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COURSE TITLE: METAL WORK PROCESSING TECHNOLOGY

LEVEL: 1

CODE: 14.1.1

TIME: 50

14.1.1.01 **MODULE TITLE: WORKSHOP SAFETY AND ENGINEERING MATERIALS**

14.1.1.02 **MODULE DESCRIPTION**

This module contains general occupational information, general workshop safety and engineering materials module units. The study of the occupational module unit will create awareness to the trainee for job and further training opportunities available to the trainee after the courses. While the study of general working and engineering materials will create firm foundation that will be used during the training in this course.

14.1.1.03 **PURPOSE**

This module is designed to provide the necessary knowledge skills and attitudes that create awareness to the available.

14.1.1.04 **GENERAL OBJECTIVES**

The aim of module is to enable the trainee to:

a) have an awareness of job and training opportunities available in the metal processing trade
b) understand the general workshop safety and regulations
c) understand the common engineering materials and their application
d) understand how to estimate and cost materials for a product

MODULE UNIT	SPECIFIC OBJECTIVES/ LEARNING OUTCOMES	LEARNING ACTIVITIES	TEACHING METHODS	LEARNING RESOURCES	ASSESSMENT
OCCUPATIONAL INFORMATION	At the end of this module unit, the trainee should be able to: a) state job opportunities for a metal processing person b) list further training programs available for a metal processing person. c) state the relationship between metal processing industry and other related trades	• Stating job opportunities • Listing further training programs • Stating relationship	- Lecturing - discussion - note taking	- career booklets - policy documents - relevant ministry policy documents - institutions directory - career booklets	- oral tests - written tests - assignments

GENERAL SAFETY	At the end of this module unit, the trainee should be able to: a) state safety rules and regulations to be observed in the workshop. b) name types of fires c) name fire fighting media for various types of fires and their location d) state the first aid procedure in the workshop e) state the importance of the factories Act	• Stating safety rules and regulations to be observed in the workshop • Naming types of fires class a, b and c • Naming fire fighting media • Stating first aid procedures • Stating the importance of the Factories Act	- lecture - discussion - notes taking	- safety manuals - textbooks - handouts - handouts on factories Act Abstract	- oral/written tests - continuous assessment tests(CATS)
ENGINEERING MATERIALS	At the end of this module unit, the trainee should be able to: a) name common engineering materials b) list properties of engineering materials c) state different forms of materials supply d) outline workshop tests used to identify materials. e) state safety precautions to be observed in handling and storing materials	• Naming common engineering materials • Listing properties of engineering materials • Stating forms of materials supply • Outlining workshop tests • Stating safety precautions	- lecture - discussion - illustrations	- text books - chalk/white board - handouts - specimen of materials	- oral/written tests - assignment

GENERAL SAFETY	At the end of this module unit, the trainee should be able to: a) identify the health hazards in a working situation and take the appropriate action b) wear appropriate working clothing c) demonstrate first aid in the workshop d) practice fire fighting drills e) observe safety awareness f) state the importance of the factories Act	• Identifying health hazards • Wearing appropriate working clothes • Demonstrating first aid • Practising fire fighting drills.(Class A, B, and C fires) • Observing safety awareness • Stating the importance of the factories Act	- illustrations - demonstration	- fire fighting equipment - protective clothing - first Aid kit - text books - chalkboard - charts - manuals	- practical exercises - oral/written tests - assignments
MATERIALS	At the end of this module unit, the trainee should be able to: a) identify different types of metals b) select appropriate materials for a given task c) identify different types of forms of supply d) perform simple workshop tests to determine given properties e) demonstrate safe working habits	• Identifying metals • Selecting appropriate materials • Identifying forms of supply • Performing simple workshop tests • Demonstrating safe working habits	- discussion/lecturer - demonstrations	- materials samples - grinding machine - magnets - files - textbooks - handout - chalk board - charts	- practical exercises - oral tests - assignments

MATERIALS ESTIMATING AND COSTING	At the end of this module unit, the trainee should be able to: a) estimate the quantities of materials required for a product form a working drawing b) cost the product	• Estimating the quantities of materials • Costing the material for the product	- lecture - discussion - demonstration	- working - drawing - price list - chalkboard - textbooks - handouts	- oral tests - written test

COURSE TITLE:	**METAL PROCESSING TECHNOLOGY**
LEVEL:	**I**
CODE:	**14.1.2**
TIME:	**400 HOURS**
.01 MODULE TITLE:	**BENCH WORK AND FITTING**

14.1.2.02 **DESCRIPTION**

Bench work and fitting practice enables the trainee to make functional products, produce tools and equipment in a workshop using measuring, marking out, cutting and forming hand tools. The graduate of this module will be able to work as competent general fitter.

14.1.2.03 **PURPOSE**

This module is deigned to equip the trainee with the necessary skills, knowledge and attitude that will enable him/her to become a competent general fitter.

14.1.2.04 **SPECIAL REQUIREMENT**

The trainee must have proper knowledge of engineering materials and their uses covered in module 1 and skills of reading and interpreting working drawing covered in technical drawing I.

14.2.05 **GENERAL OBJECTIVES**

The aim of this module is to enable the trainee to:

a) understand various hand tools and equipment used in bench work and fitting.
b) use the hand tools and equipment when doing fitting work.
c) produce functional articles
d) care for and maintain hand tools and equipment used in fitting work
e) demonstrate proper attitudes when doing fitting work

MODULE UNIT	SPECIFIC OBJECTIVES/ LEARNING OUTCOMES	LEARNING ACTIVITIES	TEACHING METHODS	LEARNING RESOURCES	ASSESSMENT
CLAMPING DEVICES	At the end of this module unit, the trainee should be able to: a) name various types of clamping devices in a workshop b) name parts of engineering vice c) explain the correct methods of maintaining and caring for engineers device	• Naming various types of clamping devices • Naming parts of the engineers vice • Explaining the correct materials of naming, maintenance and care	- Illustration - lecture - group discussion	- Working bench - Engineers vice - 'G' clamp - chalkboard - text books - handouts	- oral/written tests - assignments
MEASURING TOOLS	At the end of this module unit, the trainee should be able to: a) name various measuring tools b) state the uses of each of the measuring tools c) explain how to care for and maintaining measuring tools.	• Naming measuring tools: • Uses of measuring tools • Care and maintenance of measuring tools	- demonstration - lecture - discussion	- measuring and inspecting tools - chalkboard - text books - materials to be prepared - safety handouts	- oral tests - written tests - assignments

MARKING OUT TOOLS	At the end of this module unit, the trainee should be able to: a) name various marking out tools b) state the uses each of the marking tool c) explain how to care for and maintain marking tools	• Naming marking tools • Stating uses of marking tools • Care and maintain of measuring tools	- Illustration - Lecture/discussion	- chalkboard - handouts - text book - marking out tools	- oral/written tests - assignments
MATERIAL REMOVAL	At the end of the module unit, the training should be able to: a) name various types of tools used for materials removal b) state the uses of each of the tools c) explain how to care for and maintain materials removal tools.	• Naming types of tools. • Stating uses of files • Explaining care and maintenance	Illustration - lecture - discussion	- files - wire brush/file card - charts - chalkboard - textbook	- oral tests - written tests - assignment

CUTTING TOOLS	At the end of the module unit, the training should be able to: a) name various types of cutting tools b) state the uses of each cutting tool c) explain how to care for and maintain cutting tools.	• Naming types of cutting tools. • Stating uses of cutting tools • Caring and maintenance of cutting tools.	- Illustration - discussion - lecture	- cutting tools - textbooks - chalkboard - handout	- oral/written tests - assignments
DRILLING	At the end of the module unit, the training should be able to: name various types of drilling machines name parts of sensitive drilling machine list various types of drill bits state various operations carried on drilling machine state safety precautions to be observed when drilling explain how to care for and maintain drilling machine	• Naming types of drilling machines • Naming parts of a sensitive drilling machine • Naming types of drill bits • Naming operations on a drilling machine • Naming safety precaution • Explain care and maintenance	- demonstration - discussion - lecture	- charts - chalkboard - textbooks - sensitive drilling machine	- oral tests - written tests - assignments

THREAD CUTTING TOOLS	At the end of this module unit, the trainee should be able to: a) name various types of thread cutting tools b) state uses of thread cutting tools c) explain how to care for and maintain thread cutting tools	• Naming types of thread cutting tools uses of thread cutting tools • Caring and maintenance	- lecture - discussion - demonstration	- thread cutting tools - textbooks - chalkboard - charts	- oral/written tests - assignments
FASTENING DEVICES	At the end of this module unit, the trainee should be able to: a) name various types of fastening devices b) state uses of each fastening device c) explain how to care for and maintain fastening devices.	• Types of fastening devices • Locking devices • Uses of fastening devices • Naming various types of rivets and the materials they are made from • Care and maintenance of fastening devices	discussion lecture demonstration	rivets spanners screw drivers allen keys chalkboard textbooks handouts	oral tests written tests assignments

MEASURING AND CHECKING	At the end of this module unit, the trainee should be able to: a) identify measuring tools b) use measuring tools to take measurements and check squareness and parallelism c) care for measuring and checking tools.	• Identifying measuring and checking tools • Using tools to take measurements • Caring and maintaining of measuring and checking tools	- discussion - demonstration - taking notes	- measuring and checking tools - textbooks - charts - handout - chalkboard	- assignments - continuous assessment tests(CATS) - oral/written tests observation
MARKING OUT	At the end of this module unit, the trainee should be able to: a) identify marking out tools b) use marking out tools c) care for and maintain marking out tools d) observe safety when marking out.	Identifying marking out tools Using of marking out tools Caring and maintaining marking out tools Observing safety precautions when marking out	- demonstration - discussion/lecture	- marking out tools - textbooks - charts/diagrams - handouts	- oral/written test - practical assignment - observation

LING	At the end of this module unit, the trainee should be able to: a) identify various types of files b) use file to produce a component to the required dimensions c) care for and maintain files d) observe safety precautions when filling	Identifying types of files Using file to remove materials Caring and maintaining of files Observing safety	- demonstration - discussion - taking notes	- files - textbooks - handouts - charts/diagrams	- Practical assignment - Oral/written tests - Observation
SAWING AND CHIPPING	At the end of this module unit, the trainee should be able to: a) identify various types of sawing and chipping tools b) use sawing and chipping tools to saw and chip to size c) care for and maintain sawing and chipping tools. d) observe safety and sawing and chipping	• Identifying types of sawing and chipping tools • Using sawing and chipping tools • Caring and maintaining of sawing and chipping tools • Observing safety precautions	- demonstration - discussion/lecture	- chisels - hacksaws - textbooks - handouts - Charts	- practical assignment - oral/written tests - observation

DRILLING	At the end of this module unit, the trainee should be able to: identify various types of drilling machines identify various types of drill bits use drilling machine and drill bits to perform a given task demonstrate safe working habits when using a drilling machine care for and maintain drilling machine and drill bits	• Identifying types of drilling machines • Identifying types of drill bits • Using drilling machine to perform given task • Caring and maintaining of drilling machine and bits strating safety precautions	- demonstration - lecture/discussion - notes taking	- drilling machine - dr drilling machine - drilling bits - boring bits - counter sinking bits - textbooks - handouts - chalkboard - Charts - illing bits - boring bits - counter sinking bits - textbooks - handouts - chalkboard - Charts	- oral/written tests - practical exercises - observations

THREADS CUTTING	At the end of this module unit, the trainee should be able to: a) identify thread cutting tools b) select the correct tap and dies for a given thread c) drill appropriate hole for tapping d) use the taps to cut internal threads e) use dies to cut external threads f) care and maintain taps and wrenches g) observe safety precautions when drilling and tapping	• Identifying thread cutting tools • Selecting correct taps and dies Drilling appropriate tapping hole • Cutting internal threads • Cutting external threads using dies • Caring and maintaining of taps and dies • Observe safety precaution	- demonstration - discussion - note taking	- taps - dies - textbooks - handouts chart/diagrams	- oral/written tests - practical assignment - observations

FASTENING	At the end of this module unit, the trainee should be able to: a) identify various types of locking devices b) identify tools and equipment used in making various riveted and bolted joints c) use tools and equipment to make a riveted or bolted joint d) assess the quality of a riveted or bolted joint e) care for and maintain tools and equipment used for making riveted and bolted joints f) observe safety when making riveted or bolted joints	• Identifying locking devices • Identifying tools and equipment used in making various riveted and bolted joints • Using tools and equipment to make riveted or bolted joints • Assessing the quality of a riveted or bolted joint • Caring and maintaining tools equipment and articles	- demonstration - lecture/discussion	- riveting tools - rivets - taps and dies - bolts and screws - fastening tools - chalkboard - text books - chart/diagrams - hand outs	- oral/written tests - practical assignment observations

TITLE: METAL PROCESSING TECHNOLOGY

LEVEL I

CODE: 14.1.3

TIME: 300 HOURS

14.1.3.01 **MODULE TITLE: SHEET METAL WORK**

14.1.3.02 **DESCRIPTION**

Sheet metal work in this module is a process that is used to fabricate sheet metal products such as chicken feed trough, bodies of vehicles, agriculture implements, cabinets and office furniture using hand tools. The graduate of this module will be able to work competent sheet metal fabricator.

14.1.3.03 **PURPOSE**

This module is designed to equip the trainee with the necessary knowledge skills and attitude that will enable him/her fabricate or repair sheet metal products using hand tools.

14.1.3.04 **SPECIAL REQUIREMENT**

The trainee must have proper knowledge of sheet metals and their uses covered in module I. knowledge and skills of technical drawing will also be require before attempting this module.

14.1.3.05 **GENERAL OBJECTIVES**

The aim of this module is to enable the trainee to:

a) understand sheet metal work processes that are used in the fabrication of sheet metal products
b) use correctly hand tools when fabricating sheet metal products
c) fabricate functional sheet metal products
d) repair agricultural implements and sheet metal components
e) care for and main sheet metal tools
f) demonstrate safety precautions when fabricating sheet metal products

MODULE UNIT	SPECIFIC OBJECTIVES/ LEARNING OUTCOMES	LEARNING ACTIVITIES	TEACHING METHODS	LEARNING RESOURCES	ASSESSMENT
SHEET METAL WORK MATERIALS	At the end of this module unit, the trainee should be able to: a) list down various types of sheet metal commonly used in metal industry b) state typical applications of sheet metals in the metal industry c) state the properties and characteristics of the sheet metal materials d) explain the differences between the sheet metal and plates e) state the safety precautions to be observed when handling sheet metal	• Listing down types of sheet metal commonly used in metal industry • Stating typical application of sheet metals in the metal industry • Stating the properties and characteristics of sheet metal materials • Explaining the differences between the sheet metal and plates • Stating the safety precautions	- lecture/discussion - taking notes	- materials - textbooks - chalkboards - charts	- oral/written tests - assignment

SHEET METAL HAND TOOLS AND EQUIPMENT	At the end of this module unit, the trainee should be able to: a) name various hand tools and equipment used in sheet metal work b) state the uses of hand tools and equipment used in sheet metal work c) explain how to care for and maintain sheet metal work tools d) state the safety precautions to be observed when using the hand tools	• Naming hand tools and equipment used in sheet metal work • Explaining how to care for and maintain sheet metal tools and equipment Stating safety precautions to be observed when using tools and equipment	- lecture - discussion - taking notes	- sheet metal tools - chalkboards - chart/diagrams - textbooks	- oral/written tests - assignment

SHEET METAL JOINTS SEAMS	At the end of this module unit, the trainee should be able to: a) name sheet metal joints commonly used in sheet metal work b) state typical applications of sheet metal joints and edge treatments c) list down tools/equipment used for making each joint/seam and edge treatment d) explain how to care for and maintain of tools and equipment used in sheet metal e) explain the safety precautions to be observed when preparing given sheet mental joint seam.	• Naming sheet metal joints and edge treatment • Stating typical applications of sheet metal joints and edge treatment • Listing of tools/equipment used for making joint/seam treatment • Stating safety precautions to be observed when preparing given sheet metal joints / edges	- lecture - discussion - taking notes	- chalkboards - textbooks - chart/diagrams	- oral/written tests - assignment

PATTERN LAYOUT AND DEVELOPMENT	At the end of this module unit, the trainee should be able to: a) define the term pattern in sheet metal work b) state importance of pattern development in sheet metal work c) name the tools used for pattern layout d) explain the operation of procedure for developing the pattern for a given components e) state the necessary safety precautions to be observed when developing a pattern	• Defining the term pattern • Stating importance of surface development • Naming tools used for pattern layout • Explaining operation procedures • Stating necessary safety precaution to be observed	- pattern development tools - lecture - discussion - taking notes	- chalkboards - textbooks - chart/diagrams	- oral/written tests - assignment

SHEET METAL FORMING	At the end of this module unit, the trainee should be able to: a) distinguish between folding and bending of sheet metal b) state typical applications of each process c) name types of folding and bending tools/equipment used in sheet metal work d) explain the correct method of forming various sheet metal components e) explain how to care for and maintain folding and bending tools/equipment f) list the safety precautions to be observed when folding and bending sheet metal	• Distinguish between folding and bending • Naming tools and equipment used for folding and bending sheet metal • Stating application of each operation • Explaining the correct method of folding and bending • Explaining how to take care and maintain folding and bending tools/equipment Listing safety precautions to be observed when folding and bending sheet metal	- lecture/discussion - taking notes - field visits	- chalkboards - textbooks - chart - diagrams	- oral/written tests - quizzes assignment

SHEET METAL EDGES	At the end of this module unit, the trainee should be able to: a) list down the various types of edges formed on sheet metal products b) state the purpose of *forming* edges on a sheet metal product c) *name* various tools and equipment used in forming edges d) state the operational procedure used in forming various edges e) state safety precautions to be observed during edge forming	• Listing down various types of edges • Stating the purpose of forming edges • Naming tools and equipment used in edge forming • Stating the operational procedure used in forming edge • Stating safety precautions to be observed when forming an edge	- lecture/discussion - taking notes	- edge forming tools - textbooks - chalkboards - chart/diagrams	- oral/written tests assignment

