspension system checklist is prepared based on workplace requirements 1.5 Steering and suspension systems are visually inspected in accordance with service manual 1.6 Faulty steering and suspension components are identified as per the service manual
2. Remove steering and suspension system component from the vehicle	2.1 ***Technical information*** is used according to the service manual 2.2 Vehicle is raised in accordance with workshop procedures 2.3 ***Lubricants and fluids*** are drained and disposed according to HSE&Q 2.4 ***Steering components*** are removed as per service manual 2.5 ***Suspension components*** are removed as per service manual
3. Dismantle, clean and examine steering and suspension system components	3.1 Steering components are disassembled as per the service manual 3.2 Steering components are cleaned as per SOPs.

	3.3 Serviceability of steering components is assessed as per the service manual 3.4 Suspension components are disassembled as per the service manual 3.5 Suspension components are cleaned as per sops. 3.6 Serviceability of suspension components is assessed as per the service manual
4. Service/Repair/ Replace and assemble steering and suspension parts	4.1 Steering components are serviced according to the service manual 4.2 Worn/damaged steering components are verified against manufacturers' part numbers and replaced as per manufacturer's manual 4.3 Steering components are assembled in accordance with manufacturers' specification 4.4 Suspension components are serviced according to the service manual 4.5 Worn/damaged suspension components are verified against manufacturers' part numbers and replaced as per manufacturer's manual 4.6 Suspension components are assembled in accordance with manufacturers' specification
5. Fit steering and suspension components to vehicle	5.1 Steering components are fitted as per service manual 5.2 Lubricants and fluids are replenished according to the service manual 5.3 ***Steering geometry*** is set in accordance with manufacturers' specifications 5.4 Steering system is tested and adjusted as per the manufacturers specification 5.5 suspension components are fitted as per service manual 5.6 suspension system Lubricants and fluids are replenished according to the service manual 5.7 suspension system is tested as per the manufacturers specification
6. Carry out adjustments and reporting	6.1 Steering system service and repair is completed and tested as per manufacturer specification 6.2 Steering system final adjustment is carried out as per manufacturer specification

	6.3 suspension system service and repair is completed and tested as per manufacturer specification 6.4 suspension system final adjustment is carried out as per manufacturer specification 6.5 Work area is cleaned in accordance with work shop procedures 6.6 ***Waste*** is disposed as per OSH Act- 2007 6.7 Steering and suspension report is written and shared with relevant personnel according to workshop 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.

Variable	**Range**
1. Steering components may include but is not limited to:	• Steering wheel • Steering column • Steering box • Drop arm • Steering arms • Track arm • Tie rods; • Universal joint/coupling • Dust rubber boot
2. Suspension components may include but is not limited to:	• Wishbone/arms • Shock absorbers/dampers • Strut • Stabilizer bar • Springs -Coil/leaf/rubber/Torsion bar/Pneumatic and Hydro pneumatic bushes
3. Steering geometry may include but is not limited to:	• Toe in / Toe out • Castor • Camber • Kingpin inclination • Wheel base • Wheel track
4. Tools and equipment may include but is not limited to:	• Assorted Spanners • Screw drivers • Pliers • Oil can • Feeler gauge • Grease gun • Jacks

	• Axle stands • Car hoist • Hammers
5. Personal protective equipment (PPEs) may include but is not limited to:	• Overall • Safety boots • Gloves
6. Technical information may include but is not limited to:	• Vehicle technical data • Manufacturers' tolerances and specification data. • Manufacturers' specifications • Approved company practices
7. Lubricants and fluids may include but is not limited to:	• Steering fluid • Suspension hydraulic fluid • Grease
8. Wastes may include but is not limited to:	• Liquid • Solid/Rubber/Plastics

REQUIRED KNOWLEDGE;

The individual needs to demonstrate knowledge of:

- Kenyan legislation and workplace procedures to the vehicle and its construction
- Workplace procedures
- Reporting delays to the completion of work
- Sources of technical information
- adjustments on steering and suspension systems
- Construction and operation of suspension and steering systems
- The construction, layout and operation of different types of suspension systems,
- Active suspension and their control systems.
- Types of springs and how they are mounted and located on the vehicle
- The layout and operation of different types of steering systems, including
- Different types of steering gear
- The principles of suspension and steering geometry

Required Skills

The individual needs to demonstrate the following foundation skills:

