

**THE REPUBLIC OF KENYA**

**COMPETENCY BASED CURRICULUM**

**FOR**

**AUTOMOTIVE TECHNOLOGY**

**LEVEL 5**



 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 to 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 Occupational Standards were developed for the purpose of developing a Competency-Based Curriculum for Automotive Craftsperson Level 5. These Occupational Standards will also be the bases for assessment of an individual for competence certification.

It is my conviction that this Curriculum 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 and Sessional Paper No. 4 of 2016 on Reforming Education and Training in Kenya, emphasized the need to reform curriculum development, assessment and certification. This called for a shift to CBET in order to address the mismatch between skills acquired through training and skills needed by industry as well as increase the global competitiveness of Kenyan labour force.

The TVET Curriculum Development, Assessment and Certification Council (TVET CDACC), in conjunction with Automotive Sector Skills Advisory Committee (SSAC have developed the Occupational Standards for Automotive Craftsperson Level 5. These standards will be the bases for development of Competency Based Curriculum for Automotive Technology Level 5.

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

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

This curriculum was 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.

**COUNCIL SECRETARY/CEO**

**TVET CDACC**

# ABBREVIATION 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

KCSE Kenya Certificate of Secondary Education

KNQA Kenya National Qualification Authority

KNQF Kenya National Qualification Framework

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**

 **ENG/CU/AUT/BC/1/5/A**

Industry or sector

Occupational Standards

Occupational area

Type of competency

Competency number

Competency level

Version Control

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# COURSE OVERVIEW

**1. Brief description of the course**

This course is designed to equip individuals with the competences required to practice as Automotive Craftsperson in the modern Kenyan Motor Vehicle Service and Repair. It reflects the employers’ demand for qualified personnel, that would enable them to compete in an environment where the technical sophistication of vehicles is constantly evolving, and the expectations of clients are becoming ever more demanding.

The course consists of a programme of:

**Basic units of learning** to build the necessary skills and attitudes to enhance the employability of automotive Craftsperson, enabling them to make positive contributions to the operations and profitability of modern vehicle service and repair organisations;

**Core units of learning** to develop high-end knowledge and skills to service and repair vehicles and their systems, including engines, engine auxiliary systems, transmission, suspension, steering, brakes, electrical systems, and air conditioning.

**2. Units of Learning**

**Basic Units of Learning**

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit Code** | **Unit Title** | **Duration in Hours** | **Credit factors** |
| ENG/CU/AUT/BC/1/5/A | Communication Skills | 25 | 2.5 |
| ENG/CU/AUT/BC/2/5/A | Digital Literacy | 45 | 4.5 |
| ENG/CU/AUT/BC/3/5/A | Entrepreneurial Skills | 70 | 7 |
| ENG/CU/AUT/BC/4/6/A | Employability Skills | 50 | 5 |
| ENG/CU/AUT/BC/5/5/A | Environmental Literacy | 25 | 2.5 |
| ENG/CU/AUT/BC/6/5/A | Occupational Safety and Health Practices | 25 | 2.5 |
| **Total** | **250** | **25** |

**Common Units of Learning**

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit Code** | **Unit Title** | **Duration in Hours** | **Credit Factors** |
| ENG/CU/AUT/CC/1/5/A | Technical Drawing | 50 | 5 |
| ENG/CU/AUT/CC/2/5/A | Applied Engineering Mathematics | 50 | 5 |
| ENG/CU/AUT/3/5/A | Automotive Engineering principles | 50 | 5 |
| ENG/CU/AUT/4/5/A | Workshop Technology principles | 50 | 5 |
| **Total** | **200** | **20** |

**Core Units of Learning**

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit Code** | **Unit Title** | **Duration in Hours** | **Credit Factors** |
| ENG/CU/AUT/CR/1/5/A | Vehicle Basic Maintenance | 50 | 5 |
| ENG/CU/AUT/CR/2/5/A | Servicing and Repairing Vehicle Engine Components.. | 70 | 7 |
| ENG/CU/AUT/CR/3/5/A | Servicing Vehicle Fuel Systems | 40 | 4 |
| ENG/CU/AUT/CR/4/5/A | Servicing Vehicle Transmission Systems | 40 | 4 |
| ENG/CU/AUT/CR/5/5/A | Servicing Vehicle Steering Systems. | 40 | 4 |
| ENG/CU/AUT/CR/6/5/A | Servicing Vehicle Suspension Systems. | 50 | 5 |
| ENG/CU/AUT/CR/7/5/A | Servicing Vehicle Braking Systems | 50 | 5 |
| ENG/CU/AUT/CR/8/5/A | Servicing Vehicle Electrical Sytems | 40 | 4 |
| ENG/CU/AUT/CR/9/5/A | Performing Vehicle body works | 70 | 7 |
| **Total** | **450** | **45** |
| **Grand Total** | **900** | **90** |

**3. Entry Requirements**

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

1. Kenya Certificate of Secondary Education (K.C.S.E.) with a minimum mean grade of D (plain)

**Or**

1. Automotive Engineering Artisan Level 4 certificate with **one** year of continuous work experience

**Or**

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

**Trainer Qualification**

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

**4. Provision for Industrial attachment**

It is envisaged that the trainee will have undergone an industrial training and assessment with a recognised motor vehicle service garage as a prerequisite for completion of this training course.

**5. Assessment**

The course will be assessed at two levels: internally and externally. Internal assessment is continuous and is conducted by the trainer who is monitored by an internal accredited verifier while external assessment is the responsibility of TVET CDACC.

As part of the continuous internal assessment process, trainees will maintain a portfolio of evidence of their achievements.

**6. Certification**

On successful completion of a Unit of Learning, a trainee will be issued with a Certificate of Competency that acknowledges the achievement of that competence. On successful completion of **all** units of learning, a trainee will be awarded an Automotive Craftsperson Certificate qualification. These certificates will be issued by TVET CDACC in conjunction with training provider.

# BASIC UNITS OF LEARNING

##

## COMMUNICATION SKILLS

**UNIT CODE:** ENG/CU/AUT/BC/1/5/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Demonstrate Communication Skills

**Duration of Unit:** 25hours

**Unit Description**

This unit covers the competencies required to demonstrate communication skills. It involves meeting communication needs of clients and colleagues, contributing to the development of communication strategies, conducting workplace interviews, facilitating group discussions and representing the organisation.

**Summary of Learning Outcomes**

1. Meet communication needs of clients and colleagues
2. Contribute to the development of communication strategies
3. Conduct interviews
4. Facilitate group discussions
5. Represent the organization

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Meet communication needs of clients and colleagues
 | * Communication process
* Modes of communication
* Medium of communication
* Effective communication
* Barriers to communication
* Flow of communication
* Sources of information
* Organizational policies
* Organization requirements for written and electronic communication methods
* Report writing
* Effective questioning techniques (clarifying and probing)
* Workplace etiquette
* Ethical work practices in handling communication
* Active listening
* Feedback
* Interpretation
* Flexibility in communication
 | * Interview
* Third party reports
* Written texts
 |
| 1. Contribute to the development of communication strategies
 | * Dynamics of groups
* Styles of group leadership
* Openness and flexibility in communication
* Communication skills relevant to client groups
 | * Written
* Observation
 |
| 1. Conduct interviews
 | * Types of interview
* Establishing rapport
* Facilitating resolution of issues
* Developing action plans
 | * Written
* Observation
 |
| 1. Facilitate group discussions
 | * Identification of communication needs
* Dynamics of groups
* Styles of group leadership
* Presentation of information
* Encouraging group members participation
* Evaluating group communication strategies
 | * Written
* Observation
 |
| 1. Represent the organization
 | * Presentation techniques
* Development of a presentation
* Multi-media utilization in presentation
* Communication skills relevant to client groups
 | * Observation
* Written
 |

**Suggested Methods of Instructions**

* Role playing
* Viewing of related videos

**Recommended Resources**

* Desktop computers/laptops
* Internet connection
* Projectors
* Telephone

## DIGITAL LITERACY

**UNIT CODE:** ENG/CU/AUT/BC/2/5/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Demonstrate Digital Literacy

**Duration of Unit:** 45 hours

**Unit Description**

This unit covers the competencies required to demonstrate digital literacy. It involves identifying appropriate computer software and hardware, applying security measures to data, hardware, software in automated environment , applying computer software in solving tasks, applying internet and email in communication at workplace, applying desktop publishing in official assignment and preparing presentation packages.

**Summary of Learning Outcomes**

1. Identify computer software and hardware
2. Apply security measures to data, hardware, software in automated environment
3. Apply computer software in solving tasks
4. Apply internet and email in communication at workplace
5. Apply desktop publishing in official assignments
6. Prepare presentation packages

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Identify computer hardware and software
 | * Concepts of ICT
* Functions of ICT
* History of computers
* Components of a computer
* Classification of computers
 | * Written tests
* Oral presentation
* Observation
 |
| 1. Apply security measures to data, hardware and software
 | * Data security and control
* Security threats and control measures
* Types of computer crimes
* Detection and protection against computer crimes
* Laws governing protection of ICT
 | * Written tests
* Oral presentation
* Observation
* Project
 |
| 1. Apply computer software in solving tasks
 | * Operating system
* Word processing
* Spread sheets
* Data base design and manipulation
* Data manipulation, storage and retrieval
 | * Oral questioning
* Observation
* Project
 |
| 1. Apply internet and email in communication at workplace
 | * Computer networks
* Network configurations
* Uses of internet
* Electronic mail (e-mail) concept
 | * Oral questioning
* Observation
* Oral presentation
* Written report
 |
| 1. Apply desktop publishing in official assignments
 | * Concept of desktop publishing
* Opening publication window
* Identifying different tools and tool bars
* Determining page layout
* Opening, saving and closing files
* Drawing various shapes using DTP
* Using colour pellets to enhance a document
* Inserting text frames
* Importing and exporting text
* Object linking and embedding
* Designing of various publications
* Printing of various publications
 | * Oral questioning
* Observation
* Oral presentation
* Written report
* Project
 |
| 1. Prepare presentation packages
 | * Types of presentation packages
* Procedure of creating slides
* Formatting slides
* Presentation of slides
* Procedure for editing objects
 | * Oral questioning
* Observation
* Oral presentation
* Written report
* Project
 |

**Suggested Methods of Instructions**

* Demonstration
* Viewing of related videos
* Discussions
* Assignments
* Direct instructions

**Recommended Resources**

* Computers
* Other digital devices
* Printers
* Storage devices
* Internet access
* Computer software

## ENTREPRENEURAL SKILLS

**UNIT CODE: ENG/CU/AUT/BC/3/5/A**

**Relationship to occupational standards**

This unit addresses the Unit of Competency: Demonstrate Entreprenueral Skills

**Duration of unit:** 70 hours

**Unit Description**

This unit covers the competencies required to demonstrate understanding of entrepreneurship. It involves demonstrating understanding of an entrepreneur, entrepreneurship and self-employment. It also involves identifying entrepreneurship opportunities, creating entrepreneurial awareness, applying entrepreneurial motivation and developing business innovative strategies.