SOFT SOLDERING	At the end of this module unit, the trainee will be able to:- a) define the term soft soldering b) state common uses of soft soldering process c) list typical applications of soldering d) name various types of solders and their compositions e) name various types of fluxes f) state functions of fluxes g) list various soldering tools and equipment h) list various sheet metal work joints i) state the factors to be considered when soldering j) state qualities of a well soldered joint k) explain the correct procedure of soft soldering process l) state safety precautions to be observed when soft soldering.	• Defining the term soft soldering • Stating common use of soft soldering • Listing typical application of soft soldering • Naming various types of solders and their compositions • Naming various types of fluxes • Stating the functions of fluxes • Listing various soldering tools and equipment • Listing various sheet metal work joints • Stating the factors to be considered when soldering • Stating qualities of a well soldered joint • Explaining the correct procedure of carrying out soft soldering operation • Stating safety precautions to be observed when soldering	- lecture/discussion - taking notes illustration	- soldering equipment - solder and flux - work pieces - text books - chalkboards charts/diagrams	- oral/ written tests assignments

SOFT SOLDERING	At the end of this module unit, the trainee should be able to: a) select tools and equipment for a given task b) select a flux suitable for a given joint c) select solder suitable for a given joint d) execute a soft soldered joint e) perform visual inspection f) perform a simple leak test g) demonstrate safety to be observed in soft soldering	• Selecting tools and equipment • Selecting suitable fluxes • Selecting suitable solder • Executing a soldered joint • Performing visual inspection • Performing leak test • Demonstrating safety	- discussion / lecture - notes taking - demonstration	- soldering equipment - solder and flux - work pieces - text books - chalkboard	- practical exercises - observations - oral / written tests assignments

FABRICATION OF AN ASH TRAY	At the end of this module unit, the trainee should be able to:- a) observe safety precautions when fabricating an ash tray b) carry out product survey c) read and interpret a working drawing d) estimate and cost the materials e) select the appropriate tools and equipment f) prepare the parts of an ash try g) join the parts of an ash tray h) carry out the finishing process carry out quality control measures	• Observing safety precautions to be observed when fabrication ash tray. • Carrying out product survey • Reading and interpreting working drawing • Estimating and costing the materials required • Selecting appropriate tools and equipment • Preparation of ash tray parts • Joining parts of ash tray • Carrying out finishing process • Carrying out quality control measures	- lecture/discussion - taking notes demonstration	- soldering equipment - solder and flux - rivets - work pieces - text books - chalkboards charts/diagrams	- observations - oral/ written tests - assignments - practical exercises

COURSE TITLE: METAL PROCESSING TECHNOLOGY

LEVEL: I

CODE: 14.1.4

TIME: 350 HOURS

14.1.4.01 **MODULE TITLE: OXY-ACETYLENE GAS WELDING, CUTTING AND BRAZING**

14.1.4.02 **DESCRIPTION**

Oxy-acetlylene welding is a fusion metal joining process using oxy acetylene flame. Brazing is a non-fusion joining process and uses bonding. This process is used in repair of motor vehicle bodies, making office furniture, agricultural implements and other products made of thin sheet metal. Brazing is used to repair bicycle frames.

This module is designed therefore to equip the trainee with the necessary knowledge, skills and attitudes that will enable him/her to weld such metal products

14.1.4.03 **PURPOSE**

The purpose of this module is to expose the trainee to various gas welding, cutting and brazing techniques that will make him/her a competent gas welder in flat and horizontal welding positions

14.1.4.04 **SPECIAL REQUIREMENT**

The trainee must have proper knowledge of engineering materials and their uses, bench work and fitting covered in modules I and II respectively. Knowledge and skills of Technical drawing will also be required before attempting this module

14.1.4.05 **GENERAL OBJECTIVES**

The aim of this module is to enable the trainee to:

a) understand oxy- acetylene gas welding, cutting and brazing process and its application in fabrication of metal products

b) use correctly hand tools and equipment when gas welding, cutting and brazing metal products

c) repair and produce functional metal products
d) care for and maintain hand tools and equipment use in oxy acetylene gas welding, cutting and brazing
e) develop safety awareness that is required in welding metal products

MODULE UNIT	SPECIFIC OBJECTIVES/ LEARNING OUTCOMES	LEARNING ACTIVITIES	TEACHING METHODS	LEARNING RESOURCES	ASSESSMENT

OXY-ACETYLENE WELDING EQUIPMENT	At the end of this module unit, the trainee should be able to: a) define the term oxy-acetylene welding b) name typical application of oxy acetylene welding in metal processing industry c) name oxy-acetylene gas welding tools and equipment d) outline the uses of gas welding equipment and tools e) list the steps to be followed when setting up gas welding equipment f) outline the various gas supply systems g) care for gas welding equipment h) state safety precaution to be observed when using the equipment	• Defining the term oxy-acetylene welding • Naming typical application of oxy-acetylene welding • Naming gas welding tools and equipment • Outlining the uses of gas welding tools and equipment for a given task • Listing steps to be taken when setting up the equipment • Outlining various supply systems • Caring for the gas welding equipment • Stating safety precautions to be observed	- discussion - lecture - Illustration	- welding equipment - gas systems - text books - chalkboard - charts	- oral/written tests - assignments

OXY-ACETYLENE WELDING TECHNIQUES	At the end of the module unit, the trainee should be able to: a) differentiate rightward and leftward welding techniques b) name types of flames in gas welding and their uses c) state the factors influencing nozzle selection d) state the edge preparation necessary for various material thicknesses e) state various welding positions f) list various sizes of filler rods for a given task	• Differentiating rightward and leftward welding techniques • Naming types of flames and their uses • Stating factors influencing nozzle selection • Stating edge preparation for various thicknesses • Stating various welding positions • Listing various sizes of filler rods	- lecture - group discussion - illustration - notes taking	- oxy-acetylene equipment - textbooks - chalkboard - charts - manuals	- oral/written tests - assignments

QUALITY CONTROL IN GAS WELDING	At the end of this module unit, the trainee should be able to: a) state the qualities of a good weld b) name weld defects, causes and their remedies c) describe various types of distortions and their control d) describe a given weld test	• Stating the qualities of a good weld • Naming weld defects, their cause and remedies • Describing distortions and their controls • Description of weld tests	- lecture - taking notes discussion	- textbooks - handouts chalkboard	- oral/written tests - assignments - continuous assessment tests(CATS)
WELDING JOINTS AND SYMBOLS	At the end of this module unit, the trainee should be able to: a) name different types of welding joints b) identify welding symbols and their uses	• Naming various types of joints • Identifying welding symbols and their uses	- lecture - discussion	- chalkboard - textbooks - charts	- oral/written tests - a ssignments

OXY-ACETYLENE CUTTING	At the end of this module unit, the trainee should be able to: a) state the principle of oxy-acetylene gas cutting b) list oxy-acetylene gas cutting equipment and their uses c) describe various cutting techniques d) state the effects of various factors on the quality of cut e) state the safety precautions to be observed when gas cutting	• Stating the principle of oxy-acetylene gas cutting • Listing oxy-acetylene gas cutting equipment • Describing various cutting techniques • Stating the effects of various factors: • Stating safety precautions to be observed when gas/flame cutting.	- discussion - lecture - note taking	- charts - textbooks - chalkboards	- assignments - continuous assessment tests(CATS) - oral/written tests

BRAZING AND HARD SOLDERING	At the end of this module unit, the trainee should be able to: a) define the terms brazing and hard soldering b) list typical applications of brazing and hard soldering c) name various types of fluxes d) state functions of fluxes e) list various brazing tools and equipment f) list various brazed joints g) state the factors to be considered when brazing and hard soldering h) state qualities of a well brazing joint i) explain the correct procedure for brazing and hard soldering j) state safety precautions to be observed when brazing and hard soldering	• Defining the term brazing and hard soldering • Listing typical application of brazing and hard soldering • Naming types of flux used in brazing and hard soldering • Stating functions of fluxes • Listing various brazing tools and equipment • Listing various brazed joints • Stating the factors to be considered when brazing and soldering • Stating the qualities of a well brazed and soldered joint • Explaining the correct procedure for brazing Stating the safety precautions to be observed when brazing and hard soldering	- discussion - illustration - note taking	- handouts - textbooks - manuals - charts - illustrations	- assignments - oral/written tests

OXY ACETYLENE WELDING EQUIPMENT	At the end of this module unit, the trainee should be able to: a) identify the various gas welding equipment b) assemble basic oxy-acetylene equipment and carry out leak tests c) care for gas welding equipment d) *demonstrate safe* working habits when handling the equipment	Identifying the following equipment and tools Carrying out leak tests Caring for gas welding equipment Demonstrating safety during welding	- lectures/discussion - demonstration\role play	equipment textbooks chalkboard hoses in use pipeline	assignment oral/written tests observation practical work

OXY – ACETYLENE WELDING TECHNIQUES	At the end of this module unit, the trainee should be able to: a) assemble welding equipment and carry out leak tests b) select suitable nozzle for given materials size c) set the flame for a given materials d) execute a weld in the leftward and rightward techniques e) set the correct flame for a given job f) select the correct nozzle for a given job g) prepare the edge for a given material thickness h) select the correct filler rod for a given task i) execute a weld in the various welding positions j) demonstrate safe working habits when welding	Assembling welding equipment Selecting correct nozzle for the given job Setting of correct flame Execution of welds in leftward and rightward techniques Preparing the edge for a given material thickness Selecting the correct filler rod for the job diameter sizes Executing weld in various welding positions Demonstration of safe working habits	- demonstration - lecture - discussion - illustration	manuals charts oxy-acetylene equipment textbooks nozzles material thicknesses filler rods	practical work practical exercise oral questions

QUALITY CONTROL IN GAS WELDING	At the end of this module unit, the trainee should be able to: a) identify a good weld b) identify weld defects and their remedies c) identify various types of distortions and their controls d) perform a given weld test e) demonstrate safe working habits when carrying out weld tests	Identification of a good weld Identification of weld defects Identification of types of distortions Performing a given weld test Demonstrating safe working habits when carrying out weld tests	- discussion - demonstration	weld specimen chalkboard textbooks hand outs charts	practical work continuous assessment tests(cats) tests assignment
WELDING JOINTS AND SYMBOLS	At the end of this module unit, the trainee should be able to: a) carry out edge preparation for a given joint b) produce a desired weld joint from a given working drawing c) demonstrate safe working habits when carrying out edge preparation	Carry out edge preparation for Producing desired weld joint with welding information drawings Demonstrating safe working habit when	- discussion - demonstration - illustrations	chalkboard charts materials handout	oral/written tests assignments

OXY – ACETYLENE CUTTING	At the end of this module unit, the trainee should be able to: a) set up oxy-acetylene equipment ready for cutting b) select the correct size of cutting nozzle for a given task c) adjust the correct flame for cutting d) execute a smooth cut e) perform a visual inspection for surface defects f) observe safety precautions when cutting	• Setting up oxy-acetylene equipment • Selecting cutting nozzles • Adjusting the flame • Executing a smooth cut • Performing visual inspection • Observing safety when cutting	- discussion / lecture - demonstration	oxyacetylene equipment mild steel work pieces textbooks chalkboard charts	oral/ written tests practical exercises on cutting observation

BRAZING	At the end of this module unit, the trainee should be able to: a) select appropriate equipment for brazing b) select suitable brazing rod for a given task c) select suitable brazing flux d) prepare the materials for the task e) perform brazing task f) assess the quality of brazed joints g) demonstrate safe working habits when brazing	• Selecting equipment for brazing • Selecting suitable brazing rods • Selecting suitable flux • Preparing the material for brazing • Performing brazing task • Assessing the quality of brazed joints • Demonstrating safe working habits	- discussion / lecture - demonstrations	- brazing tools and equipment - brazing rod and flux - text books - hand out - chalkboard - charts	- oral/ written tests - practical exercises on brazing - observations

FABRICATIN G MOTOR VEHICLE SILENCER	At the end of this module unit, the trainee should be able to: a) observe safety precautions when fabricating motor vehicle silencer b) carry out product survey c) read and interpret working drawing d) estimate and cost the materials e) select the appropriate tools and equipment f) prepare the parts of the silencer g) joint the parts of the silencer h) carry out the finishing process carry out quality control measures	• Observing safety precautions to be observed when fabricating motor vehicle silencer • Carrying out product survey • Reading and interpreting working drawing • Estimating and costing • Selecting tools and equipment • Preparing parts of the silencer • Joining of silencer parts by oxy – acetylene welding • Carrying out finishing process • Carrying out quality control measures	- discussion - illustration - demonstration	- handouts - textbooks - manuals - charts - illustrations	- practical exercise - oral questions - written tests

COURSE TITLE: **METAL PROCESSING TECHNOLOGY**

LEVEL **1**

CODE: **14.1.5**

TIME: **350 HOURS**

14.1.5.01 **MODULE TITLE: MANUAL ARC WELDING OF MILD STEEL**

14.1.5.02 **DESCRIPTION**

Manual metal arc welding is a fusion joining process using the heat generated by the electric arc. This joining process is used in fabrication of products such as metal steel doors and window frames, gates, steel structures, office furniture and bodies of vehicles. The graduates of this module will be able to work competent welders.

14.1.5.03 **PURPOSE**

The purpose of this module is to expose the trainee to various arc welding techniques that will make him or her competent welder in flat and horizontal welding positions.

14.1.5.04 **SPECIAL REQUIREMENT**

The trainee must have proper knowledge of engineering materials and their uses covered in module I. Knowledge and skills of Technical drawing will also be required before attempting this module.

14.1.5.05 **GENERAL OBJECTIVES**

The aim of this module is to enable the trainee to:

a) understand manual metal arc welding process and its application in fabrication of metal products
b) use tools and equipment when welding metal products
c) produce functional metal products
d) care for and maintain hand tools and equipment in manual metal arc welding
e) develop safety awareness that is required in welding metal products

MODULE UNIT	SPECIFIC OBJECTIVES/ LEARNING OUTCOMES	LEARNING ACTIVITIES	TEACHING METHODS	LEARNING RESOURCES	ASSESSMENT

MANUAL METAL ARC WELDING PROCESS EQUIPMENT	At the end of this module unit, the trainee should be able to: a) define arc welding process b) name typical applications of manual metal arc welding in metal processing c) identify various arc welding equipment and tools d) state the uses of arc welding equipment e) explain how to care for arc welding equipment. f) state safety precaution to be observed when arc welding	• Defining arc welding process • Naming typical applications of manual metal arc welding *fabrication of door frames* • Identifying arc welding equipment • Caring for arc welding equipment • Stating safety precaution to be observed when arc welding	- lecture - discussion - illustration	- textbooks - illustration - arc welding equipment - handouts - charts - chalkboard	- oral/written tests - continuous assessment tests(CATS) - assignments

WELDING ELECTRODES	At the end of this module unit, the trainee should be able to: a) state methods of electrode classification b) name the uses of electrodes c) name the parts of an electrode d) state the functions of electrode coating e) explain factors that govern the electrode selection.	• Stating the methods of classifying electrodes • Naming the uses of electrodes • Naming parts of electrode • Describing methods of electrode coating • Stating the functions of electrode coating • Stating factors that govern electrode selection	- lecture - discussion - illustration	- textbooks - illustration - arc welding equipment - handouts - charts - chalkboard	- oral/written tests - continuous assessment tests(CATS) - assignments
ARC WELDING TECHNIQUES	At the end of this module unit, the trainee should be able to: a) describe the two methods of striking an arc b) state the factors influencing current setting. c) state the factors that govern quality of weld d) state the importance of electrode manipulation in various weave	• Describing the two methods of striking an arc • Stating the factors that influence current setting • Stating the factors that govern quality of weld • Illustrating various weave motions	- lecture - discussion - illustration	- textbooks - illustration - handouts - charts - chalkboard	- oral/written tests - continuous assessment tests(cats)

	motions				
WELDING JOINTS AND SYMBOLS	At the end of this module unit, the trainee should be able to: a) name different types of welding joints b) identify welding symbols and their uses c) state various types of joints, their symbols and use	• Naming various types of joints • Identifying welding symbols and their uses • Stating various types of weld joints and their symbols	- lecture - discussion - illustration	- chalk/white board - textbooks - charts/diagrams - boards	- oral/written tests - assignments
QUALITY CONTROL IN ARC WELDING	At the end of this module unit, the learner should be able to: a) state the qualities of a good weld b) state weld defects and their controls c) outline various types of distortions and their control d) describe a given weld test	• Sating the qualities of a good weld • Stating weld defects and their control • Outlining various types of distorting • Describing a given weld test	- discussion - lecture - notes taking	- handouts - textbooks - manuals	- oral/written tests - assignment
ARC WELDING EQUIPMENT	At the end of the module unit, the trainee should be able to: e) set the metal arc	• Setting the arc welding equipment • Striking an arc • Demonstrating correct use and maintenance of arc welding	- demonstration - illustration	- welding equipment - discussion manual - set of electrodes	- practical work assignment

	welding equipment f) strike an arc g) demonstrate correct use and maintenance of arc welding equipment h) demonstrate correct safe working habits when using welding equipment	equipment • Demonstrating correct safe working habits when using welding equipment		- textbooks - manuals	
WELDING JOINTS AND SYMBOLS	At the end of this module unit, the trainee should be able to: a) carry out edge preparation for a given joint b) produce a desired weld joint from a given working drawing c) demonstrate safe working habits when carrying out edge preparation	• Carry out edge preparation for • Producing desired weld joint with welding information drawings • Demonstrating safe working habit when	- discussion - demonstration - illustrations	- chalkboard - charts - textbooks - handout	- oral/written tests - assignments
ELDING TECHNIQUES	At the end of this module unit, the trainee should be able to: i) Select electrode	• Select electrode for a given task • Setting current for a given task • Executing welding using motioning • Execution of a desired weld • Demonstrating correct use and	- demonstration - discussion	- welding equipment - discussion manual - set of electrodes	- practical work - assignment - oral questions

	for a given task j) set current for a given task k) execute welding using various motions l) execute a desired weld in any position when using the proper welding techniques	maintenance of arc welding machine • Demonstrating correct working habits when using welding equipment		- textbooks - manuals	
QUALITY CONTROL IN ARC WELDING	At the end of this module unit, the learner should be able to: a) identify the features of a good weld b) identify arc weld defects and their remedies c) perform a given weld test	• Identifying the features of a good weld • Identifying welding defects and remedies • Performing a given weld test	- discussion - illustration - demonstration	- testing specimen - handouts - textbooks - manuals - charts	- practical exercise - assignment - written tests
FABRICATION OF STEEL WINDOW FRAME		• Observing safety precautions to be observed when fabricating steel window frame • Carrying out product survey • Reading and interpreting working drawing • Estimating and Costing • Selecting tools and equipment • Preparing parts of the frame • Joining parts of the frame by arc	- arc welding equipment - work pieces - discussion - illustration - demonstration	- handouts - textbooks - manuals - charts - illustrations	- practical exercise - observation - oral and written tests

		welding • Carrying out finishing process • Carrying out quality control measures			

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COURSE TITLE: METAL PROCESSING TECHNOLOGY

LEVEL: 2

CODE: 14.2.1

TIME: 300 HOURS

14.2.1.01 MODULE TITLE: BENCH WORK AND FITTING

14.2.1.02 DESCRIPTION

Bench work and fitting practice in this module, enables the trainee to make functional articles, repair tools and equipment using precision tools such as vernier height gauge, micrometer, combination set. The graduate of this module will be able to work as a competent and precision general fitter.