- Decision making;
- Multitasking;
- Communications (verbal and written);
- Proficient in ICT;
- Time management;
- Problem solving;
- Dismantling
- Inspecting
- Examining

- Assembling
- Planning
- Team work
- Listening
- First aid;
- Report writing;
- Record keeping
- Driving

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:** 1.1 Used PPEs appropriately 1.2 Observed regulations concerned with health and safety in the disposal of waste appropriately 1.3 Used technical information to remove and dismantle steering units appropriately 1.4 Used technical information to remove and dismantle suspension units appropriately 1.5 examined vehicle steering components correctly 1.6 examined vehicle suspension components correctly 1.7 Repaired/serviced/replaced and assembled steering components correctly 1.8 Repaired/serviced/replaced and assembled suspension components correctly 1.9 Fitted suspension components correctly 1.10 itted steering components correctly 1.11 eplenished suspension fluids correctly 1.12 eplenished steering fluids correctly 1.13 ested suspension system correctly 1.14 ested steering system correctly 1.15 ompleted steering/ suspension system servicing within set time frame 1.16 ocumented steering and suspension servicing records appropriately
2. Resource Implications.	**The following resources must be provided:** 2.1 A workshop that is fully equipped for servicing vehicle steering systems. 2.2 Vehicle lift 2.3 Tool kits and vehicle steering equipment

	2.4 Manufacturers manuals 2.5 Facilities for the disposal of waste oil and scrap parts 2.6 Customer database 2.7 Personal protection equipment 2.8 Computer
3. Methods of Assessment	Competency may be assessed through: 1. Observation 2. Oral Questioning 3. Written Tests
4. Context of Assessment	Competency may be assessed individually in an actual workplace or in work-simulated conditions within accredited institutions or during Industrial Attachment.
5. Guidance information for assessment.	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

SERVICE VEHICLE BRAKING SYSTEMS

UNIT CODE: ENG/OS/AUT/CR/5/4/A

UNIT DESCRIPTION:

This unit specifies competencies required to service vehicle braking system. It involves, inspecting braking system parts, removing, dismantling, cleaning and examining braking system components, servicing/repairing/ replacing and assembling braking system components, fitting braking system components and carrying out adjustments, testing and reporting.

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. Inspect braking system parts	1.1 Vehicle is parked and prepared in accordance with workshop procedures 1.2 ***Tools and equipment*** are assembled as per workshop procedures 1.3 Personal protective clothing and equipment ***(PPEs)*** used as per safety regulations 1.4 Vehicle braking system is tested as per service manual 1.5 Braking system inspection checklist is filled as per ***workshop procedures***
2. Remove, dismantle, clean and examine braking system components	2.1 ***Braking system components*** are removed as per manufacturers manual 2.2 Brake system components are cleaned as per ***SOPs*** 2.3 Brake components are examined as per SOPs 2.4 Worn/damaged components are identified according to the SOPs
3. Service/Repair/ Replace and assemble braking system components	3.1 Braking system components are serviced according to the service manual 3.2 Replacement parts are verified against manufacturers' part numbers 3.3 Worn/damaged brake parts are replaced as per manufacturer's manual 3.4 Braking system components are assembled in accordance with manufacturers' specification
4. Fit braking system components and carry out adjustments	4.1 Braking system components are fitted as per manufacturers manual 4.2 Adjustments are carried out as per manufacturers specifications

	4.3 Brake bleeding is carried out as per manufacturers manual
5. Test and report	5.1 Braking system performance is tested as per manufacturers manual 5.2 Braking system service and repair report is prepared and shared with relevant personnel according to workshop procedures 5.3 Work area is cleaned in accordance with work shop procedures 5.4 Waste is disposed as per OSH Act-2007

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. Tools and equipment may include but is not limited to:	• Assorted spanners • Pliers • Oil can • Jack • Axle stands • Car hoist • Hammers • Bleeding can and pipes
2. PPEs may include but is not limited to:	• Overall • Safety boots • Gloves
3. Workshop procedures may include but is not limited to:	• Service manual
4. Brake units and components may include but is not limited to:	• Servo unit (booster) • Master cylinder • Calipers • Disc (rotor) • Drum • Brake pads and linings • Wheel cylinders • Brake adjusters • Actuators • ABS unit • Flexible/steel pipes