**Summary of Learning Outcomes**

* 1. Demonstrate understanding of an entrepreneur
	2. Demonstrate knowledge of entrepreneurship and self-employment
	3. Identify entrepreneurship opportunities
	4. Create entrepreneurial awareness
	5. Apply entrepreneurial motivation
	6. Develop innovative business strategies
	7. Develop Business plan

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Demonstrate knowledge of entrepreneurship and self-employment
 | * Importance of self-employment
* Requirements for entry into self-employment
* Role of an Entrepreneur in business
* Contributions of Entrepreneurs to National development
* Entrepreneurship culture in Kenya
* Born or made entrepreneurs
 | * Individual/group assignments
* Projects
* Written tests
* Oral questions
* Third party report
* Interviews
 |
| 1. Identify entrepreneurship opportunities
 | * Business ideas and opportunities
* Sources of business ideas
* Business life cycle
* Legal aspects of business
* Assessment of product demand
* Business environment
* Factors to consider when evaluating business environment
* Technology in business
 | * Individual/group assignments
* Projects
* Written tests
* Oral questions
* Third party report
* Interviews
 |
| 1. Create entrepreneurial awareness
 | * Forms of businesses
* Sources of business finance
* Factors in selecting source of business finance
* Governing policies on Small Scale Enterprises (SSEs)
* Problems of starting and operating SSEs
 | * Individual/group assignments
* Projects
* Written tests
* Oral questions
* Third party report
* Interviews
 |
| 1. Apply entrepreneurial motivation
 | * Internal and external motivation
* Motivational theories
* Self-assessment
* Entrepreneurial orientation
* Effective communications in entrepreneurship
* Principles of communication
* Entrepreneurial motivation
 | * Case studies
* Individual/group assignments
* Projects
* Written tests
* Oral questions
* Third party report
* Interviews
 |
| 1. Develop business innovative strategies
 | * Innovation in business
* Small business Strategic Plan
* Creativity in business development
* Linkages with other entrepreneurs
* ICT in business growth and development
 | * Case studies
* Individual/group assignments
* Projects
* Written tests
* Oral questions
* Third party report
* Interviews
 |
| 1. Develop Business Plan
 | * Business description
* Marketing plan
* Organizational/Management
* plan
* Production/operation plan
* Financial plan
* Executive summary
* Presentation of Business Plan
 | * Case studies
* Individual/group assignments
* Projects
* Written tests
* Oral questions
* Third party report
* Interviews
 |

**Suggested Methods of instructions:**

* Direct instruction
* Project
* Case studies
* Field trips
* Discussions
* Demonstration
* Question and answer
* Problem solving
* Experiential
* Team training

**Recommended Resources**

* Case studies
* Business plan templates
* Computers
* Overhead projectors
* Internet
* Mobile phone
* Video clips
* Films
* Newspapers and Handouts
* Business Journals
* Writing materials

## EMPLOYABILITY SKILLS

**UNIT CODE:** **ENG/CU/AUT/BC/4/5/A**

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Demonstrate Employability Skills

**Duration of Unit:** 50 hours

**Unit Description**

This unit covers competencies required to demonstrate employability skills. It involves conducting self-management, demonstrating interpersonal communication, critical safe work habits, leading a workplace team, planning and organizing work, maintaining professional growth and development, demonstrating workplace learning, problem solving skills and managing workplace ethics.

**Summary of Learning Outcomes**

1. Conduct self-management

2. Demonstrate interpersonal communication

3. Demonstrate critical safe work habits

4. Lead small teams

5. Plan and organize work

6. Maintain professional growth and development

7. Demonstrate workplace learning

8. Demonstrate problem solving skills

9. Demonstrate workplace ethics

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Conduct self-management
 | * Self-awareness
* Formulating personal vision, mission and goals
* Strategies for overcoming life challenges
* Emotional intelligence
* Assertiveness versus aggressiveness
* Expressing personal thoughts, feelings and beliefs
* Developing and maintaining high self-esteem
* Developing and maintaining positive self-image
* Articulating ideas and aspirations
* Accountability and responsibility
* Good work habits
* Self-awareness
* Self-development
* Financial literacy
* Healthy lifestyle practices
 | * Written tests
* Oral questioning
* Interviewing
* Portfolio of evidence
* Third party report
 |
| 1. Demonstrate interpersonal communication
 | * Meaning of interpersonal communication
* Listening skills
* Types of audience
* Writing skills
* Reading skills
* Meaning of empathy
* Understanding customers’ needs
* Establishing communication networks
* Sharing information
 | * Written tests
* Oral questioning
* Interviewing
* Portfolio of evidence
* Third party report
 |
| 1. Demonstrate critical safe work habits
 | * Stress and stress management
* Punctuality and time consciousness
* Leisure
* Integratingpersonal objectives into organizational objectives
* Resources utilization
* Setting work priorities
* HIV and AIDS
* Drug and substance abuse
* Handling emerging issues
 | * Written tests
* Oral questioning
* Interviewing
* Portfolio of evidence
* Third party report
 |
| 1. Lead a small team
 | * Leadership qualities
* Team building
* Determination of team roles and objectives
* Team performance indicators
* Responsibilities in a team
* Forms of communication
* Complementing team activities
* Gender and gender mainstreaming
* Human rights
* Maintaining relationships
* Conflicts and conflict resolution
 | * Written tests
* Oral questioning
* Interviewing
* Portfolio of evidence
* Third party report
 |
| 1. Plan and organize work
 | * Functions of management
* Planning
* Organizing
* Time management
* Decision making process
* Task allocation
* Evaluating work activities
* Resource utilization
* Problem solving
* Collecting and organising information
 | * Written tests
* Oral questioning
* Interviewing
* Portfolio of evidence
* Third party report
 |
| 1. Maintain professional growth and development
 | * Opportunities for professional growth
* Assessing training needs
* Licenses and certifications for professional growth and development
* Pursuing personal and organizational goals
* Identifying work priorities
* Recognizing career advancement
 | * Written tests
* Oral questioning
* Interviewing
* Portfolio of evidence
* Third party report
 |
| 1. Demonstrate workplace learning
 | * Managing own learning
* Contributing to the learning community at the workplace
* Cultural aspects of work
* Variety of learning context
* Application of learning
* Safe use of technology
* Identifying opportunities
* Generating new ideas
* Workplace innovation
* Performance improvement
* Handling emerging issues
* Future trends and concerns in learning
 | * Written tests
* Oral questioning
* Interviewing
* Portfolio of evidence
* Third party report
 |
| 1. Demonstrate problem solving skills
 | * Problem identification
* Problem solving
* Application of problem-solving strategies
* Resolving customer concerns
 | * Written tests
* Oral questioning
* Interviewing
* Portfolio of evidence
* Third party report
 |
| 1. Demonstrate workplace ethics
 | * Meaning of ethics
* Ethical perspectives
* Principles of ethics
* Values and beliefs
* Ethical standards
* Organization code of ethics
* Common ethical dilemmas
* Organization culture
* Corruption, bribery and conflict of interest
* Privacy and data protection
* Diversity, harassment and mutual respect
* Financial responsibility/accountability
* Etiquette
* Personal and professional integrity
* Commitment to jurisdictional laws
* Emerging issues in ethics
 | * Written tests
* Oral questioning
* Interviewing
* Portfolio of evidence
* Third party report
 |

**Suggested Methods of Instructions**

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

**Recommended Resources**

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

## ENVIRONMENTAL LITERACY

**UNIT CODE:**  **ENG/CU/AUT/BC/5/5/A**

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Demonstrate Environmental Literacy

**Duration of Unit:** 25 hours

**Unit Description**

This unit describes the competencies required to demonstrate understanding of environmental literacy. It involves controlling environmental hazard, controlling control environmental pollution, complying with workplace sustainable resource use, evaluating current practices in relation to resource usage, identifying environmental legislations/conventions for environmental concerns, implementing specific environmental programs and monitoring activities on environmental protection/programs.

**Summary of Learning Outcomes**

1. Control environmental hazards
2. Control environmental Pollution
3. Demonstrate sustainable use of resource
4. Evaluate current practices in relation to resource usage
5. Identify Environmental legislations/conventions for environmental concerns
6. Implement specific environmental programs
7. Monitor activities on Environmental protection/Programs

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** |  **Content** | **Suggested Assessment Methods** |
| 1. Control environmental hazards
 | * Purposes and content of Environmental Management and Coordination Act 1999
* Purposes and content of Solid Waste Act
* Storage methods for environmentally hazardous materials
* Disposal methods of hazardous wastes
* Types and uses of PPE in line with environmental regulations
* Occupational Safety and Health Standards (OSHS)
 | * Written test
* Oral questions
* Observation
 |
| 1. Control environmental Pollution control
 | * Types of pollution
* Environmental pollution control measures
* Types of solid wastes
* Procedures for solid waste management
* Different types of noise pollution
* Methods for minimizing noise pollution
 | * Written test
* Oral questions
* Observation
 |
| 1. Demonstrate sustainable resource use
 | * Types of resources
* Techniques in measuring current usage of resources
* Calculating current usage of resources
* Methods for minimizing wastage
* Waste management procedures
* Principles of 3Rs (Reduce, Reuse, Recycle)
* Methods for economizing or reducing resource consumption
 | * Written test
* Oral questions
* Observation
 |
| 1. Evaluate current practices in relation to resource usage
 | * Collection of information on environmental and resource efficiency systems and procedures,
* Measurement and recording of current resource usage
* Analysis and recording of current purchasing strategies.
* Analysis of current work processes to access information and data
* Identification of areas for improvement
 | * Written test
* Oral questions
* Observation
 |
| 1. Identify Environmental legislations/conventions for environmental concerns
 | * Environmental issues/concerns
* Environmental legislations /conventions and local ordinances
* Industrial standard /environmental practices
* International Environmental Protocols (Montreal, Kyoto)
* Features of an environmental strategy
 | * Written questions
* Oral questions
* Observation
 |
| 1. Implement specific environmental programs
 | * Community needs and expectations
* Resource availability
* 5 s of good housekeeping
* Identification of programs/Activities
* Setting of individual roles /responsibilities
* Resolving problems /constraints encountered
* Consultation with stakeholders
 | * Written questions
* Oral questions
* Observation
 |
| 1. Monitor activities on Environmental protection/Programs
 | * Periodic monitoring and Evaluation of activities
* Gathering feedback from stakeholders
* Analysing data gathered
* Documentation of recommendations and submission
* Setting of management support systems to sustain and enhance the program
* Monitoring and reporting of environmental incidents to concerned /proper authorities
 | * Oral questions
* Written tests
* Practical test
* Observation
 |

**Suggested Methods of Instructions**

* Instructor led facilitation of theory
* Demonstration by trainer
* Viewing of related videos
* Project
* Assignements
* Role play

**Recommended Resources**

* Standard operating and/or other workplace procedures manuals
* Specific job procedures manuals
* Environmental Management and Coordination Act 1999
* Machine/equipment manufacturer’s specifications and instructions
* Personal Protective Equipment (PPE)
* ISO standards
* Ccompany environmental management systems (EMS)
* Montreal Protocol
* Kyoto Protocol