14.2.1.03 PURPOSE

This module is deigned to equip the trainee with the necessary skills, knowledge and attitude that will enable him/her to become a competent general fitter.

14.2.1.04 SPECIAL REQUIREMENT

The trainee must have covered bench work and fitting at level I.

14.2.1.05 GENERAL OBJECTIVES

The aim of this module is to enable the trainee to:

a) know various hand tools and equipment used in bench work and fitting.
b) use the hand tools and equipment when doing fitting work.
c) produce functional articles
d) care for and maintain hand tools and equipment used in fitting work
e) demonstrate proper attitudes when doing fitting work

MODULE UNIT	SPECIFIC OBJECTIVES/ LEARNING OUTCOMES	LEARNING ACTIVITIES	TEACHING METHODS	LEARNING RESOURCES	ASSESSMENT
WORK HOLDING DEVICES	At the end of this module unit, the trainee should be able to: a) name various work holding devices used in bench work and fitting b) explain the use of each work holding device c) explain the correct method of maintaining and caring for work holding devices	• Naming various work holding devices used in bench work and fitting • Explaining the uses of the work holding devices • Explaining the correct method of caring and maintaining work hold devices	- lecture - discussion - illustration taking notes	- work holding devices - chalkboard - charts - diagrams - textbooks	- oral/written tests - assignment
MEASURING AND MARKING OUT TOOLS	At the end of this module unit, the trainee should be able to: a) name various measuring and marking out tools b) state the uses of each of the marking tools c) explain how to care for and maintain measuring and marking out tools	• Naming measuring and marking out tools • Stating uses of marking tools • Explaining care and maintenance to be taken on measuring and marking tools	- lecture - discussion - illustration - taking notes	- measuring and marking out tools - chalkboard - charts - textbooks	- oral/written tests - assignment

CUTTING TOOLS AND EQUIPMENT	At the end of this module unit, the trainee should be able to: a) name various cutting tools and equipment b) state the uses of each cutting tool and equipment c) name parts of given cutting tools and equipment d) explain how to care for and maintain given cutting tools and equipment e) state safety precautions to be observed when using and cutting tools and equipment.	• Naming cutting tools and equipment • Naming parts of given cutting tool and equipment • Explaining how to care for and maintain given cutting tools and equipment • Stating safety precautions to be observed when using cutting tools and equipment	- lecture - discussion - illustration - taking notes	- cutting equipment - chalkboard - charts - diagrams - textbooks	- oral/written tests assignment

PIPE AND PIPE FITTINGS	At the end of this module unit, the trainee should be able to: a) name various types of pipes b) state various uses of pipes c) list various types of pipe fittings d) list types of tools and equipment used in pipe work e) name various methods of joining pipes explain how to care for and maintain tools and equipment used in pipe work	• Naming various types of pipes • Stating uses of pipes • Listing pipe fittings • Listing tools and equipment used in pipe work • Naming methods of joining pipes • Explaining how to care for and maintain tools and equipment used in pipe fitting work	- lecture - discussion - illustration - taking notes	- chalkboard - charts - textbooks	- oral/written tests - assignments

FITTING WORK	At the end of this module unit, the trainee should be able to: a) read and interpret of given working of a product b) select tools and equipment required to make the product c) measure and mark out the required profiles d) cut to the required shape e) fit the parts to the given tolerances f) carry out quality control measures g) care for and maintain tools and equipment used in fitting work h) observe safety precautions during fitting work.	• Reading and interpreting work drawing • Selecting tools and equipment required to make the product • Measuring and marking out the profiles • Cutting to shape • Fitting the parts to given tolerances • Carrying out quality control measures • Caring and maintaining of tools and equipment • Observing safety precautions	- demonstrations - discussions - note taking	- marking out tools - measuring tools - cutting tools - files - textbooks - chalkboards	- oral/written tests - assignment - practice exercise

PIPE WORK	At the end of this module unit, the trainee should be able to: a) read and interprete pipe work drawing b) select appropriate pipes and pipe fittings for a given job c) select the correct tools and equipment for a given job d) prepare pipes and pipe fittings for joining e) join the pipes using the correct fittings f) carry out quality control measures g) care for and maintain pipe work tools and equipment h) observe safety precautions when doing pipe work.	• Reading and interpreting drawings • Selecting appropriate pipes and pipe fittings • Preparing pipes and pipe fittings • Joining of pipes • Quality control in pipe work • Caring and maintaining pipe work tools and equipment • Observing safety precautions	- demonstrations - discussions	- pipes and pipe fittings - tools and equipments - textbooks chalkboards	- oral/written tests - assignment - practice exercise

COURSE TITLE: METAL PROCESSING TECHNOLOGY

LEVEL: 2

CODE: 14.2.2

TIME: 150 HOURS

14.2.2.01 **MODULE TITLE: SHEET METAL WORK**

14.2.2.02 **DESCRIPTION**

In this module the trainee shall gain skills that will enable him/her fabricate sheet metal products such as water tanks, office furniture, bodies of vehicles using bending, folding rolling machines. The graduate of this module will be able to work as competent sheet metal fabricator

14.2.2.03 **PURPOSE**

This module is designed to equip the trainee with the necessary knowledge, skills and attitude that will enable him/her fabricate or repair sheet metal products using bending, folding and rolling machines.

14.2.2.04 **SPECIAL REQUIREMENT**

The trainee must have proper knowledge of sheet metals and their uses covered in module I. Knowledge and skills of technical drawing will also be requiring before attempting this module.

14.2.2.05 **GENERAL OBJECTIVES**

The aim of this module is to enable the trainee to:

a) understand the working principle of sheet metal fabricating machines
b) use sheet metal fabricating machine efficiently
c) fabricate functional sheet metal products
d) care for and maintain sheet metal machines
e) demonstrate safe working habits when using sheet metal machines.

MODULE UNIT	SPECIFIC OBJECTIVES/ LEARNING OUTCOMES	LEARNING ACTIVITIES	TEACHING METHODS	LEARNING RESOURCES	ASSESSMENT

SHEET METAL BENDING, CUTTING AND FORMING MACHINES	At the end of this module unit, the trainee should be able to: a) list various sheet metal bending, cutting and forming machines b) name the parts of a given sheet metal bending, cutting and forming machine c) state the uses of bending, cutting and forming machines used in sheet metal work d) explain how to care for and maintain bending, cutting and forming machines e) state the safety precautions to be observed when using bending and forming machines	• Listing various sheet metal bending, cutting and forming machines • Naming parts of bending, and forming machines • Stating uses of bending cutting and forming machines • Explaining how to care for and maintain bending, cutting and forming sheet metal machines • Stating the safety precautions to be observed when using bending, cutting and forming sheet metal machines.	- lecture - discussion - illustration - taking notes	- bending cutting and forming machines - chalkboard - charts - textbooks	- oral/written tests - assignment

SHEET METAL JOINTS/WIRED EDGES	At the end of this module unit, the trainee should be able to: a) name sheet metal joints and edge treatments used in sheet metal work b) state typical applications of sheet metal joints and edge treatment used in sheet metal work c) list down machines used for making sheet metal joints and edges d) explain how to care for and maintain sheet metal machines e) explain the safety precautions to be observed when making sheet metal joints and wired edges	• Naming sheet metal joints • Stating typical applications of joints and edge treatments • Listing down machines used for making joints and edge treatments Joints • Explaining how to care for and maintain metal joints and edge treatment machines • Explaining the safety precautions to be observed when using sheet metal joints and edge treatment farming machines	- lecture - discussion - illustration - taking notes	- chalkboard - charts - textbooks	- oral/written tests - assignment

FORMING AND WIRING USING MACHINES	At the end of this module unit, the trainee should be able to: a) read and interprete the working drawing b) prepare a template to be formed with a wired edge c) identify the machines to be used d) set the machine for forming e) notch the edge before wiring f) form the template to shape g) wire the edge using rotary machine h) carry out quality control measure i) care for maintain forming and edge treatment machines j) observe safety when using forming machines	• Reading and interpreting the working drawing • Preparing template • Identifying the machines • Setting the machine • Notching the edges before wiring • Forming template to shape • Wiring the edge using rotary machine • Carrying out Quality control measures • Caring and maintaining forming and edge treatment machines • Observing safety when using forming machines	- discussion - demonstration - taking notes	- forming and wiring machines - chalkboard - charts - textbooks	- oral/written tests - practical exercises observations

FABRICATION OF A WATERING BUCKET	At the end of this module the trainee will be able to:- a) observe safety precautions when fabricating an ash tray b) carry out product survey c) read and interpret a working drawing d) estimate and cost the materials e) select the appropriate tools and equipment f) prepare the parts of a watering bucket g) join the parts of a watering buckets h) carry out the finishing process i) carry out quality control measures	• Observing safety precautions to be observed when fabrication of a watering buckets. • Carrying out product survey • Reading and interpreting working drawing • Estimating and costing the materials required • Selecting appropriate tools and equipment • Preparation of a watering buckets parts • Joining parts of a watering buckets • Carrying out finishing process • Carrying out quality control measures	- lecture/discussion - taking notes - demonstrations	- sheet metal - soldering equipment - solder and flux - work pieces - text books - chalkboards - charts/diagrams	- oral/ written tests - assignments - practical exercise

COURSE TITLE: METAL PROCESSING TECHNOLOGY

LEVEL: 2

CODE: 14.2.3

TIME: 200 HOURS

14.2.3.01 **MODULE TITLE: OXY ACETYLENE WELDING**

14.2.3.02 **DESCRIPTION**

Oxyacetylene welding at this level, is used in fabrication and repair of office furniture, motor vehicle bodies and other thin sheet metal products that are in position using vertical and overhead position. It is also used in welding of stainless steels and aluminium products The graduate of this module will work as competent welders in both vertical and overhead positions.

14.2.3.03 **PURPOSE**

This module is designed to equip the trainee with the necessary knowledge, skills and attitudes that will enable him/her to weld metal products in vertical and overhead positions.

14.2.3.04 **SPECIAL REQUIREMENT**

The trainee attempting this module must have covered module 1 of oxyacetlylene welding in this course.

14.2.3.05 **GENERAL OBJECTIVES**

The aim of this module is to enable the trainee :

a) understand oxy- acetylene gas welding process and its application in fabrication and repair of steel and aluminium products
b) use oxyacetylene equipment when gas welding steel and aluminium products
c) produce functional metal products
d) repair metal products in position
e) care for and maintain hand tools and equipment used in oxy-acetlyne gas welding
f) demonstrate proper attitudes when welding metal products

MODULE UNIT	SPECIFIC OBJECTIVES/ LEARNING OUTCOMES	LEARNING ACTIVITIES	TEACHING METHODS	LEARNING RESOURCES	ASSESSMENT
OXY-ACETYLENE WELDING EQUIPMENT	At the end of this module unit, the trainee should be able to: a) explain the working principle of gas welding equipment b) explain advantages and disadvantages of various gas supply systems c) describe the construction of various gas welding equipment d) explain how to care for and maintain gas welding equipment e) state safety precautions to be observed when using gas welding equipment	• Explaining working principles of gas welding equipment • Explaining advantages and disadvantages of gas supply systems • Describing the construction of gas welding equipment • Explaining how to care for and maintain gas welding equipment • Stating safety precautions observed when gas welding	- lecture - discussion - note taking	- gas welding equipment - textbooks - chalkboards - illustration - charts	- oral/written test - assignment

OXY-ACETELYNE WELDING TECHNIQUES	At the end of this module unit, the trainee should be able to: a) describe various gas welding position b) name typical applications of oxy-acetylene gas welding c) state factors to be considered when gas welding a given materials d) name various types of edge preparations for gas welding e) state factors to be considered when determining working pressures for gases during gas welding	• Describing various gas welding position • Naming typical applications of gas welding • Stating factors to be considered when welding given material • Stating factors to be considered when gas welding a given material • Naming various types of edge preparations for gas welding • Stating factors to be considered when determining working pressures for gases during gas welding	- lecture - discussion - note taking	- textbooks - chalkboards - illustration - charts	- practical exercise - oral/written test - assignment
QUALITY CONTROL IN GAS WELDING	At the end of this module unit, the trainee should be able to: a) describe various types of distorts which occur during welding of aluminum and stainless steels b) describe methods of controlling distortions c) describe procedure of carrying out a given weld test d) state safety precautions to be observed when carrying out quality control test in gas welded joints	• Describing types of distortions which occur during welding of aluminum and stainless steels • Describing methods of controlling distortions • Describing procedure of carrying out weld test • Stating safety precautions to be observed when carrying out quality control tests	- lecture - discussion - note taking	- textbooks - chalkboards - illustration - charts	- oral/written test - assignment

OXY-ACETYLENE WELDING OF STAINLESS STEEL AND ALUMINIUM	At the end of this module unit, the trainee should be able to: a) select appropriate gas welding equipment b) set up gas welding equipment for flat and horizontal gas welding equipment c) select the correct filler rod and flux for a given task d) prepare the edges, and clean the work for welding e) set up the work in the correct position for welding f) join the work piece using the correct welding procedure g) carry out quality control measures h) care for and maintain gas welding equipment i) observe safety precautions when carrying out positional welding	• Setting up equipment • Selecting correct filler rod and flux • Preparing edges and cleaning the work • Cleaning the work • Setting up work for welding • Joining the work pieces • Selecting appropriate gas welding equipment • Carrying out quality control • Caring for and maintaining gas welding equipment • Observing safety precautions when carrying out positional welding of stainless steel and aluminum	- lecture - discussion - note taking	- oxy-acetylene welding equipment workpieces - textbooks - chalkboards - illustration - charts	- practical exercises - oral/written tests assignments
POSITIONAL GAS WELDING OF MILD STEEL	At the end of this module unit, the trainee should be able to: a) select appropriate gas welding equipment b) set up gas welding equipment for vertical, inclined and overhead welding c) select the correct filler metal for a given task d) prepare the edges for welding e) set up the work in the correct position for welding f) join the work pieces using the	• Selecting appropriate welding equipment • Setting up gas welding equipment • Selecting correct filler metal • Preparing the edges for welding • Setting up the work for welding • Joining work pieces using correct procedure • Carrying out quality control measures	- demonstration - discussion - illustration - note taking	- arc welding equipment - welding material - textbooks - chalkboards - charts	- practical exercise - oral test - written test - assignment

	correct welding procedure g)carry out quality control measures h)care for and maintain gas welding equipment observe safety precautions when carrying out position welding	• Carrying for and maintaining gas welding equipment • Observing safety precautions when carrying out positioning gas welding			
FABRICATING STEEL CABINET	At the end of this module unit, the trainee should be able to: a) observe safety precautions when fabricating steel cabinet b)carry out product survey c) read and interpret working drawing d)estimate and cost the materials e) select the appropriate tools and equipment f) prepare the parts of the steel cabinet g)joint the parts of the steel cabinet h)carry out the finishing process i) carry out quality control measures	• Observing safety precautions to be observed when fabricating steel cabinet • Carrying out product survey • Recording and reporting • Reading and interpreting working drawing • Estimating and costing • Selecting tools and equipment • Preparing parts of the steel cabinet • Joining of cabinet parts by oxy – acetylene welding • Carrying out finishing process • Carrying out quality control measures	- discussion - illustration demonstrations	- handouts - textbooks - manuals - charts - illustrations	- practical exercises - oral questions - written tests

COURSE TITLE: **METAL PROCESSING TECHNOLOGY**

LEVEL: **2**

CODE: **14.2.4**

TIME: **200 HOURS**

14.2.4..01 **MODULE TITLE: MANUAL METAL ARC WELDING EQUIPMENT**

14.2.4.02 **DESCRIPTION**

Manual metal arc welding at this level, will enable a trainee gain skills in joining process that is used in fabrication of metal products such as steel doors, window frames, gates steel structures and bodies of vehicles that are in position. It is also used in welding cast iron materials.

The graduates of this module will be able to work as competent welder for structures in position or welds cast iron in various positions.