Variable	Range
	• Parking brake cable.
5. SOPs may include but is not limited to:	• Company policy • Filing system • Record management procedures • Client satisfaction management procedures

REQUIRED KNOWLEDGE AND SKILLS

Required knowledge

The individual needs to demonstrate knowledge of:

- Legislative and organizational requirements and procedures
- Kenyan legislation and workplace procedures
- Legal requirements relating to the vehicle and its construction
- Workplace procedures
- documenting assessment and rectification information.
- Relationship between time, costs and profitability
- reporting anticipated delays to relevant person(s) promptly.
- The use of technical information including:
- Operation of braking systems

Required Skills

The individual needs to demonstrate the following skills

- Proficient in ICT
- Time management
- Problem solving
- Communications (verbal and written)
- Planning
- Decision making
- Multitasking
- First aid
- Report writing
- Record keeping
- Driving
- Dismantling
- Assembling
- Inspecting
- Measuring
- Interpreting
- Examining
- Listening
- Team work

EVIDENCE GUIDE

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

1. Critical Aspects of Competency.	1.1 Assessment requires evidence that the candidate: 1.2 Assembled tools and equipment appropriately 1.3 Used technical information correctly 1.4 Examined parts correctly 1.5 Prepared recommendations for the repair of brake components correctly 1.6 Repaired/serviced/replaced and reassembled braking components correctly 1.7 Fitted braking components correctly 1.8 Carried out braking system adjustments correctly 1.9 Carried out brake bleedding correctly 1.10 Tested braking system performance correctly 1.11 Prepared braking system service /repair report appropriately 1.12 Shared braking system service /repair report appropriately 1.13 Finalized servicing activities to conform vehicle operating specifications within specified timeframe. 1.14 Disposed waste appropriately
2. Resource Implications.	***The following resources must be provided:*** 2.1 A workshop that is fully equipped for servicing vehicles braking systems including a vehicle lift, specialist tools and equipment appropriate for the different makes of vehicles that are being serviced 2.2 Personal protection equipment 2.3 Instruments and equipment for measuring and assessing the condition of brake units 2.4 Specialist equipment for servicing ABS brake units 2.5 Access to manufacturers' technical information 2.6 Facilities for the disposal of waste oil, fluids and scrap parts 2.6 Customer database and systems for recording service records
3. Methods of Assessment	Competency may be assessed through: 3.1 Observation 3.2 Oral Questioning 3.3 Written Tests
4. Context of Assessment	Competency may be assessed individually in an actual workplace or in work-simulated conditions within accredited institutions and during Industrial Attachment
5. Guidance information for assessment.	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

SERVICE VEHICLE ELECTRICAL SYSTEMS

UNIT CODE: ENG/OS/AUT/CR/6/4/A

UNIT DESCRIPTION:

This unit specifies competencies required to service vehicle electrical systems. It involves inspecting vehicle electrical systems components, removing, dismantling, cleaning and examining electrical systems components, servicing/repairing/ replacing and assembling and testing vehicle electrical systems components, fitting components, testing and preparing vehicle electrical systems service report.

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. Inspect vehicle electrical systems components	1.1 Vehicle is parked and prepared in accordance with workshop procedures 1.2 ***Tools, equipment and necessary checklists*** are assembled as per task requirements ***1.3*** Personal protective clothing and equipment (***PPEs***) is used as per ***OSHA 2007*** 1.4 Ignition system inspected as per the service manual 1.5 lighting system inspected as per the service manual 1.6 starting system inspected as per the service manual 1.7 Electrical defect(s) are identified as per manufacturers manual 1.8 Electrical system checklist is prepared based on workplace requirements
2. Remove, dismantle, clean and examine vehicle electrical components	2.1 ***Ignition system components*** are removed and dismantled as per the service manual 2.2 Ignition system components are cleaned and examined as per the SOPs 2.3 ***lighting system components*** are removed and dismantled as per the service manual 2.4 lighting system components are cleaned and examined as per the SOPs 2.5 ***starting system components*** are removed and dismantled as per the service manual 2.6 starting system components are cleaned and examined as per the SOPs