## OCCUPATIONAL SAFETY AND HEALTH PRACTICES

**UNIT CODE:** **ENG/CU/AUT/BC/6/5/A**

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Demonstrate occupational safety and health practices

**Duration of Unit:** 25 hours

**Unit Description**

This unit specifies the competencies required to identify workplace hazards and risk, identify and implement appropriate control measures and implement OSH programs, procedures and policies/ guidelines

**Summary of Learning Outcomes**

1. Identify workplace hazards and risk
2. Control OSH hazards
3. Implement OSH programs

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Identify workplace hazards and risks
 | * Identification of hazards in the workplace and/or the indicators of their presence
* Evaluation and/or work environment measurements of OSH hazards/risk existing in the workplace is conducted by
* Authorized personnel or agency
* Gathering of OHS issues and/or concerns raised
 | * Oral questions
* Written tests
* Portfolio of evidence
* Third party report
 |
| 1. Control OSH hazards
 | * Prevention and control measures, including use of PPE (personal protective equipment) for specific hazards are identified and implemented
* Appropriate risk controls based on result of OSH hazard evaluation is recommended
* Contingency measures, including emergency procedures during workplace incidents and emergencies are recognized and established in accordance with organization procedures
 | * Oral questions
* Written tests
* Portfolio of evidence
* Third party report
 |
| 1. Implement OSH programs
 | * Providing information to work team about company OHS program, procedures and policies/guidelines
* Participating in implementation of OSH procedures and policies/ guidelines
* Training of team members and advice on OSH standards and procedures
* Implementation of procedures for maintaining OSH-related records
 | * Oral questions
* Written tests
* Portfolio of evidence
* Third party report
 |

**Suggested Methods of Instructions**

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

**Recommended Resources**

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

# COMMON UNITS OF LEARNING

## TECHNICAL DRAWING

**UNIT CODE: ENG/AUT/CC/1/5/A**

**Relationship to Occupational Standards**

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

**Duration of Unit:** 50 hours

**Unit Description**

This unit covers the competencies required to prepare and interpret technical drawings. It involves competencies to select, use and maintain drawing equipment and materials. It also involves producing plain geometry drawings, solid geometry drawings, pictorial and orthographic drawings of components and application of Computer Aided Design (CAD) packages.

**Summary of Learning Outcomes**

* + - 1. Use and maintain drawing equipment and materials
			2. Produce plane geometry drawings
			3. Produce solid geometry drawings
			4. Produce pictorial and orthographic drawings of components
			5. Apply CAD packages

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

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| 1. Use and maintain drawing equipment and materials
 | * Identification and care of drawing equipment
* Identification and care of drawing materials
* Reference to manufacturer’s instructions and work place procedures on use and maintenance of drawing equipment and materials
* Reference to relevant environmental legislations
* Use of Personal Protective Equipment (PPEs)
 | * Observation
* Oral questioning
* Written tests
 |
| 1. Produce plane geometry drawings
 | * Types of lines in drawings
* Construction of geometric forms e.g. squares, circles
* Construction of different angles
* Measurement of different angles
* Bisection of different angles and lines
* Standard drawing conventions
 | * Oral questioning
* Practical tests
* Observation
 |
| 1. Produce solid geometry drawings
 | * Interpretation of sketches and drawings of patterns e.g. cylinders, prisms and pyramids
* Sectioning of solids e.g. prisms, cones
* Development and interpenetrations of solids e.g. cylinder to cylinder and cylinder to triangular, prism
 | * Observation
* Practical tests
* Oral questioning
 |
| 1. Produce orthographic drawings
 | * Meaning of pictorial and orthographic drawings
* Meaning of sectioning
* Meaning of symbols and abbreviations
* Drawing and interpretation of orthographic elevations
* Dimensioning of orthographic elevations
* Sectioning of views
 | * Observation
* Practical tests
* Oral questioning
 |
| 1. Produce pictorial drawings
 | * Meaning of pictorial drawings
* Drawing objects in isometric view
* Drawing objects in oblique view
 | * Observation
* Oral questioning
* Practical tests
 |
| 1. Produce electrical drawings
 | * Electrical symbols and abbreviations
* Meaning of electrical drawings
* Drawing of electrical diagrams e.g. block, schematic, circuit, line and wiring
 | * Observation
* Oral questioning
* Practical tests
 |
| 1. Apply CAD packages
 | * Identification of CAD packages e.g. AutoCAD, circuit maker
* Use of CAD packages in drawing of:
* Plane geometry
* Solid
* Orthographic
* Pictorial
* Electrical e.g. block, schematic, circuit, line and wiring
 | * Observation
* Oral questioning
* Practical tests
 |

**Suggested Methods of Instructions:**

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

**Recommended Resources**

* Drawing room
* Drawing instruments e.g. T-squares, set squares, drawing sets
* Drawing tables
* Pencils, papers, erasers
* Masking tapes
* Computers installed with relevant CAD packages

## APPLIED ENGINEERING MATHEMATICS

**UNIT CODE: ENG/AUT/CC/2/5/A**

**Relationship to Occupational Standards**

This unit addresses the unit of competency: **Apply Engineering Mathematics**

**Duration of Unit**: 50 hours

**Unit Description**

This unit describes the competencies required by a craftsperson in order to apply a wide range of mathematical skills in their work; apply ratios and proportions to solve problems; use algebraic and graphical techniques to analyse mathematical problems; apply concepts of probability; perform commercial calculations and collect, organise and analyse statistical data.

**Summary of Learning Outcomes**

1. Apply Algebra
2. Apply Trigonometry and hyperbolic functions
3. Apply complex numbers
4. Apply Coordinate Geometry
5. Carry out Binomial Expansion
6. Apply Calculus
7. Solve Ordinary differential equations
8. Carry out Mensuration
9. Apply Power Series
10. Apply Statistics
11. Apply Numerical methods
12. Apply Vector theory
13. Apply Matrix

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

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| * 1. Apply Algebra
 | * Base and Index
* Law of indices
* Indicial equations
* Laws of logarithm
* Logarithmic equations
* Conversion of bases
* Use of calculator
* Reduction of equations
* Solution of equations reduced to quadratic form
* Solutions of simultaneous linear equations in three unknowns
* Solutions of problems involving AP and GP
 | * Written tests
* Oral questioning
* Assignments
* Supervised exercises
 |
| * 1. Apply Trigonometry and hyperbolic functions
 | * Half -angle formula
* Factor formula
* Trigonometric functions
* Parametric equations
* Relative and absolute measures
* Measures calculation
* Meaning of hyperbolic equations
* Properties of hyperbolic functions
* Evaluations of hyperbolic functions Hyperbolic identities
* Osborne’s Rule
* Ashx+bshx=C equation
* One-to-one relationship in functions
* Inverse functions for one-to-one relationship
* Inverse functions for trigonometric functions
* Graph of inverse functions
* Inverse hyperbolic functions
 | * Written tests
* Oral questioning
* Assignments
* Supervised exercises
 |
| * 1. Apply complex numbers
 | * Meaning of complex numbers
* Stating complex numbers in numbers in terms of conjugate argument and
* Modulus
* Representation of complex numbers on the Argand diagram
* Arithmetic operation of complex numbers Application of De Moivre’s theorem
* Application of complex numbers to engineering
 | * Assignments
* Oral questioning
* Supervised exercises
* Written tests
 |
| * 1. Apply Coordinate Geometry
 | * Polar equations
* Cartesian equation
* Graphs of polar equations
* Normal and tangents
* Definition of a point
* Locus of a point in relation to a circle
* Loci of points for given mechanism
 | * Written tests
* Oral questioning
* Assignments
* Supervised exercises
 |
| * 1. Carry out Binomial Expansion
 | * Binomial theorem Power series using binomial theorem Roots of numbers using binomial theorem.
* Estimation of errors of small changes using binomial theorem.
 | * Written tests
* Oral questioning
* Assignments
* Supervised exercises
 |
| * 1. Carry out mensuration
 | * Perimeter and area of regular shapes
* Volume and surface area of solids
* Area of irregular figures
* Volumes of irregular figures
 | * Written tests
* Oral questioning
* Assignments
* Supervised exercises
 |
| * 1. Apply Calculus
 | * Meaning of differentiation
* Differentiation from fist principle
* Tables of some common derivatives
* Rules of differentiation
* Differentiation of trigonometric functions
* Differentiation of hyperbolic functions
* Rate of change and small change
* Stationery points of functions of two variables
* Meaning of integration
* Indefinite and definite integral
* Integration of trigonometric functions
* Integration of hyperbolic functions
 | * Written tests
* Oral questioning
* Assignments
* Supervised exercises
 |
| * 1. Apply Statistics
 | * Classification of data
	+ Grouped data
	+ Ungrouped data
* Data collection
* Tabulation of data
	+ Class intervals
	+ Class boundaries
	+ Frequency tables
* Diagrammatic and graphical presentation of data e.g.
	+ Histograms
	+ Frequency polygons
	+ Bar charts
	+ Pie charts
	+ Cumulative frequency curves
* Measures of central tendency mean, mode and median
* Measures of dispersion
	+ Variance and standard deviation
 | * Assignments
* Oral questioning
* Supervised exercises
* Written tests
* Simulation
* Data modeling
 |
| * 1. Apply Vector theory
 | * Definition of dot and cross product of vectors
* Solution of problems involving dot and cross production of cross
* Definition of operators
* Definition of vector field
* Solutions of problems involving vector fields
* Definition of Gradient, Divergence and curl
* Solutions of involving Gradient, Divergence and curl
* Application of vectors
 | * Assignments
* Oral questioning
* Supervised exercises
* Written tests
 |
| * 1. Apply Matrix methods
 | * Matrix operation
* Determinant of 3x3 matrix
* Inverse of 3x3 matrix
 | * Assignments
* Oral questioning
* Supervised exercises
* Written tests
 |
| 1. Apply concepts of probability in work
 | * + Meaning of probability
	+ Types of probability events
* Dependent
* Independent
* Mutually exclusive
	+ Laws of probability
	+ Counting techniques
* Permutation
* Combination
* Tree diagrams
* Venn diagrams
 | * Written tests
* Assignments
* Supervised exercises
 |
| 1. Solve Ordinary differential equations
 |  |  |
| 1. Apply Power Series
 |  |  |

**Suggested Methods of Instructions**

* Group discussions
* Demonstration by trainer
* Exercises by trainee

**Recommended Resources**

* Scientific Calculators
* Rulers, pencils, erasers
* Charts with presentations of data
* Graph books
* Dice
* Computers with internet connection

## AUTOMOTIVE ENGINEERING PRINCIPLES

**UNIT CODE: ENG/CU/AUT/CC/3/05/A**

**Relationship to Occupational Standards**

This unit addresses the unit of competency: **Apply Automotive Engineering Principles**

**Duration of Unit:** 50 hours

**Unit Description**

This unit describes the competencies required by a Craftsperson in order to apply a wide range of automotive science principles in their work. It includes resolve forces, Determine effects of loads in automotive systems, Analyse properties of materials, determine the nature of friction in automotive systems, solve problems related to motion, apply simple machines concepts, determine the effect of heat and gas laws and use the concept of density and pressure.