14.2.4.03 **PURRPOSE**

This module is designed to equip the trainee with the necessary skills, knowledge and attitudes that will enable him/her make and repair cast iron steel products

14.2.4.04 **SPECIAL REQUIREMENT**

The trainee attempting this module must have covered module 1 of manual metal arc welding in this course

14.2.4.05 **GENERAL OBJECTIVES**

The aim of this module is to enable the trainee to:

a) understand manual metal arc welding process and its application in the fabrication and repair of metal products
b) use tools and equipment when welding steel and cast iron products
c) repair steel and cast iron products
d) produce functioned steel products
e) care for and maintain hand tools and equipment in the manual metal arc welding
f) develop safety habits that is required in welding metal products

MODULE UNIT	SPECIFIC OBJECTIVES/ LEARNING OUTCOMES	LEARNING ACTIVITIES	TEACHING METHODS	LEARNING RESOURCES	ASSESSMENT
MANUAL METAL WORK EQUIPMENT	At the end of this module unit, the trainee should be able to: a) explain the working principle of manual metal arc welding equipment b) describe the construction of the arc welding equipment c) explain how to care for and maintain arc welding equipment d) state the safety precaution to be observed when using manual metal arc welding machine	• Explaining the working principle of welding equipment • Describing the construction of the welding equipment • Explaining how to care for and maintenance of welding equipment • Stating safety precautions to be observed when arc welding	- lecture - discussion - note taking	- textbooks - chalkboards - illustration - charts	- oral/written test - assignment
MANUAL METAL ARC WELDING TECHNIQUES	At the end of this module unit, the trainee should be able to: a) name various manual metal arc welding positions b) name typical applications of manual metal arc welding c) state factors to be considered when arc welding a given materials d) name various types of edge preparations for manual metal arc welding	• Naming various arc welding positions • Naming typical applications of manual metal arc welding • Stating factors to be considered when arc welding a given material • Naming various types of edge preparation for manual metal arc welding	- lecture - discussion - note taking	- textbooks - chalkboards - illustration - charts	- oral/written test - assignment
NUAL METAL ARC WELDING OF MILD STEEL	At the end of this module unit, the trainee should be able to: a) read and interprete the working drawing b) select appropriate arc welding equipment	• Reading and interpreting a working drawing • Selecting appropriate welding equipment • Selecting correct electrode	- lecture/discussion - note taking demonstrations	- arc welding equipment - work pieces - cutting tools - textbooks - chalkboards	- practical exercises - oral/written test - assignment

	c) set – up equipment for vertical and overhead welding d) select the correct electrode for a given task e) prepare the edges for welding f) join the work pieces using the correct welding procedure g) carryout quality control measures h) care for and maintain arc welding equipment i) observe safety precautions when carrying out position welding	for a given task • Setting up welding equipment for vertical and overhead position welding • Preparing the edges for welding • Joining the work pieces using the correct welding procedures • Carrying out quality measures • Caring for and maintaining arc welding equipment • Observing safety precautions when carrying out position arc welding		- illustration - charts	
MANUAL METAL ARC WELDING OF CAST IRON	At the end of this module unit, the trainee should be able to: a) read and interpret a working drawing b) select appropriate arc welding equipment c) select the appropriate electrode d) preparer the edges of the work pieces for welding e) join the work piece using the correct welding procedure f) carry out quality control measures g) care for and maintain arc welding equipment h) observe safety precaution when welding cast iron	• Reading and interpreting a working drawing • Selecting appropriate manual metal arc welding equipment • Selecting the correct electrode • Preparing the edges of the work pieces for welding • Joining the work pieces using the correct welding procedures • Carrying out quality control measures • Caring for and maintaining of arc welding equipment • Observing safety precautions when welding cast iron	- Lecture - discussion - note taking - demonstrations	- lathe machine - cutting tools - textbooks - chalkboards - illustration - charts	- practical exercises - oral/written test - assignment

FABRICATION OF STEEL DOOR FRAME	At the end of this module unit, the trainee should be able to: a) observe safety precautions when fabricating steel door frame b) carry out product survey c) read and interpret working drawing d) estimate and cost the materials e) select the appropriate tools and equipment f) prepare the parts of the door frame g) join the parts of the door frame h) carry out the finishing process i) carry out quality control measures	• Observing safety precautions to be observed when fabricating steel door frame • Carrying out product survey • Reading and interpreting working drawing • Estimating and Costing • Selecting tools and equipment • Preparing parts of the frame • Joining parts of the frame by arc welding • Carrying out finishing process	- discussion - illustration - demonstrations	- welding equipment - welding materials - work pieces - handouts - textbooks - manuals - charts - illustrations	- practical exercises - observations - assignments

COURSE TITLE: METAL PROCESSING TECHNOLOGY

LEVEL: 2

CODE: 14.2.5

TIME: 150 HOURS

14.2.5.01 **MODULE TITLE: FORGING AND HEAT TREATMENT OF METALS**

14.2.5.02 **MODULE DESCRIPTION**

Forging is the process of working on hot metals to various shapes using force. It is used in producing sheet metals, machine parts, tools and equipment. While heat treatment of metal is the process that is used to change the mechanical hardening, tempering annealing and normalizing.

14.2.5.03 **PURPOSE**

This module is designed to equip the trainee with the necessary knowledge, skills and attitude that will enable him/her to fabricate metal products by forging. The trainee will also be able to heat treat metal products to improve their mechanical properties.

14.2.5.04 **SPECIAL REQUIREMENT**

The trainee attempting the module should have skills and knowledge in materials and technical drawing .

14.2.5.05 **GENERAL OBJECTIVES**

The aim of this module is to enable the trainee to:

a) understand forging as a production process
b) understand the effects of heat treatment of metals
c) use hand tools correctly when fabricating metal products by forging
d) perform heat treatment process an metal products
e) care for and maintain forging tools and equipment
f) observe safety precaution when carrying out forging working

MODULE UNIT	SPECIFIC OBJECTIVES/ LEARNING OUTCOMES	LEARNING ACTIVITIES	TEACHING METHODS	LEARNING RESOURCES	ASSESSMENT
FORGING PROCESS	At the end of this module unit, the trainee should be able to: a) define the term forging b) list down the advantages of forging over other production process c) list down typical applications of forging in metal work d) list down various materials that are suitable for forging e) name various types of fuels used for heating f) state safety precautions to be observed when forging	• Defining the term forging • Listing advantages of forging operation • Listing down typical applications of forging • Listing suitable materials for forging • Listing types of heating fuels • Observing safety precautions	- lecture - discussion - note taking	- textbooks - chalkboards - illustration - charts	- oral/written tests - assignments
FORGING TOOLS AND EQUIPMENT	At the end of this module unit, the trainee should be able to: a) name various tools and equipment used in metal forging b) state the uses of each tool and equipment c) explain how to care for and maintain tools and equipment used in metal forging d) state safety precautions to be observed when forging	• Naming tools and equipment used in forging • Explaining how to care for and maintain of forging tools and equipment • Stating safety precautions to be observed when forging	- lecture - discussion - note taking	- forging tools and equipment - textbooks - chalkboards - charts	- oral/written tests - assignments
FORGING OPERATIONS	At the end of this module unit, the trainee should be able to: a) name various forging operations b) state typical application of various forging operations c) explain the correct procedure	• Naming various forging operations • Stating typical applications of forging applications • Explain the correct procedure of performing a	- lecture - discussion - note taking	- textbooks - chalkboards - charts	- oral/written test - assignment

	of performing a given forging operation d) state safety precautions to be observed when performing a given forging operation	given forging operation • Stating the safety precautions to be observed when performing a given forging operations			
METAL HEAT TREATMENT PROCESSES	At the end of this module unit, the trainee should be able to: a) define the term heat treatment b) state the purpose of heat treatment for metals and alloys c) name various metal heat treatment processes d) list typical applications of heat treatment in metal processing e) list tools and equipment used in heat treatment processes f) name various media used in heat treatment g) explain the care and maintenance of heat treatment tools and equipment h) state safety precautions to be observed when carrying out heat treatment processes	• Defining the term heat treatment • Stating the purpose of heat treatment • Naming various metal heat treatment processes • Listing typical applications of heat treatment processes • Listing cooling media for heat treatment processes • Listing tools and equipment for heat treatment • Explaining the care and maintenance for heat treatment tools and equipment process	- lecture - discussion - note taking	- forging tools - work pieces - textbooks - chalkboards - illustration - charts	- practical exercise - oral/written test - assignment
FORGING OPERATIONS	At the end of this module unit, the trainee should be able to: a) carry out product survey of forged items. b) make working draws of the items identified.	• Carrying out product survey of items • Making working drawing • Estimating and estimating the materials for the product identified.	- lecture - discussion - note taking - demonstration	- forging tools - work pieces - textbooks - chalkboards - illustration - charts	- practical exercises - oral/written tests - assignments - demonstration

	c) estimate and cost the materials required to fabricate the items d) select appropriate tools and equipment to be used e) perform a forging process of the article f) carry out quality control measures g) observe safety precautions when forging h) care for and main forging tools and equipment	• Selecting tools and equipment. • Performing forging process • Carrying out finishing process • Carrying quality control measures			s
HEAT TREATMENT OPERATIONS	At the end of this module unit, the trainee should be able to: a) carrying out given a heat treatment process b) carry out quality control measures when heat treatment metal components c) observe safety precautions when carrying out a heat treatment operation	• Carrying out heat treatment operations • Cleaning of the component to remove dust, scales rust • Heating components • Quenching • Quality control • Observing safety when carrying out heat treatment operations	- demonstration - discussion - note taking	- heating equipment - cooling media - textbooks - chalkboards - illustration - charts	- practical exercise - oral/written test - assignment

COURSE TITLE: METAL PROCESSING TECHNOLOGY

LEVEL 2

CODE: 14.2.6

TIME: 400 HOURS

14.2.6.01 MODULE TITLE: LATHE TURNING

14.2.6.02 MODULE DESCRIPTION

Lathe turning is a machining process that is used in producing and repairing of tools and equipment in a workshop. The process produces cylindrical flat surfaces, threaded tapered, eccentric and knurled shafts. It is also used to produce drilled and bored parts.

The graduate of this module will work as competent turner.

14.2.6.03 PURPOSE:

This module is designed to equip the trainee with the necessary knowledge, skills and attitudes that will enable him/ her machine metal products using a lathe machine.

14.2.6.04 SPECIAL REQUIREMENT

The trainee attempting this module should have skills and knowledge in technical drawing

14.2.6.05 GENERAL OBJECTIVES

The aim of this module is to enable the trainee to:

a) understand the working principle of the lathe machine
b) operate the lathe machine to produce and repair of machine tools and equipment
c) carry out various lathe operations
d) care for and maintain lathe machine and its accessories
e) observe safety precautions when working on the lathe machine

MODULE UNIT	SPECIFIC OBJECTIVES/ LEARNING OUTCOMES	LEARNING ACTIVITIES	TEACHING METHODS	LEARNING RESOURCES	ASSESSMENT
LATHE MACHINE	At the end of this module unit, the trainee should be able to: a) explain the use of lathe machine b) name various general lathe operations c) name the main parts of the lathe and their uses d) explain how to care for and maintain the lathe e) list down the safety precautions to be observed when working on the lathe	• Explaining the use of a lathe • Naming various lathe operations • Naming main parts of the lathe • Explaining the care and maintenance of the lathe • Listing down the safety precautions to be observed when working on the lathe.	- lecture - discussion - note taking	- textbooks - chalkboards - charts/diagrams	- oral/written test - assignment
COMMON LATHE CUTTING TOOLS AND THEIR USES	At the end of this module unit, the trainee should be able to: a) name various lathe cutting tools b) list materials from which tools are made c) name lathe tool angles d) explain how to care for and maintain lathe cutting tools e) explain safety precautions to be observed when grinding lathe tools	• Naming lathe cutting tools • Listing materials from which lathe tools are made. • Naming lathe tool angles • Explaining how to care for and maintain lathe cutting tools • Explaining safety precautions to be observed when grinding lathe tools	- lecture/discussion - note taking - illustrations	- lathe/cutting tools - textbooks - chalkboards - charts	- oral/written test - assignment
WORK HOLDING DEVICES	At the end of this module unit, the trainee should be able to: a) name work holding devices b) explain the use of each work holding device c) name various tool holding devices d) explain how to care for and	• Naming work holding devices • Explaining the use of work holding devices • Explaining how to care for and maintain lathe work holding devices	- lecture - discussion - illustration - taking notes	- work holding devices - chalkboard - charts - diagrams - textbooks	- oral/written tests - assignment

	maintain work holding devices				
CUTTING SPEEDS	At the end of this module unit, the trainee should be able to: a) state factors to be consider when determining cutting speeds b) calculate spindle speed	• Factors to be considered when determining spindle speeds • Calculating the spindle speed	- lecture - discussion - illustration - taking notes	- work holding devices - chalkboard - charts - diagrams - textbooks	- oral/written tests - assignment
OPERATING A LATHE MACHINE	At the end of this module unit, the trainee should be able to: a) identify parts of the lathe b) operate the lathe c) care for and maintain a lathe machine d) observe safety precaution when operating the lathe machine	• Identifying parts of the lathe • Operating the lathe • Caring for and maintaining the lathe machine • Observing safety precautions when operating the lathe machine	- demonstrations - illustrations - notes taking	- lathe machine - chalk board - textbooks - charts/diagrams	- Oral/written tests - Practical exercises - Observation
LATHE MACHINING WORK	At the end of this module unit, the trainee should be able to: a) read and interpret working drawing b) select work holding device and cutting tools to be used for a given operation c) mount work holding device on the lathe machine d) set the work on the lathe for machining e) set the work on the lathe for machining f) set the cutting tools for machining	• Reading and interpreting working drawing • Determining the turning speed • Machining to the required dimensions • Selecting work holding device and cutting tools • Mounting work holding device on the lathe machine • Setting the work for machining • Setting the tool for	- demonstration - illustration	- lathe machine - cutting tools - textbooks - chalkboards - illustration - charts	- practical exercise - oral/written test - assignment

	g) determine the turning speed h) machine to the required dimensions i) observe safety precautions when machining.	machining • Observing safety precautions to be observed when machining on the lathe			

23399 (3of4)

COURSE TITLE: MOTOR VEHICLE TECHNOLOGY

LEVEL: 1

CODE: 14.1.1

TIME: 462 HOURS

14.1.1.01 **MODULE UNIT:** METAL WORK THEORY AND PRACTICE

14.1.1.02 **DESCRIPTION**

The module is designed to equip the trainee with knowledge skills and attitudes suitable for a person who wishes to utilize metal work skills for survival. The skills attained from training in this module are self-sufficient and can be translated into saleable skills where one is able to earn livelihood. The skills form a basis for one to be a competent motor vehicle mechanic who is able to handle the professional challenges in the motor industry positively.

14.1.1.03 **PURPOSE**

To produce a mechanic who is competent in metal work repair and more so a person who can repair the motor vehicle body to a satisfactory level. The person can also fabricate simple components for servicing a motor vehicle otherwise the person can venture into general metal work and earn a living.

14.1.1.04 **SPECIAL REQUIREMENTS**

The coverage of this module requires a person who is naturally hardworking and ready to accept challenges. The person should be able to display creativity and innovativeness.

14.1.1.05 **GENERAL OBJECTIVES**

The aim of this module is to enable the trainee to:

a) apply workshop safety rules in a shop
b) understand various hand tools and equipment used in bench work and fitting
c) use hand tools and equipment when doing bench work and fitting
d) understand common engineering materials and their applications
e) produce functional articles
f) care for and maintain hand tools and equipment used in fitting work.

MODULE UNIT	SPECIFIC OBJECTIVES/LEARNING OUTCOMES	LEARNING ACTIVITIES	SUGGECTED TEACHING METHODS	SUGGECTED LEARNING RESOURCES	ASSESSMENT
SAFETY	At the end of this module unit, trainee should be able to : a) dress properly when in the workshop b) keep the Workshop clean and tidy c) care for and maintain hand tools d) handle and store materials safely e) carry out basic first aid f) locate position for fire extinguishers and their types	• Dressing • Keeping the workshop cleaning and tidy • Caring for and maintaining hand tools • Handling materials • Carrying out first aid • Locating fire Extinguishers	- demonstration - lecture - question and answer	- charts - overalls - hand tools - materials - first aid box - fire extinguishers - ref. materials - chalkboard	- oral questions - written questions - assignments - CATS

TOOLS AND EQUIPMENT	At the end of the module unit the trainees should be able to : a) select the appropriate tools and equipment for a given job b) care for and maintain tools and equipment c) observe safety when using tools and equipments d) state classes of fire e) sketch selected tools	• Selecting tools and equipment • Caring and Maintenance of tools • Observing safety when using tools and equipment • Stating classes of fire • Sketching selected tools	- discussion - demonstration - lecture	- charts - hand tools - equipment - ref. materials - measuring tools - marking tools - cutting tools - fastening tools - holding tools - drilling tools	- oral questions - written questions - assignments - sketching tools
MATERIALS, THEIR PROPERTIES AND APPLICATION	At the end of module unit the trainee should be able to: a) classify materials used in motor vehicle body work b) state properties of metals and alloys c) state the Properties of non-metals d) identify materials used in motor vehicle body	• Classification of materials • Stating properties of metals and alloys • Stating properties of non-metals • Identifying material *identification*	- discussion - observations - testing materials - identification	- metals - alloys - plastics - ceramics - fibre glass - rubber - paper - charts - manuals - journals - ref books - internet (source of information	- oral questions - written exercises - examination
RIVETING	At the end of module unit the trainee should be able to: a) state the function of rivets b) state types of rivets heads c) explain methods used in riveting d) state types of riveted joints e) state procedure for	• Stating function of rivets • Stating types of rivets • Explaining methods of riveting • Stating types of riveted joint • Stating procedure for riveting • Stating reasons for failure of riveted joints • Explaining remedies for	- discussion - observation - lecture	- rivets - riveting gun - anvil - hammers - drill bits - drilling machine - sheet metal - centre punch - files - counter sinking	- oral questions - written exercise - continuous assessment tests

	riveting f) state reasons for failure of riveted joints g)explain the remedies for preventing defects in riveted joints calculate the diameter of rivet and riveting allowance	preventing defects in riveted joints • Calculating diameter of rivets and riveting allowance		tool - marking tools - charts - manual - reference books	
SOFT AND HARD SOLDERING (BRAZING)	At the end of module unit the trainee should be able to: a) define soft soldering b)explain the procedure for soft soldering c) state the function of soldering flux d)state types of soldering fluxes e) state types of soldered joints f) define brazing g)outline the procedure for brazing h)explain how to braze aluminium i) outline the procedure for hard (silver) soldering	• Defining soft soldering • Procedure for soft soldering • Stating functions of soldering fluxes • Stating types of soldering fluxes • Stating types of soldered joints • Definition of brazing • Outlining procedure for brazing • Explaining the brazing aluminum alloys • Outlining procedure for hard soldering (silver soldering)	- discussion - observation - demonstration	- soldering iron - blow lamp - fluxes - gas welding equipment - sheet metal - galvanized sheet metal - anvil - hammers - tin snips - charts - soldering sticks - lighter (gas lighter) - manuals - reference books - brazing rods - gas welding table - aluminum alloys - aluminum brazing flux - silver solder	- oral questions - written exercise - examinations
GAS WELDING	At the end of module unit the trainee should be able	• Defining gas welding • Naming parts of gas welding	- discussion - observation	- gas welding equipment	- oral questions - written exercise