3.Service/Repair/ Replace and assemble vehicle electrical components and test	3.1 Worn out Ignition system components are Serviced/Repaired/ Replaced and assembled as per service manual 3.2 Ignition system components are assembled as per service manual 3.3 Ignition system Components are tested as per manufacturers manual 3.4 Starting system components are Serviced/Repaired/ Replaced and assembled as per service manual 3.5 starting system components are assembled as per service manual 3.6 starting system Components are tested as per manufacturers manual 3.7 Worn out lighting system components are Serviced/Repaired/ Replaced and assembled as per service manual 3.8 lighting system components are assembled as per service manual 3.9 lighting system Components are tested as per manufacturers manual
4.Fit components, test and prepare vehicle electrical system service report	4.1 ignition system Components are fitted as per manufacturers manual 4.2 Vehicle ignition system is tested as per the manufacturers specification 4.3 starting system Components are fitted as per manufacturers manual 4.4 Vehicle starting system is tested as per the manufacturers specification 4.5 lighting system Components are fitted as per manufacturers manual 4.6 ***Beam*** is set in accordance with manufacturers' specifications 4.7 Vehicle electrical systems service and repair is completed and tested according to workplace policy 4.8 Vehicle electrical system report is written and shared with relevant personnel according to workshop procedures 4.9 Work area is cleaned in accordance with work shop procedures 4.10 Waste is disposed as per OSHA act- 2007

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. Electrical Diagnostic Tools and equipment may include but is not limited to:	• General workshop equipped for servicing vehicle electrical systems; • Multi-meter

Variable	Range
	• Ignition test equipment. • Hydrometer • High rate discharge tester • Feeler gauge
2. Service Manual may include but is not limited to:	• Instructions provided by the manufacturer on how to remove, disassemble, repair and refit components
3. Condition and functionality may include but is not limited to:	• Specific gravity/hydrometer test • High rate discharge test
4. Technical information may include but is not limited to:	• Vehicle technical data; • Manufacturers' online information; • On-board diagnostics (OBD) displays; • Accessory manufacturers technical data
5. Electrical systems may include but is not limited to:	• Starting system including motors and battery terminals; • Ignition system components including steering lock switches; • Electrical wiring; • Lighting system including bulbs and sockets; • Battery
6. Headlights may include but is not limited to:	• Non-sealed beam • Sealed beam
7. Flasher unit may include but is not limited to:	• Hazard warning • Electronic type

REQUIRED KNOWLEDGE AND SKILLS

Required knowledge

The individual needs to demonstrate knowledge of:

- Legislative and organizational requirements and procedures
- Kenyan legislation and workplace procedures
- recognized assessment and rectification procedures
- documenting assessment and rectification information.
- agreed timescales
- The relationship between time, costs and profitability
- The importance of reporting
- Vehicle earthing principles and earthing methods
- Types of circuit protection and why these are necessary.

- Electrical safety procedures, electric symbols, units and terms
- Electrical and electronic control system principles
- The hazards associated with *high energy electrical component*.
- The use of appropriate test methods
- Electrical principles

Required Skills

The individual needs to demonstrate the following skills

- Proficient in ICT;
- Time management;
- Problem solving;
- Communications (verbal and written);
- Planning;
- Decision making;
- Multitasking;
- First aid
- Dismantling
- Inspecting
- Assembling
- Report writing;
- Driving
- Listening
- Team work

EVIDENCE GUIDE

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

1. Critical Aspects of Competency	***Assessment requires evidence that the candidate:*** 1.1 Worked in a safe and clean environment using personal protection, tools and equipment appropriately 1.2 Observed regulations concerned with health and safety in the disposal of waste correctly 1.3 Used technical information to remove and dismantle vehicle electrical systems correctly 1.4 Examined vehicle electrical systems components correctly 1.5 Repaired/serviced, replaced vehicle electrical systems components correctly 1.6 Reassembled vehicle electrical systems components correctly 1.7 Completed vehicle electrical systems servicing within set time frame

	1.8 Documented vehicle electrical systems servicing records correctly
2. Resource Implications	***he following resources must be provided:*** 2.1 General workshop equipped for servicing vehicle electrical systems; 2.2 Electronic diagnostic equipment; 2.3 Multi-meters; 2.4 Ignition test equipment.
3. Methods of Assessment	***Competency may be assessed through:*** 3.1 Observation 3.2 Oral questioning; 3.3 Written tests
4. Context of Assessment	Competency may be assessed individually in an actual workplace or in work-simulated conditions within accredited institutions or during Industrial Attachment
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.