**Summary of Learning Outcomes**

1. Resolution of forces
2. Determine effects of loads in automotive systems
3. Analyze properties of materials
4. Determine the nature of friction in automotive systems.
5. Solve problems related to motion
6. Apply simple machines concepts
7. Determine the effect of heat and apply the gas laws
8. Use the concept of density and pressure.

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Resolve forces.
 | * Define force
* State and explain the parallelogram, triangle and polygon of forces theorems
* Determine the resultant of coplanar forces
* Application of force theorems
 | * Written tests
* Oral questioning
* Assignments
* Supervised exercises
 |
| 1. Determine effects of loads in automotive systems
 | * Define moment of a force about an axis
* Analysis of point loads and reaction Calculations.
* State the principle of moments
* Determination of center of gravity
* Application of moments to automotive systems
 | * Written tests
* Oral questioning
* Assignments
* Supervised exercises.
* Practical tests
 |
| 1. Analyze properties of materials
 | * Definition of mechanical properties of materials
* Draw the stress strain graph
* Carry out material testing
* Determine factors affecting choice of materials.
* Calculate direct, shear and torsion stress in materials
 | * Assignments
* Oral questioning
* Supervised exercises
* Written tests.
* Practical tests
 |
| 1. Determine the nature of friction in automotive systems
 | * Definition of friction
* State the laws of friction
* State the effects of friction
* Calculate the force to overcome friction on horizontal and inclined planes, bearings ,brakes, belts, and clutch
 | * Assignments
* Oral questioning
* Practical tests
* Observation
* Supervised exercises
* Written tests
 |
| 1. Solve problems related to motion
 | * Definition of terms related to motion
* State newton’s laws of motion, law of conservation of momentum
* Calculate: velocity, acceleration, momentum, impulse, inertia force and simple harmonic motion.
* Draw velocity time graphs.
* Determine relationship between linear and angular motion.
* Analyze motion of a vehicle on a curved and banked track
 | * Assignments
* Supervised exercises
* Written tests
* Practical test
 |
| 1. Apply simple machines concepts in automotive engineering
 | * Definition of : work, power energy, mechanical advantage, velocity ratio and efficiency.
* Describe simple machines: gears, levers, pulleys, screw jack, and wheel and axle.
* Apply the law of machine.
* Determination of work, energy, power, mechanical advantage, velocity ratio and efficiency
 | * Assignments
* Oral questioning
* Practical tests
* Observation
* Supervised exercises
* Written tests
 |
| 1. Determine the effect of heat and apply the gas laws
 | * Definition of heat , temperature and heat capacity
* Explain the effect of heat on matter.
* Describe modes of heat transfer
* State the gas laws.
* Measure quantity of heat and temperature.
* Solve problems on heat and gases.
 | * Assignments
* Supervised exercises
* Written tests
* Practical test
 |
| 1. Use the concept of density and pressure.
 | * Define density, relative density and pressure.
* Measure density, relative density and pressure using appropriate instruments.
* State Archimedes principle and the law of floatation.
* Calculate problems on density, relative density and pressure.
* Application of pressure in brakes, pumps, jacks and other engineering systems.
 | * Written test
* Assignments
* Oral questioning
* Practical tests
* Observation
* Supervised exercises
* Written tests
 |

**Suggested Methods of Instructions**

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

**Recommended Resources**

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

## **WORKSHOP TECHNOLOGY PRINCIPLES**

**UNIT CODE: ENG/AUT/CC/4 /05/A**

**Relationship to Occupational Standards:**

This unit addresses the unit of competency: **Apply Workshop Technology Principles**

**Duration of Unit:** 50 Hours

**Unit description**

This unit describes the competencies required by an automotive Craftsperson in order to apply a wide range of workshop technology skills in their work. It involves use of different methods to produce work pieces using basic tools while observing occupational safety and health legislations, regulations and safe working practices, interpret working drawings, select appropriate techniques for a given task to achieve specified results as well as perform housekeeping.

**Summary of Learning Outcome**

1. Use technical drawing to plan work operations
2. Choose appropriare tools and materials
3. Measure and mark out dimensions on workpieces
4. Use hand tools to cut and file parts
5. Use drills to make holes
6. Thread using taps and dies
7. Assemble metal parts and sub-assemblies
8. Polish finished work
9. Perform housekeeping
10. Inspect finished work for accuracy and quality
11. Maintenance of tools and equipment

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

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| 1. Interpreting working drawings
 | * Reading and extraction of information (dimensions, tolerances, BS/ANSI Drawing Standards, geometric ISO symbols & abbreviations)
	+ Development of working procedure/ operational plan
 | Administration of written and oral testsAssessment of worksheet/ operation plans |
| 1. Choosing of appropriate tools and materials
 | * + Types of hand tools
	+ Using hand tools.
	+ Using machine tools
	+ Selection of tools as per the specific operation
	+ Inspection and/or recalibration of tools
	+ Demonstration of correct handling of tools.
	+ Selection of material for the given component
 | Observation of correct selection of tools for specific operationObservation of inspection and/or recalibration of toolsObservation of appropriate handling of toolsAdministration of oral and written questions  |
| 1. Marking out of work piece(s)
 | * use of marking out tools
	+ Laying out work piece(s)
	+ Transfer of dimensions onto the work piece(s)
 | Observation of laying out of work piece(s)Assessment of transferred dimensions Administration of oral and written questions  |
| 1. Producing components as per the drawing
 | * + Set up work piece on work holding device securely.
	+ perform suggested operations but not limited to:
	+ Tapping
	+ Drilling
	+ boring
	+ Filing
	+ Grinding
	+ Sawing
	+ Turning
	+ Soldering/brazing
	+ welding
 | use of correct procedureAssessment of the produced component  |
| 1. Performing finishing processes
 | * + Finishing
	+ Polishing
	+ Filing
	+ Grinding
	+ de-burring
	+ painting of components
 | Observation of degree of surface finishAssessment of finished surface(s) using inspection toolsAssessment of finished surface(s) visually |
| 1. Assembling produced parts
 | * + Joining and fitting parts
	+ Quality control (Dimensions, Tolerances, surface finishing, Alignment)
 | Observation of the joined or fitted partsAssessment of the joined or fitted partsAssessment of functionality  |
| 1. Performing housekeeping
 | * + Cleaning of work environment (waste sorting and disposal)
	+ Cleaning and storing of tools and equipment
	+ Servicing and maintenance of machine (lubrication, inspection, alignment and adjustment)
 | Observation of servicing and maintenance of the machine Observation of clean working environment Observation clean and stored tools and equipment  |

**Suggested Methods of Instructions**

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

**List of Recommended Resources**

* Tools and equipment suggested but not limited to:
	+ Welding
* Drilling machines
* Vices
* Burnishing machine
* Cutting tools
* Combination square
	+ Centre punch
	+ Centre lathe
	+ scribers
* calipers
	+ Dies and taps
* Surface plate
* V-blocks
	+ Dial gauge
	+ Die stock
	+ Engineer’s square
* File card
* Assorted Files
	+ Clamps
* Assorted hand tools
	+ Hammers
* Measuring tools
	+ Drill bits
* Assorted inspection tools and equipment
	+ Inspection and measuring tools, GO and NOT GO gauges
	+ Jigs and fixture
	+ Pliers
* Rotary disc abrasive grinder
	+ Reamers
	+ Saw
	+ Screwdrivers
	+ Spiral lowering
	+ Tap wrench
	+ Vacuum cleaners
	+ V-block
* Workbenches
	+ Vacuum cleaners
* Mops/ Brooms and buckets
	+ Firefighting equipment
* First Aid kit

**Materials and supplies suggested but not limited to:**

* Personal safety gear:
* Goggles
* Safety shoes
* Overall
* Cap
* Ear Muffs
* Gloves
* Drawing papers
* Raw materials
* Mild steel plate
* Sheet metal
* Brass sheets
* Zinc sheets
* Aluminum sheets
* Bright Drawn Mild Steel
* Carbon steel
* Brass rods
* Aluminum rods
* Abrasive materials
* Grinding paste
* Cotton wastes
* Cleaning detergents

# CORE UNITS OF LEARNING

## VEHICLE BASIC MAINTENANCE

**UNIT CODE: ENG/CU/AUT/CR/1/5/A**

**Relationship to Occupational Standards**

This unit addresses the unit of competency: **Perform Vehicle Basic Maintenance.**

**Duration of Unit:** 50 hours

 **Unit description**

This unit specifies the competencies required to perform vehicle basic maintenance. It involves assess vehicle mechanical and operational condition, carry out diagnostic tests, service vehicle lubrication system, replenish fluids and lubricants, replace/service vehicle service parts, conduct road tests, service Vehicle Wheels and Tyres and finalize service and repair procedures.

**Summary of Learning Outcomes**

1. Assess vehicle mechanical and operational condition
2. Carry out diagnostic tests
3. Service vehicle lubrication system
4. Replenish fluids and lubricants
5. Replace/service vehicle serviceable parts Conduct road tests
6. Carry out vehicle component and system adjustments
7. Service Vehicle Wheels and Tyres
8. Finalize service and repair procedures