AND GAS CUTTING	to: a) define gas welding b) name parts of a gas welding equipment c) outline the procedure for lighting up the gas welding equipment d) outline the procedure for shutting down gas welding equipment e) state safety precautions associated with gas welding f) define gas cutting g) outline the procedure for gas cutting process h) explain defects which could occur in oxy-acetylene welding i) state factors affecting quality of welding	equipment • Outlining procedure for lighting up gas welding equipment • Outlining procedure for shutting down gas welding equipment • Stating safety precautions associated with gas welding • Defining gas cutting • Outlining procedure for gas cutting process • Explaining defects in oxy-acetylene welding • Stating factors affecting quality of welding	- demonstration	- mild steel - sheet steel - gas welding rods - gas welding table - shield - tin snips - hammers - anvil - marking tools - charts - safety posters - reference books	- examination
ARC WELDING	At the end of module unit the trainee should be able to: a) define arc welding b) list commonly used types of arc welding c) list equipment used in arc welding d) state the function of electrode and its coating e) state safety precautions associated with arc welding f) outline the procedure for striking and maintaining	• Defining arc welding • Listing types of arc welding • Listing arc welding equipment • Stating functions of the electrode and its coating • Stating safety precautions • Outlining procedure for striking and maintaining the arc • Stating types of arc welding joints • Naming parts of MIG welder • Outlining procedure of	- discussion - observation - demonstration	- welding machines - electrodes - welding shield - mild steel of metal	- oral questions - written exercises - assignments

	the arc g) state types of arc welding joints h) name parts of a MIG welding machine i) outline procedure of switching on the MIG welding machine	switching on MIG welder			
SCREW THREADS	At the end of module unit the trainee should be able to: a) state the application of various screw forms b) state the functions of the screw threading tools c) state the meaning of tapping size or tapping drill d) estimate the value of tapping size or tapping drill using a given formulae e) state types of tolerances and fits f) state the importance of tolerances and fits g) calculate the amount of tolerance and type of fit	• Stating thread forms • Stating functions of screw threading tools • Stating meaning of tapping size or tapping drill • Estimating calculating tapping diameter using formulae • Stating types of tolerances and fits • Stating the importance of tolerances and fits • Calculating amount of tolerance and type of fit.	- discussion - demonstration - lecture	- bolts and nuts - tapping drill - tap and tap wrench - die and die stock - taper tap - second tap - plug	- oral questions - written exercises - assignments - CATs - examinations
METAL JOINING (P)	At the end of module unit the trainee should be able to: a) select appropriate joining tools and equipment for a given task b) apply the correct	• Selecting appropriate tools and equipment • Applying joining process • caring for tools and equipment • Demonstrating safety	- demonstration - selection - application	- joining tools - heating equipment - hand tools - filler metal - fluxes - rivets	- oral questions - practical exercises - CATs - examination - phase tests - project –garden

	procedure to make a joint c) care for joining tools and equipment d) demonstrate safe working habits in metal joining processes			- sheet metal - bolts and nuts, screws - galvanized sheet - reference books	rake
OXY-ACETYLENE GAS WELDING AND GAS CUTTING (P)	At the end of module unit the trainee should be able to: a) identify oxy-acetylene gas welding equipment b) select the appropriate type of flame for a given job c) select the correct welding technique when welding d) perform welding process e) check the quality of welded joints f) observe safety precautions when welding g) cut sheet metal using gas.	• Identifying oxy-acetylene welding equipment • Selecting types of welding flames • Selecting welding techniques • Performing welding process • Checking weld defects • Observing safety precaution when welding • Cutting thick sheet metal using gas	- observation - discussion	- oxy-acetylene gas equipment - lighter - sheet metal - cutting nozzle - gas welding table	- oral questions - written reports - practical exercise - projects (garden trowel) - cats - examination
ARC WELDING (P)	At the end of module unit the trainee should be able to: a) identify arc welding machine parts b) select appropriate current for a given electrode c) prepare the joints to be welded d) use the correct procedure for a given task e) carry out a welding exercise f) care for the arc –welding	• identifying arc welding machine parts • selecting current selection • preparing welding joints preparation • using welding procedures • caring for arc welding equipment • demonstrating safety • carrying out welding exercise	- demonstrations - observations	- arc welding machine - welding shields - electrodes - sheet metal - reference books - instructional sheets	- oral questions - practical exercises - written assignments - CATs - project –vehicle axle stand

	equipment g) demonstrate safe working habits				
LIMITS AND FITS (P)	At the end of module unit the trainee should be able to: a) select various types of fits b) produce a project to given limits c) assemble and dismantle given mating parts to given fit d) select appropriate tools and equipment for assembling and dismantling parts e) exercise care when assembling and dismantling parts	• Selecting types of fits • Producing a project to given limits • Assembling and dismantling mating parts • Selecting tools and equipment Caring and maintenance of parts	- discussion - demonstration - observation	- project - metal materials - hand tools - pullers - hand press - reference materials - instruction sheets	- oral questions - practical exercise - project - phase tests
SCREW THREADING (P)	At the end of module unit the trainee should be able to: a) identify threading tools b) mark hole position c) select appropriate drill size for drilling hole d) produce internal threads in a drilled hole e) produce external threads on a selected rod f) demonstrate safety when tapping	• Identifying threading tools • Selecting of drill bit • Producing internal threads • Producing external threads • Demonstrating safety when tapping	- demonstration - observation - discussion	- drill bits - tap wrench - die and die stock - taps (taper, second, plug)	- practical exercise - oral questions - project - g-clamp - screw

COURSE TITLE: **MOTOR VEHICLE TECHNOLOGY**

LEVEL: **1**

CODE: **14.1.2**

TIME: **274 HOURS**

14.1.2.01 **MODULE TITLE: VEHICLE SERVICE**

14.1.2.02 **MODULE DESCRIPTION**

The course module is designed to equip the trainees with knowledge, skills and attitudes to acquire competencies in routine vehicle service. After completing this module, the trainee is capable of working in a garage or service station. It targets persons who are interested in gaining basic mechanics skills. The module forms a basis for all other modules to be covered in the course.

14.1.2.03 **PURPOSE**

To produce a service mechanic with thorough knowledge on routine service in various vehicle models.

14.1.2.04 **SPECIAL REQUIREMENTS**

Entry into the study of this module requires one to have graduated from Std.8 and above or a vehicle owner/driver who has the liking of maintaining the vehicle under his/her care.

14.1.2.05 **GENERAL OBJECTIVES**

The aim of this module is to enable the trainee to:

a) understand the layout and functions of the main vehicle components
b) understand the sealing and locking methods to seal and lock motor vehicle components efficiently
c) carry out routine maintenance on motor vehicles
d) understand the working principle of combustion in spark and compression ignition engines
e) understand workshop /garage layout and operations procedures
f) determine the cost of a vehicle service.

MODULE UNIT	SPECIFIC OBJECTIVES/LEARNING OUTCOMES	LEARNING ACTIVITIES	SUGGECTED TEACHING METHODS	SUGGECTED LEARNING RESOURCES	ASSESSMENT
VEHICLE LAYOUT	At the end of the module unit, the trainee should be able to: a) identify the main components, auxiliary systems of a motor vehicle b) state the functions of the vehicle components in the layout c) explain the principle operation of vehicle components in the layout d) sketch the layout of the main components of the motor vehicle	• Identifying vehicle layout • Stating functions • Explaining operation • Sketching layout	- lecture - demonstration - discussion	- vehicle components - chassis - models - film disc - computers and relevant software - reference books	- oral questions - written assignments - sketching and labeling - multiple choice questions
LOCKING AND SEALING DEVICES	At the end of this module unit, the trainee should be able to: a) state the functions of the locking devices b) name types of the locking devices c) name functions of sealing devices d) name types of sealing devices e) explain the locking methods	• Stating the Functions of locking devices • Naming the types of locking devices • Naming the functions of sealing devices • Explaining the types of sealing devices	- discussion - demonstration - lecture	- locking devices - chart - photographs - journals - manuals - references books	- oral questions - written assignment - multiple choice questions
SERVICE PROCEDURES	At the end of this module unit, the trainee should be	• Stating the routine vehicle maintenance	- demonstration - discussion	- samples of oils	- oral questions - written

AND ROUTINE MAINTENANCE	able to: a) state basic operations in routine vehicle maintenance b) name types of lubricants c) list the properties of oils d) explain the properties of fuels e) explain the safety precautions in handling oils and fuels	• Naming the types of lubricants • Listing the properties of oils • Listing the properties of fuels • Explaining the safety in handling oils and fuels	- lecture - observations	- grease - fuel - charts - ref books - air cleaner filters - fuel filters	exercises - CATs - multiple choice questions
WHEELS, TYRES AND WHEEL ALIGNMENT	At the end of the module unit, the trainees should be able to: a) state the purpose of wheels in a vehicle b) state types of wheels c) name types of tyres d) state the advantages of tubeless tyres e) name types of carcass plies used on tyres f) compare bias plies and radial plies g) state the different types of tread patterns made on tyres h) state the methods used to specify the tyre size i) state the factors that guide the selection of tyres for a vehicle j) explain the importance of tyre inflation pressures k) state problems caused by high pressure in tyres	• Stating the purpose of wheels in a vehicle • Stating the types of wheels • Naming the types of tyres • Stating the advantages of tubeless tyres • Naming the types of carcass pliers used on tyres • Comparing between bias plies and radial plies • Stating the different types of tread patterns of tyres • Stating the methods used to specify the tyre size • Stating the factors guiding selection of tyres • Explaining the importance of tyre inflation pressures • Stating the problems	- lecture - demonstrate - discussion	- tyres - rims - charts - photos - journals - sections of tyres - projectors	- or oral - written assignments - multiple choice questions - CATs - al - written assignments - multiple choice questions - CATs

	l) state problems caused by low pressure in tyres m) state requirements to be considered when storing tyres n) state the importance of tyre rotation o) outline the procedure of tyre rotation p) name types of tyres damage q) state methods of tyre repair r) state factors determining front wheel alignment s) relate the complaint with causes and remedies to steering mechanism t) name types of wheel balancing	caused by high pressure in tyres • Stating the problems caused by low pressure in tyres • Stating the requirements for storage of tyres • Stating the importance of tyre rotation • Outlining the procedure of tyre rotation • Naming the types of tyre damage • Stating the methods of tyre repair • Stating the factors determining front wheel alignment • Relating the complaint of steering mechanism • Naming types of wheel balancing			
WORKSHOP/ GARAGE LAYOUT AND OPERATION PROCEDURES	At the end of the module unit, the trainee should be able to: a) sketch the layout of a service workshop b) state the use of the service equipments in the service workshop c) outline the service procedures in a service workshop	• Sketching the layout of a service workshop • Stating the use of service equipments • Outlining service procedures in a service workshop	- discussion - lecture - demonstration - field visits	- vehicle - charts - battery charger - greasing gun - wheel alignment equipment - beam setter - tyre pressure gauge - inspection pit / rain	- CATs - oral questions - written test - multiple choice questions

				- oil - grease - batteries - reference books - projectors	
COMBUSTION S PROCESS IN SPARK IGNITION ENGINES	At the end of the module unit, the trainees should be able to: a) name components of a multi cylinder engine b) sketch line diagrams of engine cylinder arrangements c) classify the internal combustion engines by shape d) explain the operation of a four – stroke cycle petrol engine e) sketch the valve timing diagram of a typical engine f) outline the sequence of valve adjustment g) explain the sequence of operation of a two-stroke OTTO cycle petrol engine h) state the differences between Four – stroke circle and two- stroke circle engine	• Naming components of a Multi cylinder engine • Sketching line diagrams of cylinder arrangements • Classifying engines by shape • Explaining four stroke cycle • Sketching valve timing diagram • Outlining sequence of valve adjustment • Explaining sequence of operation of a two stroke cycle petrol engine • Stating differences between four-stroke and two- stroke engine	- demonstrate - discussion - lecture	- charts - complete engine - projector - LCD - filter gauges - hand tools - reference books	- oral questions - written assignments - sketching and labelling - CATs - assignment
COMBUSTION PROCESS IN A COMPRESSIO N IGNITION	At the end of this module unit, the trainee should be able to: a) define an engine	• Definition of an engine • Explaining four stroke cycle diesel engine • Sketching valve timing	- charts - engine - model - reference	- discussion - observation - lecture	- oral questions - written assignments - multiple choice

ENGINE	b) explain the sequence of operation of a four – stroke cycle diesel engine c) sketch a valve timing diagram for a typical four stroke diesel cycle engine d) name the parts of a two-stroke diesel engine (Crankcase scavenged) explain the sequence of operation of a two – stroke cycle diesel engine	diagrams for diesel cycle engine • Naming two – stroke diesel engine	books - journals - LCD - projector		questions
COMBUSTION CHAMBERS IN DIESEL ENGINES	At the end of this module unit, the trainee should be able to: a) state the types of combustion chambers b) name the various types of open combustion chambers c) state the use of pre-combustion chamber in indirect injection d) state the purpose of a heater plug e) sketch a heater plug	• Stating types of combustion chambers • Naming open combustion chambers • Stating pre- combustion chamber • Stating the purpose of heater plug Sketching heater plug construction	- charts - engines - pistons - cylinder head - reference books	- discussion - observation - lecture	- oral questions - written assignments - multiple choice questions - filling of blanks
VEHICLE SYSTEM	At the end of this module unit, the trainee should be able to: a) name various vehicle systems b) state the purpose of a given vehicle system c) name parts of a given vehicle system	• Naming the various lubrication system • Stating the purpose of a given vehicle • Naming the main parts of a given vehicle system	- discussion - lecture - observation	- charts - vehicle - training boards - reference books	- oral questions - written assignments - multiple choice questions - labeling sketches - sketching wiring diagrams and label them - filling of blanks

COSTING OF A VEHICLE SERVICE	At the end of the module unit, the trainee should be able to a) determine the cost of offering a vehicle service.	• Cost of vehicle service	- *discussion* - lecture - observation	- *job cards* - charts - catalogue - manual - stock record	- *written tests*
VEHICLE MAINTENANCE	At the end of the module unit, the trainee should be able to: a) carry out servicing sealing and locking operations of various components of motor vehicles b) replace burnt electric bulbs c) check radiators coolant for contamination d) visually inspect the radiator for leaks and external damages e) check, tighten clips and replace broken radiator hoses f) check and repair damaged areas on the bolts and nuts on the underbody g) tighten bolts and nuts on the underbody.	• Carrying out locking device and seals • Replacing faulty bulbs • Replacing contaminated coolant • Visually inspecting radiator leaks • Checking, tighten clips and replace radiator hoses • Checking and repair damaged areas of underbody • Tightening bolts and nuts	- demonstration - discussion - observations	- complete vehicle assembly devices - seals - hand tools - screw driver - multi-tester	- practical test - oral test
BATTERY SERVICE	At the end of the module unit, the trainee should be able to: a) service a lead acid battery b) connect the battery to a charger c) charge batteries in series and parallel connectors d) service vehicle systems	• Servicing lead acid battery • Connecting charge battery • Charging series/parallel connection • Servicing vehicle system	- demonstration - discussion - observation	- hydrometer - high rate discharge tester - multi-tester - voltmeter - electrolyte - distilled water - charger	- practical exercises - oral tests

				(battery) - cleaning agent - battery grease - battery cables - carburetor - greasing equipment - hand tools - grease - oil filter - pressure line - air compressor - brake fluids	
WHEELS AND TYRE REPAIR	At the end of the module unit, the trainees should be able to: a) repair tubes and tyres b) check tyres for wear and wheel distortion c) repair/ replace distorted wheels d) identify tyre sizes for a vehicle e) carry out tyre rotation in the correct sequence f) balance a wheel on the balancing machine g) perform wheel alignment	• Repairing tubes and tyres • Checking tyre wear • Repairing wheel distortion replacement or repair • Identifying tyre sizes for a vehicle • Carrying out tyre rotation sequence • Balancing a wheel on balancing machine Performing wheel alignment	- demonstration - discussions - observation	- tubes - wheels - tyres - vulcanizer - patches - vehicle - wheel alignment equipment	- oral questions - practical exercises
SPARK OR COMPRESSIO N IGNITION ENGINE	At the end of the module unit, the trainee should be able to: a) dismantle an engine	• Dismantling engine • Cleaning cylinder head • Checking cylinder head flatness	- demonstration - discussion	- engine - hand tools - instruction sheets	- oral questions - practical exercise

	b) clean cylinder head c) check cylinder head for flatness d) remove and replace a cylinder head gasket e) tighten cylinder head using correct torque and sequence	• Removing cylinder head gasket • Tightening cylinder head		- workshop manual - torque wrench - feeler gauge - straight edge - valve/ push rod rack - cylinder head gasket set	

COURSE TITLE: **MOTOR VEHICLE TECHNOLOGY**

LEVEL: **1**

CODE: **14.1.3**

TIME: **54 HOURS**

14.1.3.01 **MODULE TITLE : ENGINE RECONDITIONING (PETROL AND DIESEL)**

14.1.3.02 **MODULE DESCRIPTION**

This course module is designed to equip the trainee with the necessary skills, knowledge and attitudes that will enable them recondition a worn out (petrol and diesel) engine for effective performance.

14.1.3.03 **PURPOSE**

Produce an engine reconditioning mechanic who is capable of reconditioning a worn out engine (petrol and diesel) to a satisfactory working condition.

14.1.3.04 **SPECIAL REQUIREMENTS**

A trainees who have trained in vehicle service has an added advantage.