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Assess vehicle mechanical and operational condition
 | * Preparing periodic maintenance schedule
* Preparing work area
* Assessment methods
* OSHA 2007
* Conducive working environment e.g. appropriate ventilations, free from fumes and poisonous gases
* use of personal protective equipment and clothing (PPE)
* selection and use of appropriate tools and equipment
* use of protective covering to prevent damage to vehicles
* Draining and disposal of used oils
* Disposing of scrap components
* Preparing mechanical and operational assessment report
 | * Observation
* Practical test
* Written tests
* Oral questioning
 |
| 1. Carry out diagnostic tests
 | * Identifying sources of technical information and regulations
* Identifying vehicle system codes
* Assessing condition and performance of the vehicle system
* Identifying defects using diagnostic equipment
* Adhering to manufacturers’ specifications and guidelines
* Proper use of diagnostic machine in the vehicle
* Adhering to agreed timescales and completion times
* Keeping customers informed of progress
* Preparing diagnostic assessment report
* Maintenance documentation and records
 | * Observation
* Practical test
* Written tests
* Oral questioning
 |
| 1. Service vehicle lubrication system
 | * Diagnosing vehicle lubrication system
* Replacing Engine transmission and hydraulic filters
* Greasing vehicle components
* Testing lubrication system pressure
 | * Observation
* Practical test
* Written tests
* Oral questioning
 |
| 1. Replenish fluids and lubricants
 | * Identification and selection of appropriate tools, equipment, vehicle and personal protective equipment;
* Assessment methods used to check for vehicle conformity;
* Identification of the different systems to be inspected including:
* engine
* chassis
* brakes
* wheels and tyres
* steering and suspension
* transmission and driveline
* electrical and electronics
* exterior vehicle body
* vehicle interior
* 3.4 Use of approved inspection checklists and recording documentation.
 | * Observation
* Written tests
* Practical test.
* Oral questioning
 |
| 1. Replace/service vehicle service parts
 | * Identification of appropriate diagnostic equipment and instrumentation;
* The importance of equipment calibration before use;
* Identification of systems to be tested including:
* battery and charging;
* fuel;
* ignition;
* engine management;
* exhaust emission;
* lighting;
* electrical and electronics;
* steering and suspension geometry;
* Air-conditioning.
* Procedures for carrying out diagnostic tests and identification of faults;
* Carrying out adjustments in accordance with manufacturers specifications;
* Rectification of identified faults to restore performance to original specifications;
* The use of checklists and recording documentation.
 | * Observation
* Written tests
* Practical test
* Oral questioning
 |
| 1. Conduct road tests.
 | * The use of manufacturers’ specifications to identify the correct types and grades of lubricants and fluids for systems including:
* brakes and clutch operation;
* power assisted steering;
* cooling system;
* windscreen washers;
* Diesel engine emission control.
* Lubricants and fluids replenished to the levels and quantities as specified by the manufactures;
* Protective measures to avoid spillage that may damage the vehicle and cause a safety and health hazard;
* Identification of service parts that should be replaced as part of routine maintenance including:
* Oil, fuel, air and diesel exhaust filters;
* Wiper blades;
* Spark plugs;
* Brake pads/linings;
* Drive belts;
* Seals and gaskets.
* The use of manufacturers’ part numbers to verify that the parts are correct for the type of vehicle;
* Use of appropriate tools for removal and replacement to ensure correct replacement without damage;
* Tests to ensure that the replacement parts perform to manufacturers specifications;
* Disposal of waste oil, fluids, and scrap parts in accordance with current environmental regulations.
 | * Observation
* Written tests
* Practical test
* Oral questioning
 |
| 1. Carry out adjustments to vehicle components and systems.
 | * Use of manufacturers technical information to identify operating specifications and tolerances;
* Special tools and equipment for checking and carrying out adjustments;
* Identification of components and systems that are to be checked and adjusted including:
* valve clearances;
* spark plug gaps;
* exhaust emission settings;
* wheel, steering and suspension alignment;
* headlight alignment;
* drive belt tension;
* engine idling speed;
* lubricants and fluid levels;
* fuel pressure;
* brake clearances;
* tyre rotation;
* Wheel balancing.
* The use of approved checklists and documentation to record checks and adjustments carried out.
 | * Observation
* Practical test.
* Written tests
* Oral questioning
 |
| 1. Service Vehicle Wheels and Tyres
 | * Identifying and repairing tyre punctures
* Performing wheel balancing
* Performing tyre fitting on the rim
* Straightening bent wheel rims
* Replacing tyre pressure nozzles
* Maintaining tyre pressure
 | * Observation
* Written tests
* Practical test
* Oral questioning
 |
| 1. Finalize service and repair procedures.
 | * All maintenance activities completed within an agreed timescale;
* The vehicle interior and exterior clean and presentable in compliance with company policy;
* A report for the customer that includes all the work that was carried out during the routine maintenance, including results of assessments, rectifications and replaced parts;
* A report to advise the customer of any further defect(s) that were identified during the routine maintenance, with recommendations for further action;
* Maintenance records completed accurately in an approved format.
 | * Written tests
* Practical test.
* Oral questioning
 |

**Suggested Methods of instructions**

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

**Recommended Resources**

* A fully equipped motor vehicle maintenance workshop;
	+ Fully functional light vehicle(s);
	+ Vehicle lift;
	+ Specialist tools and diagnostic equipment appropriate for the different makes of vehicles that are being maintained;
	+ Exhaust emission tester;
	+ Headlamp alignment equipment;
	+ Internet access to manufacturers’ technical information;
	+ Torque setting tools;
	+ Personal protective equipment (PPE) and suitable coverings to protect vehicles;
	+ Facilities for the disposal of waste oil and used parts;
* Engine and transmission lubricants;
* Fluids for cooling systems, brakes, clutch, windscreen washer, hydraulic power assisted steering and diesel engine exhaust emission control;
* Air, oil, exhaust, and air conditioning filters;
* Oil seals and gaskets;
* Brake pads and linings;
* Spark plugs;
* Screen wiper blades;
* Drive belts.
* Vehicle cleaning materials;
	+ Hand cleaner.

## SERVICING AND REPAIRING VEHICLE ENGINE COMPONENTS

**UNIT CODE: ENG/AUT/CR/2/5/A**

**Relationship to Occupational Standards**

This unit addresses the unit of competency: **Service and Repair Vehicle Engine Components**

**Duration of Unit:** 70 hours

**Unit Description:**

This unit describes the competencies required in service and repair vehicle engine components. It involves troubleshooting and servicing vehicle engine components, performing vehicle engine overhaul, servicing vehicle engine cooling system, servicing vehicle engine exhaust system and lubricating vehicle engine system

**Summary of Learning Outcomes:**

1. Troubleshoot and service vehicle engine components
2. Perform vehicle engine overhaul
3. Service vehicle engine cooling system
4. Service vehicle engine exhaust system
5. Lubricate vehicle engine system

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Troubleshoot vehicle engine components conditions
 | * Use of Personal protective equipment (PPE)
* Health and safety regulations
* Engine removal
* Dismantling of engine
* Engine parts
* Servicing engine parts
* Reassembling of engine parts
* Engine fitting
* Re-installation checks
 | * Practical
* Oral questioning
* Written test
 |
| 1. perform vehicle engine overhaul
 | * Replacement of Engine oil seals
* Replacement of Engine oil rings/ piston gudgeon pin
* Replacement of Timing belts/chains
* Replacement of Engine bearings
* Replacement of ***Engine pulleys***
* Replacement of ***Engine V-belts***
* Replacement of Engine gaskets
* Servicing Engine blocks
* Replacement of Water/oil pump
* Adjustment of Tappet clearance
* Replacement of Engine camshaft
* Grinding Valve seats
* Replacement of Valve guides
* Replacement of Oil sump/strainer/PCV
* Replacement of Engine mountings
* Performing Engine tune up
 | * Practical
* Oral questioning
* Written test
 |
| 1. Service vehicle engine cooling system
 | * Checking and testing Radiator cap
* Checking and testing cooling radiator
* Checking and testing cooling system hoses
* Checking and testing thermostat operations
* Checking and testing thermistor switches/ sensors
* Checking and testing water pump
* Checking and testing cooling fan operation
* Checking and testing cooling system
* bleeding cooling system
* reading vehicle engine coolant
* replenishing coolant
 | * Practical
* Oral questioning
* Written test
 |
| 1. Service vehicle engine exhaust system
 | * Checking leakage
* checking blockage
* checking and testing catalytic converter/ particulate filters
* repairing exhaust system leaks
* installing and mounting exhaust system
* checking and testing oxygen sensor
 | * Practical
* Oral questioning
* Written test
 |
| 1. lubricate vehicle engine system
 | * draining and replacing engine oil
* replacing engine transmission and hydraulic filters
* greasing light vehicle components
* greasing heavy commercial vehicle components
* greasing Heavy machinery
* reading Lubricants
 | * Practical
* Oral questioning
* Written test
 |

**Suggested Methods of instructions**

* Presentations
* Demonstrations
* Guided learner activities
* Supervised activities and projects in a workshop;
* Visiting lecturer/trainer from the motor vehicle service and repair sector;
* Industrial visits.

**Recommended Resources**

* Comprehensive set of hand tools for the service and repair of motor vehicle Engines.
* Engine instructional models;
* A fully equipped motor vehicle maintenance workshop;
* Fully functional vehicle(s);
* Vehicle lift/inspection pit;
* Specialist tools and diagnostic equipment appropriate for the different makes and types of vehicle engines that are being maintained;
* Internet access to manufacturers’ technical information/data
* Torque setting tools;
* Personal protective equipment (PPE) and suitable coverings to protect vehicles;
* Vehicle protective coverings;
* Facilities for the disposal of waste oil and used parts;
* Customer database and systems for recording maintenance records.
* igital instructional material including DVDs and CDs;
* Consumables for service and repair of vehicle engines including:
* Engine lubricants;
* Sealants, oil seals and gaskets;
* Cleaning materials;
* Hand cleaner;
* Cotton waste for cleaning

## SERVICING VEHICLE FUEL SYSTEM

**UNIT CODE: ENG/CU/AUT/CR/3/5/A**

**Relationship to Occupational Standards**

This unit addresses the unit of competency: **Service Vehicle Fuel System**

**Duration of Unit:** 40 hours

**Unit Description:**

This unit describes the competencies required to service vehicle fuel system. It involves servicing fuel components, replacing petrol fuel pump and diesel injector pump, performing injector timing, testing injectors for pressure and voltage.

**Summary of Learning Outcomes:**

1. Service fuel components e.g. injectors, tank

2. Replace petrol fuel pump

3. Replace diesel injector pump, rail, pipes and nozzles.

4. Perform injector pump timing

5. Test fuel injectors for injection pressure and voltage

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Service fuel components e.g. injectors, tank.
 | * The observance of Kenyan regulations concerned with health, safety and the environment;
* Disposal of faulty components
* The use of personal protective equipment and clothing (PPE) used throughout work activities;
* Components of vehicle fuel system
* Tools and equipment for servicing fuel system
* Troubleshooting of fuel system
* Dismantling of the fuel system of the vehicle
* Use of technical data in servicing and repairing components.
 | * Practical test
* Oral questioning
* Portfolio of evidence
* Written test
 |
| 1. Replace petrol fuel pump
 | * Functions of the petrol fuel pump.
* Principle of operation of the pump
* Structure of the pump
* Servicing and fitting of the pump in the vehicle fuel system
* Precautions when handling petrol fuel pump.
 | * Practical test
* Oral questioning
* Portfolio of evidence
* Written test
 |
| 1. Replace diesel injector pump, rail, pipes and nozzles.
 | * + Functions of the
* Diesel injector pump
* Rail
* Fuel pipes
* Nozzles
* Principle of operation of the:
* Diesel injector pump
* Rail
* Fuel pipes
* Nozzles
* Structure of the pump
* Injector pump
* Rail
* Fuel pipes
* Nozzles
* Servicing and fitting of the diesel pump components in the vehicle fuel system
* Precautions when handling petrol fuel pump
 | * Practical test
* Oral questioning
* Portfolio of evidence
* Written test
 |
| 1. Perform injector pump timing
 | * Definition of the injector pump timing
* Importance of the injector pump timing
* Injector timing units
* Tools and equipment for injector pump timing
 | * Practical test
* Oral questioning
* Portfolio of evidence
* Written test
 |
| 1. Test fuel injectors for injection pressure and voltage
 | * Tools and equipment for testing
* Manufacturer’s specification in setting pressure and voltage
* Procedure for testing voltage and pressure for fuel injectors
* Default voltage and pressure for fuel injectors.
 | * Practical test
* Oral questioning
* Portfolio of evidence
* Written test
 |

**Suggested Methods of instructions**

* Presentations
* Demonstrations
* Guided learner activities
* Visiting lecturer/trainer from the motor vehicle service and repair sector;
* Industrial visits.