14.1.3.05 **GENERAL OBJECTIVES**

The aim of this module is to enable the trainee to:

a) understand the safety procedures and their applications
b) understand the operation of all types of automobile engines
c) perform the process of cylinder reboring
d) follow the correct method of grinding crankshaft to manufactures specification
e) demonstrate ability to recondition worn out engine to good working condition

MODULE UNIT	SPECIFIC OBJECTIVES/LEARNING OUTCOMES	LEARNING ACTIVITIES	SUGGECTED TEACHING METHODS	SUGGECTED LEARNING RESOURCES	ASSESSMENT
PRINCIPLES OF ENGINES OPERATIONS (PETROL AND DIESEL)	At the end of the Module unit, the trainee should be able to: a) explain the safety precautions to be observed during vehicle engine reconditioning b) explain the operation of two stroke and four stroke cycle engines	• Safety precautions in the workshop • Operation principles of	- discussion - demonstration - question and answer	- handouts - measuring tools - charts - models - handouts - equipment - charts	- written assignments - oral questions - multiple choice questions
ENGINE CYLINDER REBORING	At the end of the module unit, the trainee should be able to: a) explain the process of replacing defective components b) outline the process of carrying out cylinder reboring	• Process of replacing of defective components • Cylinder reboring process	- discussion - demonstration - question and answer	- engine components - charts - manuals - engine parts	- oral test - written tests
CRANK SHAFT MAINTENANCE	At the end of the module unit, the trainee should be able to: a) explain the process of crankshaft grinding to specification b) explain the process of checking alignment and realignment of piston connecting rod	• Process of crankshaft grinding. • Alignment and realignment of piston connecting rods	- demonstration - discussion - question and answer	- crankshaft - connecting rod - alignment jig - crankshaft grinding machine - manufacturers manual - outside micrometer - crankshaft bearing shells	- oral test - CATs - written test
ENGINE	At the end of the Module unit, the	• Explaining engine	- discussion	- handouts	- written test

SERVICE	trainee should be able to: a) explain the procedure of engine overhaul, repair and maintenance b) name types of limits and fits in relation to piston and cylinders c) outline the process of taking engine measurements explain the use of engine measuring instruments	overhauls • Dismantling procedure • Naming types of limits and fits in relation to piston and cylinders Explaining use of measuring instruments	- demonstration - observation	- hand tools - special tools for special joints - lifting *equipment* - charts - manuals - measuring tools	- oral test - multiple choice questions - *filling of* blanks
ENGINE MAINTENANCE (P)	At the end of the module unit, the trainee should be able to: a) safety precaution in the workshop b) dismantle and inspect a given cylinder head assembly for a spark or compression ignition engine c) replace worn out or damaged cylinder head assembly d) adjust tappet clearance e) inspect and replace defective components of an engine f) *inspect and carry out* cylinder reboring g) inspect and carry out crankshaft grinding	• Observing safety working conditions • Dismantling cylinder head assembly for a spark and compression engine : • Replacing worn out or damaged cylinder head assembly • Adjusting tappet clearance • Inspecting and replacement of defective engine components. • Inspecting and carryout cylinder reboring • Inspect and carryout crankshaft grinding to specification	- demonstration - *discussion* - question and answer	- posters - *materials* - first Aid Kits - fire extinguishers - *engine* - cleaning detergents - engine (dismantled engine parts) - measuring tools - hand tools - dismantled cylinder head assembly - defective engine components - reboring machine - crankshaft - grinding machine	- workshop *reports* - practical exercises - phase tests

COURSE TITLE: ***MOTOR VEHICLE TECHNOLOGY***

COURSE TITLE: **MOTOR VEHICLE TECHNOLOGY**

LEVEL: **1**

CODE: **14.1.4**

TIME: **180 HOURS**

14.1.4.01 **MODULE TITLE :** **PETROL ENGINE MAINTENANCE**

14.1.4.02 **MODULE DESCRIPTION**

The course module is designed to equip the trainees with knowledge, skills and attitudes that will enable them carryout general maintenance and reconditioning on petrol engine. The graduate of this module can work as competent mechanic for petrol engines.

14.1.4.03 **PURPOSE**

Produce a petrol engine mechanic who perform the basic principles of general maintenance and reconditioning of petrol engine

14.1.4.04 **SPECIAL REQUIREMENTS**

Complete module on vehicle service.

14.1.4.05 **GENERAL OBJECTIVES**

The aim of this module is to enable the trainee to:

a) understand the working principles of a petrol engine
b) understand the working principle of fuel and engine cooling systems
c) carry out maintenance of petrol engine, and fuel the cooking systems
d) care for and maintain tools and equipment used during the maintenance of petrol engines, fuel and cooling systems
e) observe safety precaution when maintaining petrol engine, fuel and cooling systems.

MODULE UNIT	SPECIFIC OBJECTIVES/LEARNING OUTCOMES	LEARNING ACTIVITIES	SUGGECTED TEACHING METHODS	SUGGECTED LEARNING RESOURCES	ASSESSMENT
ENGINE	At the end of this Module unit, the trainee should be able to: a) explain the working principles of petrol engine b) explain the types of piston rings and gudgeon pins used on a motor vehicle engines c) explain the difference between two stroke and four stroke engine d) explain the principles of operation of different types of carburetors used in motor vehicles e) describe the operation and the use of contact breaker point f) name the functions of the advance and retard mechanism g) explain the general principles and types of combustion chamber designs h) explain the operation principles of electric and mechanical fuel pump i) explain the method of correct sequence of tightening the cylinder head bolts	• Explaining working principles of petrol engine • Naming piston rings and gudgeon pins • Explaining difference between two stroke and four stroke engine • Describing types of carburetors used in motor vehicles simple carburetor multi barred carburetor • Describing contract breaker points operation use • Naming advance and retard mechanisms • Explaining combustion chamber designs principles of chamber design types of combustion chambers • Explaining electric and mechanical fuel pump principles of operation • Explaining tightening the cylinder head bolts	- lecture - demonstration - group discussion - questioning and answer	- realia - chalkboard - slide projectors - textbooks - LCDs - reference - charts	- written test - oral test
ENGINE VALVES	At the end of this module unit, the trainee should be able to: a) explain the basic operating	• Explaining functions of inlet and exhaust valve • Stating operation of inlet	- lecture - demonstration - discussion	- inlet valves - exhaust valves - different types	- oral tests - CATs - assignments

	principles of inlet and exhaust valves b) state function of inlet and exhaust valve c) explain the layout of various engine valve gear arrangements	and exhaust valve • Explaining methods of driving the cam shaft	- questioning and answer	of engines	
FUEL SYSTEM	At the end of this module unit, the trainee should be able to: a) name the functions of fuel system b) describe the layout of the fuel system c) explain methods of mixture correction and slow running device d) state functions of a simple and multi jet carburetors e) explain the principle of operation of a simple multi jet carburettor f) state the difference between constant choke and constant vacuum carburetors	• Naming the function of fuel system • Describing the layout of fuel system • Explain mixture corrections • Stating the function of simple and multi jet carburetors • Explaining the principles of operation of simple and multi jet carburetors • Stating the difference between constant choke and constant vacuum carburetors	- lecture - discussion - questioning and answer	- layout model - charts - reference books - projectors - carburetors	- oral tests - CATs - assignments
COOLING SYSTEM	At the end of this module unit, the trainee should be able to: a) explain the working principles of water cooled engine b) explain the working principles of air cooled engine c) state the functions of the cooling systems of an engine describe the main features of air	• Explaining function and working of: • Explaining main components of air cooled and water cooled engine • Explaining working principles of air cooled engine • Explaining the working principles of water	- lecture - demonstrate - question and answer	- realia - text books - chart/diagram - chalkboard	- oral tests - cats - examinations - assignments

	cooled and water cooled engines	cooled engine			
LUBRICATION SYSTEM	At the end of this Module unit, the trainee should be able to: a) state the function of a lubrication system b) describe the types of lubrication c) explain the various components of the lubrication system	• Stating the functions of the lubrication system • Describing types of lubrication • Explaining components of lubrication system	- lecture - demonstrate - question and answer	- Realia - Textbooks - Charts/diagrams chalkboard	- oral questions - cats - examinations - assignments
MOTOR VEHICLE ACT, DRIVING RULES AND TRAFFIC SIGNS	At the end of this module unit, trainee should be able to. a) explain the purpose of observing traffic rules b) explain the process of registering motor vehicles c) explain the importance of obtaining a driving license d) explain how traffic is controlled e) describe the duty of driver in case of accident and injury to a person f) explain the importance of insuring a vehicle g) describe driving techniques for special situations h) interpret traffic signs i) practice driving techniques within short distances	• Explaining Traffic Act • Explaining process of registration of motor vehicles • Explaining driving license • Explaining Traffic control • Describing duty of driver in case of accident and injury to a person • Describing vehicle insurance • Describing driving regulations • Describing driving techniques for specials situations • Interpret Traffic signals • Practicing driving	- discussion - lecture - observation - field work	- traffic act document - traffic signs - driving techniques book - a vehicle in good working condition - chart - training board	- oral questions - written questions - assignment - practical exercises on driving
ENGINE REPAIR	At the end of this module unit, trainee should be able to. a) repair and maintain an	• Repairing and maintaining an engine	- demonstration - observation	- different types of vehicle engine	- practical exercise - reports

	engine			- hand tools - dial gauge - straight edges - micrometer - screw gauge	
ENGINE TUNE - UP	At the end of this Module unit, the trainee should be able to a) carryout complete engine tune up.	• Carrying out engine tune - up	- demonstration - question and answer - observation	- oils - filters - filter gauge - hand tools - *timing light* - tachometer	- practical exercises - oral/written tests

COURSE TITLE: **MOTOR VEHICLE TECHNOLOGY**

LEVEL: **I**

CODE: **14.1.5**

TIME: **152 HOURS**

14.1.5.01 **MODULE TITLE:** **AUTO-ELECTRIC / ELECTRONICS**

14.1.5.02 **MODULE DESCRIPTION**

The course module is designed to equip the trainees with knowledge, skills and attitude that will enable them trace faults of a vehicle electrical system and do the necessary repairs.

14.1.5.03 **PURPOSE**

Produce an Auto-electrical mechanic who is capable of carrying out the maintenance and repair of vehicle electrical systems.

14.1.5.04 **SPECIAL REQUIREMENTS**

Knowledge of basic principles of electricity eg. Electrical circuits, magnetism, Electromagnetism, diodes and transistors.

14.1.5.05 **GENERAL OBJECTIVES**

The aim of this module is to enable the trainee to:

a) understand the principles of electricity generator in a motor vehicle
b) understand the operating principles of ignition system
c) understand the operating principles of vehicle electrical systems
d) understand the operation of a transistor ignition system
e) diagnose vehicle electrical systems faults and effect the necessary

MODULE UNIT	SPECIFIC OBJECTIVES/LEARNING OUTCOMES	LEARNING ACTIVITIES	SUGGECTED TEACHING METHODS	SUGGECTED LEARNING RESOURCES	ASSESSMENT
VEHICLE ELECTRICITY GENERATOR	At the end of this module unit, the trainee should be able to: a) explain the working principle of A.C and D.C generators b) explain the chemical reaction that takes place during charge and discharge process of a lead acid battery. c) state the principle of operation of the starter motor d) explain the principles of electro magnetic induction	• Explaining operation principles of DC and the AC generator • Stating starter motor operating • Explaining electro magnetic induction	- lecture - discussion - question and answer	- chalkboard - charts - electronic components	- written tests - CATs - exams
IGNITION SYSTEM	At the end of this module unit, the trainee should be able to: a) state the functions of the ignition system b) sketch and label the layout of the ignitions system c) state the functions of the major parts of the Ignition system d) describe the process of ignition timing	• Stating the functions of ignition system • Sketching the layout of ignition system • Stating the function of ignition system parts • Describing the process of ignition timing	- lecture - discussion - question and answer	- ignition coil - textbook - charts - handouts - timing light	- written tests - CATs - examinations
ELECTRICAL SYSTEMS	At the end of this Module unit, the trainee should be able to: a) state the functions of electrical circuits b) sketch and label layouts of given electrical circuits c) state different types of electrical cables and connectors	• Stating the functions of electrical circuits • Sketching the layout of electrical circuits • Stating the different types of electrical cables and connectors	- lecture - discussion - question and answer	- vehicle with complete electrical circuits - handouts - charts - textbooks - manuals	- written test - oral questions - CATs - examinations
TRANSISTORI	At the end of this Module unit,	• Explaining electronic	- discussion	- vehicle with	- written tests

ZED IGNITION SYSTEM	the trainee should be able to: a) state the functions of the electronic components b) explain the operation of principles of transistorized ignition system	components • Explaining transistorized coil ignition with contact breaker points.	- lecture - question and answer	complete electrical circuits - handouts - charts - textbooks - manuals	- oral questions - CATs
VEHICLE ELECTRICITY GENERATION (P)	At the end of this module unit, the trainee should be able to: a) diagnose common battery faults b) carryout visual inspection of a battery condition c) inspect the charging system and rectify faults observe safety	• Battery faults • Visual inspection of battery • Charging system • Safety precautions	- discussion - observation - inspection - examination	- battery - complete vehicles with all auxiliaries - instruction sheets - manuals - wiring diagrams - hand tools	- written tests - practical tests - phase tests
IGNITION SYSTEM	At the end of this Module unit, the trainee should be able to a) carryout ignition timing b) check dwell angle c) trace the layout of the ignition system d) carryout visual inspection of main parts	• Carrying out ignition timing • Checking dwell angle • Tracing the layout of ignition system • Carrying out ignition coil components	- demonstration - practice - observation	- battery - timing light - chalk - dwell meter - timing light - manual - hand tools	- practical exercises - assignments - oral and written tests
ELECTRICAL SYSTEMS	At the end of this Module unit, the trainee should be able to: a) trace starting, lighting and auxiliary circuits b) identify various types of starter motors carryout tests on vehicle electrical systems	• Tracing starting ,lighting auxiliaries circuits • Identifying inertia and pre-engaged starter motors • Carrying out tests on electrical system	- lecture - discussion - demonstration	- complete vehicle with electrical systems - handouts - textbooks	- practical test - observation
TRANSISTORIZED IGNITION	At the end of this Module unit the trainee should be able to: a) carryout tests on transistors	• Carrying out testing transistorized ignition system	- demonstration - discussion - observation	- relevant tools - manufacturers manual	- practical exercise - oral questions

SYSTEM	ignition system b) trace and rectify faults of transistorized ignition use hand held tester (HHT) to trace electrical/electronic faults	• Tracing fault tracing and rectification • Using hand held tester to trace electrical / electronic faults		- complete working vehicle	- practical test

COURSE TITLE: **MOTOR VEHICLE TECHNOLOGY**

LEVEL: **1**

CODE: **14.1.6**

TIME: **112 HOURS**

14.1.6 **MODULE TITLE : TRANSMISSION**

14.1.6.01 **MODULE DESCRIPTION**

The module intends to equip the trainee with the necessary skills, knowledge and attitudes to be able to repair, service and maintain the transmission system to acceptable standards.

14.1.6.02 **PURPOSE**

Employment is available both in informal and formal sector.

The module is designed to produce a mechanic with knowledge, and practical skills to carry out effectively the service and repair of transmission systems unit.

14.1.6.03 **PRE-REQUISITES:**

A trainee who have trained in vehicle service has an added advantage.

14.1.6.04 **GENERAL OBJECTIVES**

The aim of this module is to enable the trainee to:

a) explain the working principles of transmission system
b) carry out repair and maintenance of transmission system
c) care for and maintain transmission system
d) observe safety precautions when carrying out repairs an maintenance of transmission systems

MODULE UNIT	SPECIFIC OBJECTIVES/LEARNING OUTCOMES	LEARNING ACTIVITIES	SUGGECTED TEACHING METHODS	SUGGECTED LEARNING RESOURCES	ASSESSMENT
UNITS OF TRANSMISSION SYSTEM	At the end of the Module unit, the trainee should be able to: a) list the main units of transmission b) name the various types of units of transmission c) state the functions of each unit of transmission d) sketch the layout of a conventional transmission system e) describe the operation of each main component f) list possible defects and remedies of the transmission units g) outline the procedure of bleeding the clutch.	• Listing main units • Naming the various types of units of transmission • Stating the functions of units of transmission • Sketching lay out of a conventional transmission system • Describing operation of main components • Defects and remedies • Clutch bleeding procedure	- discussion - demonstration - observation - question and answer	- vehicle - clutch components - gearboxes - propeller shaft / drive shafts - rear axle assembly - charts - LCD - projectors - reference books	- oral questions - written assignments - cat - exams - structured questions - label the diagrams
UNITS OF TRANSMISSION SYSTEMS	At the end of the module unit, the trainee should be able to: a) identify main units of the transmission b) carry out basic adjustments c) remove and install given units of transmission system d) dismantle and replace seals in a clutch master cylinder e) dismantle and replace seals in a clutch slave cylinder f) bleed the clutch system using the correct procedure	• Identifying the main parts • Carrying out basic adjustments • Removal and installation of transmission units • Dismantling and replace the clutch master cylinder • Dismantling the clutch slave cylinder • Bleeding the clutch system using the correct	- discussion - notes taking	- transmission system - text books - charts/diagrams - chalkboard	- observations - oral questions - practical exercises - workshop reports

COURSE TITLE: **MOTOR VEHICLE TECHNOLOGY**

LEVEL: **I**

CODE: **14.1.7**

TIME: **104 HOURS**

14.1.7 **MODULE TITLE: SUSPENSION, STEERING AND BRAKING SYSTEM**

14.1.7.01 **DESCRIPTION**

The module intends to equip the trainee with the necessary skills, knowledge and attitudes to be able to repair service and maintain suspension, steering and braking systems of a motor vehicle. After completion of this module, the graduate trainee is capable of getting employment in the formal and informal sector.

14.1.7.02 **PURPOSE**

The module is designed to equip the trainee with theoretical and practical skills to carry out effective service repairs on suspension, steering and braking systems

14.1.7.04 **PRE-REQUISITE**

The module assumes that the trainee has knowledge on applied geometry which assists in better understanding of the steering system geometry.

14.1.7.05 **GENERAL OBJECTIVES**

The aim of this module is to enable the trainee to:

a) understand the principles of operation of suspension system.
b) demonstrate ability to repair and adjust suspension units.
c) understand the principles of operations of vehicle braking system.
d) demonstrate ability to diagnose, repair faults in mechanical and hydraulic brakes
e) understand the principles of operation of vehicle steering system
f) demonstrate ability to repair and adjust steering system units.

MODULE UNIT	SPECIFIC OBJECTIVES/LEARNING OUTCOMES	LEARNING ACTIVITIES	SUGGECTED TEACHING METHODS	SUGGECTED LEARNING RESOURCES	ASSESSMENT
SUSPENSION SYSTEM	At the end of this Module unit the trainee should be able to: a) state the functions of suspension system b) explain the working principles of various types of suspension systems c) sketch types of suspension systems	• Stating the functions of suspension system • Exploring the working principles of various types of suspension systems. • Sketching the types of suspension systems	- demonstration - lecture - discussion	- suspension units - textbooks - charts	- written test - multiple choice questions - practicals
BRAKING SYSTEM	At the end of the Module unit, the trainee should be able to: a) state functions of the braking systems b) name components of braking system c) list different types of braking systems d) name various types of hydraulic braking systems e) sketch layout of braking system	• Stating the functions of the braking system • Naming the parts of braking systems • Listing the types of breaking systems • Naming the hydraulic braking systems • Sketching the layout of braking system	- demonstration - lecture - discussion - question and answer	- braking systems - components - charts - textbooks	- written tests - label sketches
STEERING SYSTEM	At the end of the Module unit, the trainee should be able to: a) state the functions of steering system b) name different types of steering systems c) sketch layout of steering system d) naming common types of steering boxes	• Stating the functions of steering system • Naming the types of steering systems • Sketching layout of steering system • Naming the common steering boxes	- demonstration - lecture - discussion - observation	- steering system components - textbooks - charts - handouts	- written assignment - oral test - multiple choice questions - completing sketches - label sketches

STEERING SYSTEM (P)	At the end of the Module unit, the trainee should be able to: b) identify different parts of steering systems c) dismantle various types of steering boxes d) inspect and examine defective parts e) replace defective parts	• Identifying different parts of steering systems • Dismantling the various types of boxes • Inspecting and examination of defects parts of defective parts • Replacing defective parts	- demonstration - observation	- workshop manual - steering system components - defective components - instruction sheets - complete Vehicle with steering system	- workshop reports - projects - phase tests
BRAKING SYSTEM(DRUM BRAKES)	At the end of the Module unit, the trainee should be able to a) identify types of braking system b) identify components of braking system c) service the drum brakes d) service the master cylinder e) repair a leaking hydraulic steel pipe f) diagnosing drum – brake troubles g) rectify drum brake troubles	• Identifying the types of braking system • Identifying the brake system components • Servicing drum brake service • Servicing master cylinder from vehicle • Repairing leaking hydraulic steel pipes • Designing drum – brake trouble diagnosis	- discussion - demonstration - observation	- workshop manual - master cylinder - replacement parts - gas cylinders - brazing rods - brazing flux - hydraulic pipe - lighter - instruction sheets - diagnostic chart	- workshop reports - practical exercises
DISC BRAKES	At the end of the module unit, the trainee should be able to: a) identify parts of disc brakes b) replace disc brake pads c) replace caliper pistons d) bleed the brakes using correct procedure.	• Identifying parts of disc brakes. • Replacing disc brake pads • Replacing caliper piston replacement • Bleeding the brakes	- demonstration - observation - discussion - questions and answer	- vehicle with disc brakes - instruction sheets - workshop manual - clear plastic bottle - clear plastic pipe	- workshop reports - practical exercises

SUSPENSION SYSTEM	At the end of the Module unit, the trainee should be able to: a) identify types of suspension systems b) identify components of suspension systems c) identify defective parts of the suspension system d) carryout routine maintenance and mechanical adjustments of the suspension system e) service a leaf spring f) install a defective damper g) service the front wheel hub h) replace a broken coil spring	• Identifying the types of suspension systems • Identifying components of suspension systems • Shackles • Examining the defective parts suspension system for • Removing, examining and replacement of defective parts • Servicing leaf spring • Installing damper • Servicing front wheel hub • Coil spring	- demonstration - observation	- suspension systems - charts - manuals - instruction sheets - hand tools - leaf spring - damper - replacement parts - jack - stands	- workshop reports - oral tests - phase tests - projects

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COURSE TITLE: **MOTOR VEHICLE TECHNOLOGY**

LEVEL: **II**

CODE: **14.2.1**

TIME: **328 HOURS**

14.2.1.01: **MODULE TITLE: MOTOR VEHICLE BODY WORK**

14.2.1.02: **MODULE DESCRIPTION:-**
This course module aims to equip the trainee with the necessary knowledge, skills and attitudes that enables one to repair the vehicle bodies and other parts of a vehicle. The trainee should also be able to spray the vehicle bodies to acceptable standards.

14.2.1.03: **PURPOSE**
To produce a trainee who is competent in maintaining, repairing and spraying a vehicle body to acceptable standards so as to prolong the service life of the vehicle.

14.2.1.04: **PRE-REQUISITE**
A trainee taking this module is advised to have trained in metal work module in level one so as to gain metal joining skills.

14.2.1.05: **GENERAL OBJECTIVES:**
The aim of this module is to enable the trainee to:
a) understand how various bodies of motor vehicles are constructed
b) use tools and equipment to repair damaged or dented vehicle body
c) spray paint the vehicle bodies to acceptable standards
d) observe safety precautions when working on a motor vehicle body work

MODULE UNIT	SPECIFIC OBJECTIVES/LEARNING OUTCOMES	LEARNING ACTIVITIES	SUGGECTED TEACHING METHODS	SUGGECTED LEARNING RESOURCES	ASSESSMENT
VEHICLE STRUCTURE	At the end of this module unit, the trainee should be able to: a) name various types of vehicle body designs b) name various body units c) explain different types of body defects d) describe routine maintenance and adjustments necessary on vehicle bodies e) outline alignment testing procedures using test equipment f) state the functional requirements of vehicle body types	• Naming various types of vehicle body designs • Naming various body units • Explaining different of body defects • Describing routine maintenance and adjustments necessary on body defects (dents, corrosion, cracks) • Outlining alignment testing procedures • Stating the functional requirements of vehicle body types •	• discussion • lecture • demonstration	- charts - vehicles - handouts - test equipment - body jack - reference books -	- oral questions - written exercises - CATS -
PANEL BEATING	At the end of this module unit, the trainee should be able to: a) state the use of panel beating tools b) explain panel beating techniques c) state the use of panel beating materials d) explain the proper procedure in panel beating e) describe the importance of vehicle valeting f) state safety precautions to	• Stating the use of panel beating tools and equipment • Explaining Panel beating techniques • Stating the use of panel beating materials • Explaining Panel beating procedures • Describing Valeting Stating safety precautions when panel beating	- discussion - demonstration - lecture	- panel beating tools - cleaning materials/ equipment - first aid box - reference books - handout	- oral questions - written exercise - CATs

MODULE UNIT	SPECIFIC OBJECTIVES/LEARNING OUTCOMES	LEARNING ACTIVITIES	SUGGECTED TEACHING METHODS	SUGGECTED LEARNING RESOURCES	ASSESSMENT
	be observed when panel beating				
SPRAY PAINTING	At the end of this module unit, the trainees should be able to: a) state the need for spray painting. b) list paint constituents c) list materials for surface preparation d) explain the use of painting tools and equipment e) name methods of surface preparation f) explain factors which influence the quality of painted surface g) name various types of paints and thinners h) explain the correct spray painting techniques	• Stating the need for spray painting • Listing the paint constituents • Listing materials for surface preparation • Explaining the use of painting tools and equipment • Naming the methods of surface preparation • Explain the Quality of control factors • Naming types of paints and thinners • Explaining the correct spray painting techniques	- discussion - lecture - demonstrations	- paints - thinners - paint removers - sand papers - power sander - panel beating hand tools - spray gun - compressed air supply - scrappers - paraffin - sanding block - reference books - charts	- oral tests - written exercises - CATs - exams
CAR UPHOLSTERY	At the end of this module unit, the trainee should be able to: a) define the term upholstery b) state types of tools used in upholstery c) name types of adhesives	• Defining the definition of uphostery • Stating Tools and equipment • Naming types of adhesives	- discussion - observation	- upholstery tools and materials - epoxy resin glue - contact adhesive glue - rubber latex solution - PVC adhesives	- oral test - written exercises - question and answer - CATs

MODULE UNIT	SPECIFIC OBJECTIVES/LEARNING OUTCOMES	LEARNING ACTIVITIES	SUGGECTED TEACHING METHODS	SUGGECTED LEARNING RESOURCES	ASSESSMENT
				- clear household glue	
PANEL BEATING	At the end of this module unit, the trainee should be able to: a) identify panel beating tools b) straighten dents on a vehicle body. c) check chassis or body for defects d) apply filler and sand as required on vehicle body repair e) observe safety when panel beating	• Identifying panel beating tools and equipment • Straightening vehicle body dents • Checking filler application and sanding • Observing safety when panel beating	- demonstration - observations	- dollies - spoons - hammers - files - body jack - sanders - plumb line - alignment jigs - body filler - filler hardener - spatula - scrapers - sand papers - emery cloth - reference books	- oral questions - practical exercises - projects (replacement/repair of a damaged panel)
SPRAY PAINTING	At the end of this module unit, the trainee should be able to: a) select the appropriate tools and equipment for surface preparation b) prepare the surface for painting c) select the correct tools and equipments for spray painting d) apply the correct sequence when spray painting	• Selecting appropriate tools and equipment • Preparing the surface painting • Selecting the correct tools and equipment • Applying the correct spray painting sequence • Checking the finished painted work • Caring and maintenance of tools Observing safety precautions when	- demonstration - observation - practicals	- wire brushes - scrapers - files - emery cloth - sand paper - spray gun - air compressor - masking tapes - old newspapers - primer colour - spot putty	- practical exercises - oral questions - projects (spray paint a vehicle after panel beating)

MODULE UNIT	SPECIFIC OBJECTIVES/LEARNING OUTCOMES	LEARNING ACTIVITIES	SUGGECTED TEACHING METHODS	SUGGECTED LEARNING RESOURCES	ASSESSMENT
	e) check the finished painted work f) care for and maintain the tools and equipment g) observe safety when spray painting	spray painting		- colour paints - polish - reference books	
UPHOLSTERY	At the end of this module unit, the trainee should be able to: a) use upholstery tools safely and correctly b) select suitable fabrics for upholstery c) patch a car carpet d) patch a torn seat cover	• Using Upholstery tools • Selecting suitable upholstery fabrics • Patching a car carpet • Patching Torn at cover	- demonstration - discussion - observation - practicals	- upholstery tools - needles (assorted) - webbing pliers - sewing machines - scissors / shears - trestle/horses - pins(assorted) - jute webbing - stretcher - ripping chisel - upholstery materials - patching materials - canvas - carpet stud - adhesive - thin nosed pliers - light hammer - scissors - patching	- practical exercises - written exercises - observations

MODULE UNIT	SPECIFIC OBJECTIVES/LEARNING OUTCOMES	LEARNING ACTIVITIES	SUGGECTED TEACHING METHODS	SUGGECTED LEARNING RESOURCES	ASSESSMENT
				materials - contact adhesive - scissors	

COURSE TITLE: MOTOR VEHICLE TECHNOLOGY

LEVEL: II

TIME: 220 HOURS

CODE: 14.2.2

14.2.2.01 **MODULE TITLE:** CHASSIS, STEERING, SUSPENSION AND BRAKING SYSTEM

14.2.2.02 **MODULE DESCRIPTION**

The module intends to equip the trainee with the necessary knowledge, skills and attitudes to carry out repairs, service and maintain chassis, steering, suspension and braking system of a motor vehicle.

14.2.2.03 **PURPOSE**

The module is designed to equip the trainee with theoretical and practical skills necessary to carryout effective service and repairs on a chassis, steering , suspension and braking system of a motor vehicle.

14.2.2.04 **PRE-REQUISITE**

The trainee have must successfully covered suspension, steering and braking system module at level I.

14.2.2.05 **GENERAL OBJECTIVES:**

The aim of this module, is to enable the trainee to:

a) understand the operation principle of steering system and carry out diagnose of faults and rectify the problem
b) understand the characteristics of various types of chassis construction and carry out repair and maintenance.
c) understand the working principles of suspension system and be able to carry out repair and maintenance.
d) understand the working principle of braking system and be able to carryout repairs and maintenance.
e) appreciate the advantages of power steering over the manual steering system.

MODULE UNIT	SPECIFIC OBJECTIVES/LEARNING OUTCOMES	LEARNING ACTIVITIES	SUGGECTED TEACHING METHODS	SUGGECTED LEARNING RESOURCES	ASSESSMENT
CHASSIS	At the end of this module unit, the trainee should be able to: a) explain the functions of chassis frame b) describe types of forces acting on chassis frame c) describe types of frame, sections and design d) explain the integral construction of frames	• Explaining the functions of Chassis frame • Describing types of forces acting on Chassis frame • Describing types of frame sections • Explaining the integral construction of frames	- discussion - lecture - demonstration	- chassis frame - charts	- written Test - oral tests
STEERING SYSTEM	At the end of this module unit, the trainee should be able to: a) describe construction and operation of a twin front axle steering and its steering geometry b) state types of power steering c) describe the construction and operation of power steering d) compare the advantages of power steering over manual steering	• Describing construction and operation of twin front axle steering • Stating types of power steering • Describing construction and operation of power steering system • Comparing advantages over manual systems	- demonstration - discussion - illustrations	- complete vehicle - steering components - charts - models	- written tests - oral tests - assignments
SUSPENSION SYSTEM	At the end of this module unit, the trainee should be able to a) describe the construction and operation of	Describing construction and operation of suspension systems	- discussion - lecture - demonstration	- vehicle components - models - charts	- written tests - oral tests - assignments

	suspension systems				
BRAKING SYSTEM	At the end of this module unit, the trainee should be able to: a) describe the construction and operation of power assisted braking system b) describe the construction and operation of auxiliary braking systems	• Describing construction and operation of power assisted brakes • Describing construction and operation of braking system • Describing compressed air brakes	- discussion - demonstration - question and answer	- charts - models - brake components	- written tests - oral tests - assignments
CHASSIS	At the end of this module unit, the trainee should be able to: a) examine chassis alignments for distortion b) carry basic maintenance on chassis frames	• Examining inspection on chassis for distortion; • Carrying out maintenance on chassis • Carrying out removal dismantling, examination assemble, and test the steering system • Adjusting and replace worn out parts	- demonstration - observation - discussion	- chassis frame - welding plates - welding equipment - plumb line - hand tools - workshop manual	- project – repair of broken chassis frame - workshop reports
SUSPENSION SYSTEM	At the end of this module unit, the trainee should be able to: a) remove, overhaul and fit macpherson strut suspension system b) overhaul hydro-pneumatic, hydralastic and hydragas suspension	• Removing, dismantling examination, assembling refitting and testing • Carrying out removal, examination, assemble, refit and test hydro-pneumatic, hydraulastic and hydragas • Describing suspension units.	- demonstration - observations - discussion	- macphersons strut - suspension systems - hand tools - text books	- practical exercises - workshop reports
BRAKE SYSTEM	At the end of this module unit, the trainee should be able to: a) overhaul power assisted	• Carryout removal, dismantling, inspecting components of : • Testing brakes efficiency	- demonstration - observations - discussion	- vehicle with auxiliary brakes - workshop manual	- road testing - brake performance test chart

	brake system b) overhaul auxiliary brake systems c) test the efficiency of brakes			- instruction sheets - workshop tools - vehicle with brakes - roller brake testing machine - road dry and not sandy	- taking readings from roller brake testing machine - workshop reports
STEERING SYSTEM	At the end of this module unit, the trainee should be able to: a) overhaul a twin front axle steering system b) carry out adjustments on steering system c) overhaul a power assisted steering system d) overhaul power steering system	• Overhauling twin front axle steering system • Carrying out steering geometry • Overhauling power assisted steering system	- discussion - demonstration - practical - illustrations	- hand tools - vehicle with power steering - workshop manual - steering adjustment equipment - power steering units - steering fluid	- practical exercises - workshop reports - oral tests

COURSE TITLE: **MOTOR VEHICLE TECHNOLOGY**

LEVEL: **II**

CODE: **14.2.3**

TIME: **202 HOURS**

14.2.3.01 **MODULE TITLE: DIESEL ENGINE MAINTENANCE**

14.2.3.02 **DESCRIPTION**

This course module is designed to equip the trainee with the necessary knowledge, skills and attitudes so that the trainee can acquire various competencies in Diesel engine maintenance.

14.2.3.03 **PURPOSE**

To provide the trainee with the necessary skills to carryout general maintenance to a fuel injector system and a diesel engine component.

14.2.3.04 **PRE-REQUISITE**

Should have successfully completed the module on vehicle service.

14.2.3.05 **GENERAL OBJECTIVES**

The aim of this module is t enable the trainee to:

a) understand the working principles of inline and rotary fuel injector pumps
b) understand the operation of the compression ignition engine
c) carryout repairs and maintenance of the component of fuel delivery system
d) effect overhaul and repairs of inline and rotary fuel injector pumps.
e) understand the working principles of a diesel engine
f) perform the engine tune up and test for efficiency (diesel engine)
g) understand the working principles of different types of governors