**Recommended Resources**

Comprehensive set of hand tools for the service and repair of motor vehicle auxiliary systems

* Vehicle lift/inspection pit;
* Specialist tools and diagnostic equipment appropriate for the different makes and types of vehicle that are being maintained;
* Internet access to manufacturers’ technical information;
* Torque setting tools;
* Personal protective equipment (PPE) and suitable coverings to protect vehicles;
* Facilities for the disposal of waste oil and used parts;
* Fuel system Instructional models;
* A fully equipped motor vehicle maintenance workshop;
* Fully functional vehicle(s)
* Functional fuel system;
* Digital instructional material including DVDs and CDs;
* Consumables for service and repair of vehicle auxiliary systems including;
* Oil seals and gaskets;
* Coolants;
* Cleaning materials;
* Hand cleaner;
* Dusters.

## SERVICINGVEHICLE TRANSMISSION SYSTEMS

**UNIT CODE: ENG/CU/AUT/CR/4/5/A**

**Relationship to Occupational Standards**

This unit addresses the unit of competency: **Service Vehicle Transmission Systems.**

**Duration of Unit:** 40 hours

**Unit Description**

This unit specifies competencies required to service vehicle transmission system.It involves organize to service vehicle transmission systems,Troubleshoot vehicle transmission system ,overhaul gearbox unit (manual), overhaul gearbox semi/automatic, carry out hydraulic/tiptronic test and measurement.

**Summary of Learning Outcomes**

* + - 1. Organize to service vehicle
			2. Troubleshoot vehicle transmission system
			3. Overhaul gearbox (manual)
			4. Overhaul gearbox (semi/ automatic)
			5. Carry out hydraulic/ tiptronic system tests and measurements.

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Organize to service vehicle
 | * + The observance of Kenyan regulations concerned with health, safety and the environment;
	+ The adoption of safe working practices to avoid injury and the prevention of damage to vehicles and property;
	+ The use of personal protective equipment and clothing (PPE) used throughout work activities;
	+ The selection and use of appropriate tools and equipment relevant to all activities;
	+ Steps taken to avoid spillage of fluids that may cause personal injury and damage vehicles;
	+ The use of protective covering to prevent damage to vehicles;
	+ The disposal of scrap components, waste oils and fluids in accordance with current legal requirements and company policy.
 | * Practical test
* Oral questioning
* Written tests
* Portfolio of evidence.
 |
| 1. Troubleshoot vehicle transmission system
 | * + How transmission systems and their related units and components are constructed and operate;
	+ The importance of using appropriate technical information for the removal of units;
	+ Cleaning of components to facilitate inspection and assessment
	+ Correct methods and procedures of inspecting and assessing transmission components including:
	+ Damage;
	+ Wear;
	+ Fracture.
	+ Troubleshooting techniques
	+ Evaluation of components for:
	+ Serviceability;
	+ Unserviceability;
	+ Need for replacement;
	+ Need for adjustment
 | * Practical test
* Oral questioning
* Written tests
* Portfolio of evidence.
 |
| 1. Overhaul gearbox unit (manual)
 | * + How transmission units and components are removed and replaced for the type of vehicle worked upon;
* Units include:
	+ Manual friction clutch;
	+ Torque converter;
	+ Manual gearbox;
	+ Propeller shaft and centre; support bearing;
	+ Drive shafts;
	+ Final drive;
	+ Differential;
	+ Transaxle
	+ Vehicle transmission components
	+ Bearings;
	+ Wheel hubs;
	+ Gears;
	+ Synchronizer;
	+ Gearbox shafts and thrust plates;
	+ Gear selectors, sensors and linkages;
	+ Constant velocity (CV) and universal joints (UJ);
	+ Clutch assemblies release bearings;
	+ Transmission unit mountings.
	+ Correct methods and procedures for dismantling transmission units;
	+ Importance of the use of manufactures’ part numbers for replacement parts
	+ Assembling of components in accordance with manufacturers’ procedures including:
	+ Torque setting;
	+ Clearances;
	+ Adjustments;
	+ End-float;
	+ Tolerances.
	+ Selection and use of gaskets, sealants, seals, fittings and fasteners
 | * Practical test
* Oral questioning
* Written tests
* Portfolio of evidence.
 |
| 1. Overhaul gearbox unit (semi/ automatic)
 | * + How transmission systems and their related units and components are constructed and operated.
	+ Importance of the use of manufactures’ part numbers for replacement parts;
	+ Reassembling components in accordance with manufacturers’ procedures including:
	+ Torque setting;
	+ Clearances;
	+ Adjustments;
	+ End-float;
	+ Tolerances.
	+ Selection and use of gaskets, sealants, seals, fittings and fasteners;
	+ Transmission components
* Units include:
	+ Torque converter;
	+ Semi/ automatic gearbox;
	+ Front clutch
	+ Rear clutch
	+ Front brake band
	+ Rear brake band
	+ Sun wheel gear
	+ Planetary gear
	+ Carrier gear
	+ Pressure pump
	+ Shift valve
 | * Practical test
* Oral questioning
* Written tests
* Portfolio of evidence..
 |
| 1. Carry out hydraulic/ tiptronic system tests and measurements
 | * + Types of post vehicle transmission system tests
	+ Importance of testing after reassembly.
	+ The importance of completing all service and repair activities within an agreed timescale.
 | * Practical test
* Oral questioning
* Written tests
* Portfolio of evidence.
 |

**Suggested Methods of instructions**

* Presentations
* Demonstrations
* Guided learner activities
* Visiting lecturer/trainer from the motor vehicle service and repair sector;
* Industrial visits.

**Recommended Resources**

* Transmission Instructional models;
* A fully equipped motor vehicle maintenance workshop;
* Fully functional light vehicle(s);
* Transmission units;
* Vehicle lift/inspection pit;
* Gearbox jack;
* Specialist tools and diagnostic equipment appropriate for the different makes and types of vehicle transmission systems that are being maintained;
* Automatic transmission test equipment;
* Internet access to manufacturers’ technical information;
* Torque setting tools;
* Personal protective equipment (PPE) and suitable coverings to protect vehicles;
* Facilities for the disposal of waste oil and used parts;
* Digital instructional material including DVDs and CDs
* Consumables for service and repair of vehicle transmission systems including:
* Transmission lubricants
* Oil seals and gaskets
* Cleaning materials
* Hand cleaner
* Dusters

## SERVICING VEHICLE STEERING SYSTEMS

**UNIT CODE: ENG/CU/AUT/CR/5/5/A**

**Relationship to Occupational Standards**

This unit addresses the unit of competency**:** **Service Vehicle Steering System.**

**Duration of Unit:** 40 hours

**Unit Description:**

This unit specifies competencies required to service vehicle steering system. It involves assess vehicle steering system, remove steering components, assess serviceability of vehicle, replace/service vehicle steering, fit and test vehicle steering components and document vehicle steering system service

**Summary of Learning Outcomes:**

* + - 1. Assess vehicle steering system
			2. Remove steering components
			3. Assess serviceability of vehicle.
			4. Replace/service vehicle steering.
			5. Fit and test vehicle steering components.
			6. Finalize vehicle steering system service

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Method** |
| 1. Assess vehicle steering system
 | * The observance of Kenyan regulations concerned with health, safety and the environment;
* The use of personal protective equipment and clothing (PPE) used throughout work activities;
* The disposal of scrap components, waste oils and fluids in accordance with current legal requirements and company policy.
* Functions of steering system in the vehicle
* Types of steering systems
* Conventional
* Twin-axle
 | * Practical tests e
* Oral questioning
* Written test
* Portfolio of evidence.
 |
| 1. Remove steering components
 | * Functions of steering system
* Components of steering system
* Layout of various steering systems
* Tools and equipment for servicing steering system
* Dismantling of the steering system
* Safety precautions in servicing steering system
* 2.7 Disposal of faulty components
 | * Practical tests e
* Oral questioning
* Written test
* Portfolio of evidence
 |
| 1. Assess serviceability of vehicle.
 | * Diagnosis and servicing of steering gearbox
* Worm and wheel
* Worm and sector
* Worm and nut
* Worm and roller
* Recirculating
* Rack and pinion
* Diagnosis, service and replacement of steering systems
* Conventional
* Power assisted
* Leakages
* Over steering
* Under steering
* Power
* Components of four wheel steering system
 | * Practical tests e
* Oral questioning
* Written test
* Portfolio of evidence
 |
| 1. Replace/service vehicle steering.
 | * The importance of using appropriate technical information as a guide for assessment;
* Correct methods and procedures for dismantling steering units;
* Cleaning of components to facilitate inspection and assessment of components;
* Using visual and measurement methods and procedures for inspecting and assessing components for:
* Damage;
* Wear;
* Corrosion;
* Fracture;
* Distortion.
* Evaluate components for:
* Serviceability;
* Unserviceability;
* Tolerances;
* Need for replacement;
* Need for adjustment.
* Importance of the use of manufactures’ part numbers for replacement parts;
* Selection and use of gaskets, seals, shims, fittings and fasteners;
* Steering wheel centralisation;
* 4.10 Test and evaluate the performance of the steering units and components after reassembly.
 | * Practical tests e
* Oral questioning
* Written test
* Portfolio of evidence
 |
| 1. Fit and test vehicle steering components.
 | * The selection and use of appropriate tools and equipment for the replacement of suspension and steering units;
* Replacement of steering units and components.
* Securing and adjusting external linkages, connections and operating mechanisms;
* Replenish lubricants and fluids as prescribed;
* Testing and components for satisfactory operation;
* Setting steering geometry
 | * Practical tests e
* Oral questioning
* Written test
* Portfolio of evidence
 |
| 1. Finalize vehicle steering system service
 | * Importance of testing vehicle steering system.
* Types of tests done on steering system.
* Data analyzation and report writing.
* 6.4 The importance of completing all service and repair activities within an agreed timescale and keeping others informed of progress
 | * Practical tests e
* Oral questioning
* Written test
* Portfolio of evidence
 |

**Suggested Methods of instructions**

* Presentations
* Demonstrations
* Guided learner activities
* Supervised activities
* Visiting lecturer/trainer from the motor vehicle service and repair sector;
* Industrial visits.

**Recommended Resources**

* Steering systems instructional models
* A fully equipped motor vehicle maintenance workshop
* Comprehensive set of hand tools for the service and repair of motor vehicle suspension and steering systems.
* Vehicle lift/inspection pit,
* Specialist tools and diagnostic equipment appropriate for the different makes and types of vehicle that are being worked on;
* Steering geometry measurement equipment;
* Internet access to manufacturers’ technical information
* Torque setting tools
* Personal protective equipment (PPE) and suitable coverings to protect vehicles.
* Facilities for the disposal of waste oil and used parts;
* Customer database and systems for recording maintenance records
* Steering and suspension lubricants including grease
* Power assisted steering fluid
* Oil seals and gaskets
* Cleaning materials

## SERVICING VEHICLE SUSPENSION SYSTEMS.

**UNIT CODE: ENG/CU/AUT/CR/6/5/A**

**Relationship to Occupational Standards**

This unit addresses the unit of competency**:** **Service vehicle suspension.**

**Duration of Unit:** 50 hours

**Unit Description**

This unit specifies competencies required to service vehicle suspension system. It involves assess vehicle suspension components, remove vehicle suspension system components, assess vehicle suspension component serviceability and replace/service vehicle system It also involves fitting and testing vehicle suspension components and documenting vehicle suspension service.

**Summary of Learning Outcomes:**

* + - 1. Assess vehicle suspension system.
			2. Remove vehicle suspension components.
			3. Assess vehicle suspension components serviceability.
			4. Replace/service vehicle suspension components.
			5. Fit and test vehicle suspension components.
			6. Vehicle suspension system service documentation

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Method** |
| 1. Assess vehicle suspension system.
 | * The observance of Kenyan regulations concerned with health, safety and the environment;
* The use of personal protective equipment and clothing (PPE) used throughout work activities;
* The disposal of scrap components, waste oils and fluids in accordance with current legal requirements and company policy.
* Functions of suspension system in the vehicle
* Types of suspension systems
* MacPherson struct
* Wishbone
* Construction
* Operation
* Suspension units in a vehicle
* Springs
* Arms
* Dampers
* Air suspension
* Hydra gas
* Hydro pneumatic
* Hydraulic suspension
* Rubber suspension
* Hydrolastic
 | * Practical tests e
* Oral questioning
* Written test
* Portfolio of evidence
 |
| 1. Remove vehicle suspension components.
 | * The importance of using appropriate technical information throughout servicing and repair activities;
* Identification and selection of appropriate tools, equipment, and personal protective when removing suspension units and components;
* Correct methods and procedures for the removal of suspension units.
* The layout and operation of suspension systems;
* The construction and operation of suspension systems units including:
* Suspension coil and leaf springs;
* Torsion bar spring;
* Suspension dampers;
* Suspension struts;
* Control arms;
* Tie rods;
* Anti-roll bar;
* Hydro-Pneumatic and control unit;
 | * Practical tests e
* Oral questioning
* Written test
* Portfolio of evidence
 |
| 1. Assess vehicle suspension components serviceability.
 | * Troubleshooting vehicle suspension components
* Tools and equipment for troubleshooting vehicle suspension system
* Using visual and measurement methods and procedures for inspecting and assessing components for:
* Damage;
* Wear;
* Corrosion;
* Fracture;
* Distortion.
* Servicing vehicle suspension system
* Materials used in servicing vehicle suspension system
* Disposal of faulty vehicle suspension system
 | * Practical tests e
* Oral questioning
* Written test
* Portfolio of evidence
 |
| 1. Replace/service vehicle suspension components.
 | * Cleaning of components to facilitate inspection and assessment of components;
* Evaluate components for:
* Serviceability;
* Unserviceability;
* Tolerances;
* Need for replacement;
* Need for adjustment.
* Components reassembled in accordance with manufacturers’ procedures, torque settings and adjustments;
* Importance of the use of manufactures’ part numbers for replacement parts;
* Selection and use of gaskets, seals, shims, fittings and fasteners;
* Test and evaluate the performance of the suspension and steering units and components after reassembly.
 | * Practical tests e
* Oral questioning
* Written test
* Portfolio of evidence
 |
| 1. Fit and test vehicle suspension components.
 | * The selection and use of appropriate tools and equipment for the replacement of suspension and steering units;
* Procedure of replacing suspension
* Securing and adjusting external linkages, connections and operating mechanisms;
* Replenishing of lubricants and fluids.
* Setting of suspension geometry.
 | * Practical tests e
* Oral questioning
* Written test
* Portfolio of evidence
 |
| 1. Vehicle suspension system service documentation
 | * Importance of testing vehicle suspension system.
* Types of tests done on suspension system.
* Data analyzation and report writing.
* The importance of completing all service and repair activities within an agreed timescale and keeping others informed of progress
 | * Practical tests e
* Oral questioning
* Written test
* Portfolio of evidence
 |

**Suggested Methods of instructions**

* Presentations
* Demonstrations
* Guided learner activities
* Supervised activities
* Visiting lecturer/trainer from the motor vehicle service and repair sector;
* Industrial visits.

**Recommended Resources**

* Suspension systems instructional models
* A fully equipped motor vehicle maintenance workshop
* Vehicle lift/inspection pit,
* Specialist tools and diagnostic equipment appropriate for the different makes and types of vehicle that are being worked on;
* Internet access to manufacturers’ technical information
* Torque setting tools
* Personal protective equipment (PPE) and suitable coverings to protect vehicles.
* Facilities for the disposal of waste oil and used parts;
* Customer database and systems for recording maintenance records
* Steering and suspension lubricants including grease
* Power assisted steering fluid
* Oil seals and gaskets
* Cleaning materials
* Hand cleaner
* Dusters

## SERVICING VEHICLE BRAKING SYSTEMS

**UNIT CODE: ENG/CU/AUT/CR/7/5/A**

**Relationship to Occupational Standards**

This unit addresses the unit of competency: **Service Vehicle Braking Systems.**

**Duration of Unit:** 50 hours

**Unit Description**

This unit specifies competencies required to service motor vehicle braking system. It involves, assess vehicle braking system,dismantle wheel brake assembly parts ,assess braking components,replace wheel brake assembly parts,replace brake cylinders and service brake system

**Summary of Learning Outcomes**

1. Assess vehicle braking system
2. Dismantle wheel brake assembly parts
3. Assess braking components
4. Replace brake units and components
5. Replace brake cylinders
6. Service brake system

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Method** |
| 1. Assess vehicle braking system | * selection and use of appropriate tools and equipment
* Kenyan health and safety regulations
* safe working practices
* Conducive working environment e.g. Ventilation, dust and fumes free
* Personal protective equipment(PPE) and clothing
* Work area cleaning
* Motor vehicle cleaning.
* Brake fluid draining and disposed
* Steps taken to avoid spillage of fluids and damage to vehicles
 | * Practical Test
* Written Test
* Oral Questioning
 |
| 2 . Dismantle wheel brake assembly parts | * The construction and operation of the following types of braking systems:
* Mechanical brakes;
* Hydraulic brakes;
* Pneumatic brakes
* Antilock brakes;
* Traction control.
* Using appropriate technical information
* Methods and procedures for the removal of brake units;
* The operation of the following components:
* Master cylinders;
* Wheel cylinders;
* Brake lines;
* Brake servo units;
* Brake discs;
* Callipers;
* Brake pads;
* Brake pedal;
* Drum;
* Shoes and lining;
* Brake adjusters;
* Brake sensors and actuators;
* ABS unit;
* Parking brake cable;
* Hydraulic brake fluid.
 | * Practical Test
* Written Test
* Oral Questioning
 |
| 3.Assess braking components  | * Methods and procedures for disassembling braking system
* Cleaning braking components for inspection and assessment
* Methods and procedures of inspecting and assessing braking components
* Evaluating brake components for:
* Serviceability,
* Unserviceability,
* Need for replacement,
* Need for adjustment
* Replacing worn out and damage components
* Assembling of braking components
* Selection and use of seals, fittings and fasteners;
* Test and evaluate the performance of brake units and components after reassembly.
 | * Practical Test
* Written Test
* Oral Questioning
 |
| 4. Replace brake units and components. | * Manufacturers’ technical specification replacing braking units and components
* Replacing braking units and components
* Replacing brake pads and linings
* Replacing Brake callipers and drum
* Replacing Brake flexible pipes
* Replacing Brake adjusters/actuators (HCV)
* Servicing Parking brake
* Replenishing brake fluids
* Use of manufactures’ part numbers for replacement parts
* Testing braking units and components
 | * Practical Test
* Written Test
* Oral Questioning
 |
| 5.Replace brake cylinders | * Replacing Brake master cylinder
* Servicing Brake booster
 | * Practical Test
* Written Test
* Oral Questioning
 |
| 6. Service brake system | * assembling Drum/disc brakes
* replenishing and bleeding Brake fluid
* Servicing Brake booster and ABS system
* Adjusting Braking (Dynamometer test)
* Servicing Auxiliary brakes
* Conducting Vehicle road test
* Adhering to Service and repair time frame
* Documentation of Service and repair
 | * Practical Test
* Written Test
* Oral Questioning
 |

**Suggested Methods of instructions**

* Presentations
* Demonstrations
* Guided learner activities
* Supervised activities
* Visiting lecturer/trainer from the motor vehicle service and repair sector;
* Industrial visits.

**Recommended Tools and Equipment**

* Comprehensive set of hand and power tools for the service and repair of motor vehicle brake system
* Brake system instructional models
* A fully equipped motor vehicle maintenance workshop
* Fully functional vehicle(s)
* Brake units
* Vehicle lift/inspection pit
* Jack and stands
* Brake testers/platform /roller
* Specialist tools and diagnostic equipment appropriate for the different makes and types of vehicle braking systems that are being maintained
* Internet access to manufacturers’ technical information
* Torque setting tools
* Personal protective equipment (PPE) and suitable coverings to protect vehicles
* Facilities for the disposal of waste brake fluid and used parts
* Customer database and systems for recording maintenance records
* Digital instructional material including DVDs and CDs;
* Brake fluids;
* Lubricants;
* Seals, fasteners and fittings;
* Cleaning materials;
* Hand cleaner;
* Dusters;
* Vehicle protective covering

## SERVICING VEHICLE ELECTRICAL SYSTEMS

**UNIT CODE: ENG/CU/AUT/CR/8/5/A**

**Relationship to Occupational Standards**

This unit addresses the unit of competency: **Service Vehicle Electrical Systems**

**Duration of Unit: 40** hours

**Unit Description:**

This unit specifies competencies required to service vehicle electrical system. It involves, diagnosis electrical system, service vehicle ignition system, electrical accessories, service vehicle air conditioning, service vehicle charging systems,service vehicle auxiliary systems,service vehicle lighting system,service vehicle electrical motors and install vehicle safety systems

**Summary of Learning Outcomes:**

1. Diagnose electrical systems
2. Service vehicle ignition system
3. Service vehicle electrical accessories
4. Service vehicle air conditioning system
5. Service vehicle charging systems
6. Service vehicle auxiliary system
7. Service vehicle lighting system
8. Service vehicle electrical motors
9. Install Vehicle safety systems

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Diagnose electrical systems
 | The importance of verifying electrical defect(s) with the client;* The importance of referring to appropriate technical information throughout diagnostic and rectification activities;
* The use of relevant electrical diagnostic equipment including on
* multi meters
* scanners
* code readers
* board diagnostics
* The use of correct and systematic methods and procedures for the removal of components.
* Measures taken to prevent electrical hazards.
 | * Practical Tests
* Oral questioning
* Written test
* Portfolio of Evidence
 |
| 1. Service vehicle ignition system
 | * Types of ignition systems
* Coil ignition
* Magneto ignition
* Transistor assisted ignition
* Electronic ignition
* Capacitor discharge ignition
* Operating principles of ignition system
* Coil ignition
* Primary and secondary
* Contact breaker points
* Condenser
* Spark plugs
* Distributor
* Battery
* High tension leads
* Switch
* Operation
* Construction components of ignition systems
* Diagonizing and repair of ignition system
* Diagonizing tools and equipment
* Testing of ignition system
 | * Practical Tests
* Oral questioning
* Written test
* Portfolio of Evidence
 |
| 1. Service vehicle electrical accessories
 | * The importance of confirming replacement accessory compatibility with the vehicle;
* Confirmed of the accessories with legislations in terms of legality and prohibition;
* Fitting of the accessories to the vehicle
* Accessory installed in accordance with prescribed guidelines;
* Accessory tested after fitting to confirm correct operation.
 | * Practical Tests
* Oral questioning
* Written test
* Portfolio of Evidence
 |
| 1. Service vehicle air conditioning systems
 | * Definition of vehicle air conditioning
* Construction and operation of air condition system
* Evaporator
* Heater blower motor
* Condenser
* Pump
* Drier
* Piping
* Electric control of vehicle air conditioning system
* Diagnosing of air conditioning system
 | * Practical Tests
* Oral questioning
* Written test
* Portfolio of Evidence

. |
| 1. Service vehicle charging systems
 | * Vehicle charging circuit components
* Charging circuit principles
* Dynamo
* Alternator
* Parts of charging system
* Generator/dynamo/alternator
* Rectifier
* Regulator
* Stator
* Rotor
* Battery
* Switch
* Dismantle vehicle charging system
* Diagnose and repair faults in a charging system
 | * Practical Tests
* Oral questioning
* Written test
* Portfolio of Evidence
 |
| 1. Service vehicle auxiliary systems.
 | * Auxiliary components of vehicles
* Windscreen
* Radio and television
* Camera
* GPRs
* Wipers
* Mirrors
* Central locking
* Windows and doors
* Gauges
* Horns
* Security alarms
* Air bags
* Principles of operations of auxiliary components
* Diagonizing and servicing of the components
* Installation of auxiliary components
 | * Practical Tests
* Oral questioning
* Written test
* Portfolio of Evidence
 |
| 1. Service vehicle lighting systems
 | * Definition of vehicle lighting system
* Lighting system layouts
* Construction and operation of different types of vehicles lamps
* Diagnosis and repair of vehicle lighting system
* Vehicle lighting circuits
* Types of lamps
* Beam setting
* Manual
* Optical
* Switches
 | * Practical Tests
* Oral questioning
* Written test
* Portfolio of Evidence
 |
| 1. Service vehicle electrical motors
 | * Definition of electrical motors
* Principles of operation of electrical motors
* Types of electrical motors
* Handling of vehicle electrical motors
* Servicing of motors
* Components of motors
* Uses of motors
* Fitting of electrical motors in vehicles
* Disposal of faulty electrical motors
* Electrical motor calculations
 | * Practical Tests
* Oral questioning
* Written test
* Portfolio of Evidence
* Project
 |
| 1. Install Vehicle safety systems
 | * Installing Airbags
* Connecting Safety belts
* Mounting electrical components related to vehicle
* Fitting anti-roll components
* Fitting vehicle tracker
 | * Practical Tests
* Oral questioning
* Written test
* Portfolio of Evidence
 |

**Suggested Methods of instruction**

* Presentations
* Demonstrations
* Guided learner activities
* Supervised activities
* Visiting lecturer/trainer from the motor vehicle service and repair sector;
* Industrial visits.

**Recommended**

* Comprehensive set of hand and power tools for the diagnosis service and repair of motor vehicle electrical systems
* Electrical system instructional models;
* A fully equipped motor vehicle maintenance workshop;
* Vehicle lift/inspection pit;
* Specialist tools and diagnostic equipment appropriate for the different makes and types of vehicle electrical systems that are being maintained including multi-meters, scanners and code readers
* Internet access to manufacturers’ technical information
* Torque setting tools
* Personal protective equipment (PPE)
* Vehicle protective coverings
* Facilities for the disposal of used parts
* Customer database and systems for recording maintenance records
* Fully functional light vehicle(s)
* Digital instructional material including DVDs and CDs
* Vehicle Electrical cables and connectors
* Seals, fasteners and fittings
* Cleaning materials
* Dusters
* Aftermarket accessories including GPS systems, dash cameras; radios and speakers, auxiliary lights.
* Manufacturers service manuals for the vehicles that are being serviced
* Appropriate automotive engineering text books available on numerous websites e.g.
* Vehicle Construction and Use Regulations
* Aftermarket manufacturer’s manuals.

## PERFORMING VEHICLE BODY WORKS

**UNIT CODE: ENG/CU/AUT/CR/9/5/A**

**Relationship to Occupational Standards**

This unit addresses the unit of competency: **Perform Vehicle Body Works**

**Duration of Unit: 70** hours

**Unit Description:**

This unit specifies the competencies required to perform vehicle body works. It involves use body work tools and equipment, perform vehicle body jacking, perform vehicle body pulling ,perform vehicle body dent checking, beating and gas welding ,perform vehicle body filing and sanding ,apply spot putty ,perform vehicle body cleaning/degreasing ,spray and valet vehicle body,perform vehicle body fitting and perform vehicle body buffing ispose vehicle body scrap/dead stock

**Summary of Learning Outcomes:**

1. Perform vehicle body jacking
2. Perform vehicle body pulling
3. Perform vehicle body dent checking, beating and gas welding
4. Perform vehicle body filling and sanding
5. Apply spot putty
6. Perform vehicle body cleaning/degreasing
7. Spray and valet vehicle body
8. Perform vehicle body fitting
9. Perform vehicle body buffing

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Perform vehicle body jacking
 | * Definition of jacking
* Types of jacking
* Importance of jacking
* Safety precautions in jacking
* Jacking sections in vehicle body
* Jacking tools and equipment
* Operation of jacking machines
 | * Practical Test
* Oral Questioning
* Supervised exercises
* Wriiten Test
* Portfolio of eveidence
* project

. |
| 1. Perform vehicle body pulling
 | * Definition of pulling
* Types of vehicle pulling
* Importance of pulling
* Safety precautions in pulling
* Pulling sections in vehicle body
* Pulling tools and equipment
* Operation of pulling machines
 | * Practical Test
* Oral Questioning
* Supervised exercises
* Wriiten Test
* Portfolio of eveidence
* project
 |
| 1. Perform vehicle body dent checking, beating and gas welding
 | * Vehicle body dent identification techniques
* Types of vehicle body damages
* Types of damage
* Minor damages
* Major damages
* Technical report
* Tools and equipment in panel beating
* Types of vehicle body parts
* Parts of vehicle body
* Bonnet
* Boot
* Firewall/bulkhead
* Sill
* Pillar
* Cant rails
* Panels
* Door skins
* Scuttle
* Drip moulding
* Valance
* Methods of chassis alignment
* Materials used in panel beating
* Panel beating procedures
* Precautions for panel beating process
 | * Practical Test
* Oral Questioning
* Supervised exercises
* Wriiten Test
* Portfolio of eveidence

project |
| 1. Perform vehicle body filling and sanding
 | * Vehicle body preparation for filling and sanding.
* Body filling and sanding tools and equipment
* Filling materials
* Filling and sanding procedures
* Repair of damaged filling procedures
* Precautions in body vehicle sanding
 | * Practical Test
* Oral Questioning
* Supervised exercises
* Wriiten Test
* Portfolio of eveidence

project |
| 1. Apply spot putty
 | * Definition of spot putty
* Importance of spot putty
* Spot putty materials
* Spot putty application process
* Removal of spot putty materials
* Sand drying process
* Safety precautions
 | * Practical Test
* Oral Questioning
* Supervised exercises
* Wriiten Test
* Portfolio of eveidence

project |
| 1. Perform vehicle body cleaning/degreasing
 | * Importance of vehicle body cleaning
* Cleaning tools and equipment
* Cleaning agents
* Cleaning procedures
* Disposal of cleaning waste
 | * Practical Test
* Oral Questioning
* Supervised exercises
* Wriiten Test
* Portfolio of eveidence

project |
| 1. Spray and valet vehicle body
 | * Tools and equipment used in spray painting
* Spray guns
* Gravity feed
* Pressure feed
* Suction
* Compressors
* Strainers
* Computerized paint mixer
* Spectrophotometer
* Spreaders
* Materials used in spray painting
* Cloth/paper towels
* Tack rags
* Paint paddle
* Spot and glaze putty
* Sanding blocks
* Rubbing compounds
* Polishes and waxes
* Paints
* Undercoats
* Thinner
* Guide coat
* Spraying painting process
* Color mixing
* Color coding
* Surface preparation
* Painting sequence
* Safety precautions
 | * Practical Test
* Oral Questioning
* Supervised exercises
* Wriiten Test
* Portfolio of eveidence

project |
| 1. Perform vehicle body fitting
 | * Tools and equipment for vehicle body fittings
* Sewing machines
* Web stretchers
* Ripping chassis
* Cutting tools
* Joining tools
* Qualities of the parts to be fixed
* Economic use of available materials
* Types of vehicle belts and seat belts
* Bench
* Bucket
* Seat belts
* Continuous lap
* Lap
* Shoulder
* Fixing vehicle body parts
 | * Practical Test
* Oral Questioning
* Supervised exercises
* Wriiten Test
* Portfolio of eveidence

project |
| 1. Perform vehicle body buffing
 |  |  |

**Suggested Methods of instructions**

* Presentations
* Demonstrations
* Guided learner activities
* Supervised activities
* Visiting lecturer/trainer from the motor vehicle service and repair sector;
* Industrial visits.

**Recommended Resources**

* Comprehensive set of hand and power tools for the diagnosis service and repair of motor vehicle electrical systems
* Electrical system instructional models;
* A fully equipped motor vehicle maintenance workshop;
* Fully functional light vehicle(s)
* Vehicle lift/inspection pit;
* Specialist tools and diagnostic equipment appropriate for the different makes and types of vehicle electrical systems that are being maintained including multi-meters, scanners and code readers;
* Internet access to manufacturers’ technical information;
* Torque setting tools;
* Personal protective equipment (PPE);
* Vehicle protective coverings;
* Facilities for the disposal of used parts
* Digital instructional material including DVDs and CDs
* Vehicle Electrical cables and connectors
* Seals, fasteners and fittings
* Cleaning materials
* Dusters
* Aftermarket accessories including GPS systems, dash cameras; radios and speakers, auxiliary lights.
* Manufacturers service manuals for the vehicles that are being serviced;
* Appropriate automotive engineering text books available on numerous websites e.g.
* Vehicle Construction and Use Regulations;
* Aftermarket manufacturer’s manuals.
* Customer database and systems for recording maintenance records.