MODULE UNIT	SPECIFIC OBJECTIVES/LEARNING OUTCOMES	LEARNING ACTIVITIES	SUGGECTED TEACHING METHODS	SUGGECTED LEARNING RESOURCES	ASSESSMENT
COMPRESSION IGNITION ENGINE	At the end of this module unit, the trainee should be able to: a) describe the layout of pump room b) explain the principles of fuel atomization in a diesel engine c) explain the functions of the combustion chamber of a compression ignition engine d) explain the characteristics of injector nozzles and the pressure braking points e) explain the uses of tools and equipment used in testing of injectors	• Describing layout of a diesel pump room • Explaining precautions in handling diesel fuel • Explaining principles of fuel atomization in diesel engine • Explaining functions of combustion chambers in C.I engine • Explaining injector nozzles • Explaining testing of injectors	- demonstration - lecture - discussion	- diesel room - test bench - nozzle tester - reference books - manuals - catalogues - projectors - charts	- oral test - structured questions - cats - written tests
FUEL INJECTION PUMPS (DIESEL)	At the end of this module unit, the trainee should be able to: a) state the working principle of inline diesel injection pump b) describe the construction of a diesel inline injection pump c) state the working principles of a rotary diesel injection d) describe the construction of a rotary diesel injection	• Stating working of an inline diesel injection pump • Describing construction of an inline injection pump • Stating working principles of a rotary diesel injection pump • Describing rotary injection pump parts • Describing layout of a diesel fuel feed system for a distributor fuel injection pump • Explaining importance of adjusting injection pump	- lecture - demonstration - discussion	- equipped diesel pump - testing equipment - reference books - manuals - catalogues - pump governors	- oral tests - written tests - assignments - CATS

	pump e) describe the layout of a diesel fuel feed system for a distributor fuel injection pump f) explain the importance of adjusting injection pump governors g) describe the procedure for phasing and calibrating an inline injection pump.	governors • Describing inline injection pump			
WORKING PRINCIPLES OF DIESEL ENGINES AND THEIR TUNE UP	At the end of this module unit, the trainee should be able to: a) explain the operation of a four stroke cycle diesel engine b) explain the operation of two stroke cycle diesel engine c) explain the concepts of pressure (negative and positive) and the relationship between volume and pressure d) explain the purpose of a diesel fuel feed system e) explain the working principle of diesel fuel feed system f) explain the purpose of bleeding a diesel engine g) explain the common faults associated with diesel engine h) explain the constructional	• Explaining operation of four stroke cycle diesel engine • Explaining operation of two stroke cycle diesel engine • Explaining concepts of pressure (negative and positive) and the relationship between volume and pressure • Explaining purpose of diesel fuel feed system • Explaining diesel fuel feed system • Explaining bleeding the diesel engine • Explaining common faults associated with diesel engine • Explaining constructional differences between petrol and CI engine	- lecture - demonstration - discussion	- diesel engine - injection pump - injectors - chalkboard - chart - reference books	- oral test - written test - cats - exams - assignments

	differences between petrol and CI engine main components				
LUBRICATION SYSTEM LAYOUT AND METHODS OF OIL DISTRIBUTION	At the end of this module unit, the trainee should be able to: a) explain the layout of wet sump engine lubrication system b) explain the operation of pressure feed lubrication c) explain the operation of oil pressure relief valves d) explain the operation of splash oil lubrication system e) name the types of gaskets and seals used in the retention of engine oil f) explain the methods of crankcase ventilation g) explain the importance of an oil cooler in an engine h) state types of lubricants i) state the properties of oil j) explain the importance of servicing the lubrication system k) explain how to trouble shoot lubrication system	• Explaining layout of wet sump engine lubrication system • Explaining pressure feed lubrication system • Explaining oil pressure relief valve • Explaining splash oil lubrication system • Naming gaskets and oil seals • Stating crankcase ventilation • Stating types of lubricants • Stating oil properties • Explaining servicing lubrication system • Explaining lubrication system trouble shooting.	- discussion - lecture - question and answer - observation	- samples of oils - charts - complete vehicle - reference books - manual - lcd - overhead projector	- CATS - assignments - written test - oral test
CAMS AND CAMSHAFT DRIVES	At the end of this module unit, the trainee should be able to: a) explain the working principle of cams and	• Explaining principle of cams and camshaft arrangements • Explaining type of cam shapes • Locating drive gear to the camshaft	- lecture - demonstration - discussion	- overhead projector - transparencies - working engine	- written test - assignments

	camshaft arrangements for side and overhead camshafts b) explain methods of locating the drive gear to the camshaft c) explain how end float of the camshaft is determined d) name methods of connecting camshaft drives	• Determining camshaft endfloat • Naming methods of connecting camshaft drives			
VALVE PORT TIMING FOR BOTH SPARK AND COMPRESSION IGNITION ENGINE	At the end of this module unit, the trainee should be able to: a) state the function of valves b) explain valve construction and valve timing c) explain the effects of engine performance on valve overlap, valve lead and valve lag	• Stating valve timing diagrams for splash ignition engine and CI engine • Explaining valve construction • Explaining valve overlap, overhead and valve tag	- lecture - discussion - question and answer	- overhead projector - transparencies - working engine - chart - illustrations - textbooks	- written test - assignment - oral tests
BALANCING AND VIBRATION DAMPING	At the end of this module unit, the trainee should be able to: a) explain the principles of crankshafts balancing b) describe the causes of crankshafts vibrations c) explain the method of mounting crankshaft damper	• Explaining principles of crankshaft balancing • Describing causes of crankshaft vibrations • Explaining methods of mounting crankshaft damper	- lecture - demonstration - discussion	- overhead projector - transparencies - working engine - charts	- written tests - oral tests - assignments
COMPRESSION	At the end of this module	• Observing safety and health	- demonstration	- pump room	- report writing

IGNITION ENGINE	unit, the trainee should be able to: a) observe safety and healthy precautions associated with fuel and oil testing procedures in a pump room b) repaire and *maintain* a diesel engine	precautions	- discussion - practical assignment	with all the relevant testing and service *equipment* - working diesel engine - spare parts - engine testing rig - feeler gauges - valve grinding machines - rubber suckers - grinding paste	- practical exercises
LUBRICATION SYSTEM	At the end of this module unit, the trainee should be able to: a) service the lubrication system b) trouble shoot the lubrication system c) apply lubricant to lubrication points of a car mechanism	• Servicing lubrication system • Trouble shooting lubrication system • Lubricating car mechanism lubrication points	- discussion - demonstration - observation - practice	- hand tools - complete vehicle - charts - grease gun - grease - oil	- report writing - practical exercises - phase test
FUEL INJECTION PUMPS (DIESEL TYPE)	At the end of this module unit, the trainee should be able to: a) service a faulty injector assembly. b) carryout injector tests with standard equipment c) overhaul and time in line and rotary pumps to engine d) *calibrate a pump and*	• Diagnosing faults • Carrying out Injector tests • Overhauling and time inline and rotating pumps • Pumping calibration • Carrying out diesel engine fuel switch • Carrying out engine test and adjustment	- demonstration - observation	- injectors with nozzles - spare parts - calibration and phasing machine - *rotary and inline* pumps - workshop manual - catalogue	- practical test - examination

	collate results e) carry out the diesel engine fuel service f) carry out engine test and adjust to peak performance			- oil filters - fuel filters - (fuel diesel) - engine test rigs - hand tools	

COURSE TITLE: **MOTOR VEHICLE TECHNOLOGY**

LEVEL: **II**

CODE: **14.2.4**

14.2.4.01 **MODULE TITLE:** **ENGINE REPAIR**

14.2.4.02 **MODULE DESCRIPTION**

This module on engine repair work aims at exposing the trainee to a higher level of knowledge and skills after graduating fro level I. The trainee is exposed to skills related to repair and maintenance of electronic fuel injection, diesel fuel injection, pressurized cooling systems

- Alternative power units
- After completion of the module, the trainee can be absorbed in both formal and in-formal employment.

14.2.4.03 **PURRPOSE**

To produce a skilled mechanic who is able to diagnose and repair vehicles employing modern technology.

14.2.4.04 **SPECIAL REQUIREMENTS**

The trainee should also cover the module on vehicle electrical and electronics, petrol and diesel engine maintenance, prior to taking this module

14.2.4.05 **GENERAL OBJECTIVES**

The aim of this module is to enable the trainee to:

a) understand the working principles of a twin carburetor.
b) understand the construction and operation of CI engine fuel system
c) understand the operating principles of gas turbine and wankel rotary engines
d) understand valve and valve port timing for both spark and C.I engines
e) understand the principles of crankshaft balancing and vibration damping
f) understand the construction and operation of the components in a pressurized water-cooling and vehicle heating system
g) demonstrate skills in diagnosing, repair and testing of the fuel and ignition systems.
h) demonstrate ability to repair, service and maintain injectors and injection pump

MODULE UNIT	SPECIFIC OBJECTIVES/LEARNING OUTCOMES	LEARNING ACTIVITIES	SUGGECTED TEACHING METHODS	SUGGECTED LEARNING RESOURCES	ASSESSMENT
SPARK IGNITION ENGINE FUEL SYSTEM AND AIR INTAKE	At the end of this module unit, the trainee should be able to: a) explain the basic principles of operation of carburetors b) describe the construction of carburetors c) explain the advantages and disadvantages of single, twin and multi barrel carburetors d) explain the operation of a constant choke carburetor e) describe construction and operation of inlet and exhaust manifolds f) explain the construction of air cleaners and silencers g) explain the operation of air induction systems h) explain construction and operation of electronic fuel injection systems	• Explaining operation of carburetors • Describing construction of carburetors • Explaining advantages and disadvantages of single, twin and multi barrel carburetors • Explaining action of constant choke carburetors with regard to • Describing construction and operation of inlet and exhaust manifold • Explaining air cleaners and silencers • Explaining air induction system	- discussion - demonstration - lecture - question and answer	- visual aids - components (carburetors) - manifold - charts - manuals - models - air cleaners - turbo chargers	- oral questions - written tests

		• Explaining basic principles of electronic fuel injection			
VALVE TIMING FOR SI AND CI ENGINE	At the end of this module unit, the trainee should be able to: a) describe the operation and construction of valve and valve port timing on SI engine b) explain the importance of engine timing c) explain the difference between CI and SI engines d) describe the operation of valve and valve port timing on CI engine	• Describing operation and construction • Explaining engine timing • Explaining difference between CI and SI engines • Describing construction and operation	- discussion - question and answer - group discussion	- charts - SI engine - SI port engine - CI engine - CI port engine - projector - LCD - journals	- oral questions - CATS - exams - assignments - written exercises
ROTARY DISTRIBUTOR PUMP	At the end of this module unit, the trainee should be able to: a) describe Diesel fuel feed system layout b) working principles of sanction and deliver	• Describing diesel fuel feed system layout • Working principles	- charts - distributor pump - engine	- discussion - lecture - question and answer - group discussion	- oral question - assignments - written exercises
FUEL FILTERS	At the of this module unit, the trainee should be able to a) state types of fuel filters b) explain the construction and operation of fuel filters	• Stating types of fuel filters • Explaining Fuel filters	- discussion - lecture - questions and answer - observation	- fuel filter - hand outs - charts - reference books	- oral questions - written exercise - CATS

EMMISSION CONTROL	At the end of this module unit, the trainee should be able to: a) state the importance of controlling the fuel supply to the CI engine b) explain the purpose of using special devices to control the quantity of fuel injected during acceleration c) identify the control devices	• Stating controlling fuel supply • Explaining purpose of special devices Identifying control devices	- lecture - discussion - illustrations - notes taking	• Emission control devices - aneroids - throttle delay mechanism - manifold - pressure compensations - fuel ratio controls - reference book journals - s	- oral questions - written exercises - cats - exams
GAS TURBINE AND WANKEL ROTARY ENGINES	At the end of this module unit, the trainee should be able to: a) explain the principles of operation and construction of Gas turbine engine b) explain principles of operation and construction of Wankel Rotary Engine	• Explaining gas turbine engine • Explaining Wankel Engine	- discussion - lecture - demonstration	- charts - gas turbine engine - models - reference books	- written tests
COMBUSTION CHAMBER	At the end of this module unit, the trainee should be able to: a) state factors considered in designing combustion chambers b) explain the construction of combustion chambers in a diesel engine	• Stating factors considered in designing combustion chambers • Explaining construction of combustion chambers	- discussion - demonstration - lecture	- charts - models - engine parts - reference books	- written test - assignment - structured questions

		• Explaining Pre combustion chamber			
CRANKSHAFT BALANCING AND VIBRATION DAMPING	At the end of this module unit, the trainee should be able to: a) state the principles of crankshaft balancing and construction details b) describe the construction of engine vibration damper	• Stating principles of crankshaft balancing • Describing vibration dampers construction	- discussion - lecture - notes taking	- crankshaft - models - charts - manuals - reference books	- written test - assignments
COOLING SYSTEM	At the end of this module unit, the trainee should be able to: a) describe the construction and operation of temperature indicating system b) explain the construction and operation of pressurized cooling system. c) describe the layout of interior heater system	• Describing types of temperatures indicating system • Explaining pressurized cooling system • Describing construction and operation of	- discussion - lecture - demonstration	- components for interior heater systems - charts - manuals - models	- written tests - oral tests
FUEL SYSTEM SI ENGINE	At the end of this module unit, the trainee should be able to: a) diagnose common carburetor faults b) rectify the common carburetors faults	• Diagonising common carburetors faults • Rectifying of common	- demonstration - discussion	- complete convectional engine - hand tools - re counter - manufacturers manual	- practical tests - phase test - report writing

	c) remove and overhaul carburetor d) remove and overhaul petrol pumps (Mechanical) e) remove and overhaul petrol engine injectors f) carryout calibration and phasing of inline pump	carburetor faults • Removing carburetors • Removing mechanical fuel pump • Removing petrol fuel Injectors • Carrying out calibration and phasing of inline pumps		- complete convectional engine - hand tools - re. counter - manufacturers manual	
AIR INTAKE SERVICE	At the end of this module unit, the trainee should be able to: a) Service an air cleaner b) Overhaul a turbo charger c) Refit back to engine	• Servicing air cleaner • Overhauling turbo charger • Refitting turbo charger back to engine	- demonstration - group discussion - observation - practical	- air cleaner - turbo charger - hand tools - instruction sheets - manual	- practical test - report - phase test
FUEL SYSTEM CI ENGINES	At the end of this module unit, the trainee should be able to: a) remove and overhaul diesel injector b) diagnose common diesel injection pump faults c) rectify common injection pump faults (diesel) d) remove and overhaul diesel injector pump	• Removing diesel injectors • Diagonising diesel injector pump of faults • Diagonising Rectification of diesel injection	- demonstration - group discussion	- functional engine - pump testering - hand tools	- practical exercise - observation

		pump • Rectifying diesel pump			
IGNITION SYSTEM	At the end of this module unit, the trainee should be able to: a) remove overhaul and refit the ignition distributor and magnetos b) remove, clean, set and test spark plug	• Removing ignition distribution and magnetos • Removing spark plug	- discussion - demonstration	- distributor - magnet - handtools - timing light - dwell angle meter - rev. counter - spark plug spanner - spark plug cleaner and tester - feeler gauge	- practical exercises - assignment - report writing - phase tests
LUBRICATIO N SYSTEM	At the end of this module unit, the trainee should be able to: a) diagnose and rectify oil lubricating faults b) carryout service and maintenance of lubrication system c) remove, examine and replace oil filter d) remove, overhaul oil pump	• Diagonising lubrication system • Carrying out service and maintenance • Removing filters(compo nent service) • Removing oil pumps overhaul	- discussion - demonstration	- hand tools - spark plug spanner - spark plug cleaner tester - cleaning agent - feeler gaps	- practical test - report writing
COOLING SYSTEM	At the end of this module unit, the trainee should be able to:	• Carrying out service and maintenance	- discussion - demonstration	- complete functional engine	- practical test - reports

	a) carryout service and maintenance of the cooling system b) remove and overhaul a water pump	• Removing water pump		- hand tools - thread - test equipment - thermostat - pressure cap - thermometer - heater - water - container - hand tools - test equipment	

COURSE TITLE: **MOTOR VEHICLE TECHNOLOGY**

LEVEL **II**

CODE: **14.2.5**

TIME: **106 HOURS**

14.2.5.01 **MODULE TITLE:** **TRANSMISSION**

14.2.5.02 **MODULE DESCRIPTION**

This module exposes trainees to knowledge and skills applicable to the repair, and maintenance of the transmission units. It covers units of transmission that were not taught in Level I in the transmission module.

The skills imparted are overhaul, repair, maintenance, testing and adjustment of the transmission units. The graduates can work in formal and informal sector.

14.2.5.03 **PURPOSE**

Produce competent mechanic able to repair and maintain vehicle to an acceptable level.

14.2.5.04 **SPECIAL REQUIREMENT**

The trainee is expected to have covered the module on transmission at Level I.

14.2.5.05 **GENERAL OBJECTIVES**

The aim of this module is to enable the trainee to:

a) understand the construction methods and adjustments of multi-plate and centrifugally operated clutches
b) understand the purpose and operation of the components of drive shafts
c) understand the functions, and operations of double reduction final drive
d) demonstrate ability to diagnose faults and rectify them
e) understand the operating principles of automatic transmission gear box
f) demonstrate ability to overhaul automatic gearbox.

MODULE UNIT	SPECIFIC OBJECTIVES/LEARNING OUTCOMES	LEARNING ACTIVITIES	SUGGECTED TEACHING METHODS	SUGGECTED LEARNING RESOURCES	ASSESSMENT
CLUTCHES	At the end of this module unit, the trainee should be able to: a) state the types of multiplate clutches b) describe the construction of the multiplate clutches c) explain the operation of multi-plate clutch d) describe the construction of centrifugal clutches explain the operation of centrifugal clutches	• Stating types of multiplate clutches • Describing construction the of multiplate clutches • Explaining the operation of multiplate clutches • Describing the centrifugal clutches construction • Explaining operation of centrifugal clutches	- observation - discussion - lecture	- multiplate clutch components - centrifugal clutches - charts - reference books	- written test - oral test - CATs - structured questions
FOUR WHEEL DRIVE	At the end of this module unit, the trainee should be able to: a) sketch the layout of four wheel drive b) explain the operation of a four wheel drive transmission	• Sketching layout of four wheel drive • Explaining operation of four wheel drive	- observation - discussion - lecture	- four wheel drive vehicles (FWD) - full time FWD - part time FWD - charts - reference books	- written tests - oral questions - CATs - structured questions
OVERDRIVE UNIT	At the end of this module unit, the trainee should be able to: a) state the function of an overdrive b) describe the construction and operation of the overdrive c) explain the operation of four speed gearbox with	• Stating the functions of overdrive • Describing the construction and operation of over drive • Describing operation four speed with overdrive • Describing operation five speed with overdrive	- observation - discussion - lecture - notes taking	- over drive unit - chart - reference books - gear boxes	- oral questions - assignments - CATs - written exercises

	overdrive d)explain the operation of five speed gearbox with overdrive				
CONSTANT VELOCITY JOINTS	At the end of this module unit, the trainee should be able to: a) state the function of constant velocity joints b)describe the construction of constant velocity (CU) joints c)explain the operation of constant velocity joints d)name types of constant velocity joints	• Stating the functions of constant velocity joints • Describing construction of C V joints construction • Explaining operation of C V joints operation • Naming the types of constant velocity types	- discussion - observation - lecture	• constant velocity joints - tracta joint - zeppa - weiss - charts - reference books	- oral test - written exercises - CATs - structured questions
REAR AXLE	At the end of this module unit, the trainee should be able to: a) name types of rear axles b)name types of live rear axles c) state the purpose of rear axles d)sketch the types of live rear axles	• Naming types of rear axles • Naming types of Live axles • Stating purpose of rear axle • Sketching types of live rear axles	- discussion - lecture - observation	- charts - rear axle - reference books	- oral tests - written tests - CATs - assignments
DOUBLE REDUCTION REAR AXLE	At the end of this 4C, the trainee should be able to acquire information on: a) state types of rear axles for heavy vehicles b)describe the construction of double reduction rear axle	• Stating types of rear axles for heavy vehicles • Describing construction of double reduction rear axle • Describing operation of double reduction rear axle	- discussion - observation	- charts - rear axles - reference books - double reduction - multi-drive axle - worm and worm wheel	- oral test - written test - CATs - exam - assignments

	c) describe the operation of double reduction rear axle				
DIFFERENTIAL	At the end of this module unit, the trainee should be able to: a) describe the construction of a third differential b) explain the operation of a third differential c) describe the construction and operation of the limited slip differential d) describe the construction and operation of the differential lock	• Describing the construction of third differential • Explaining operation of third differential • Describing the construction of limited slip differential • Describing the construction and operation of differential lock	- discussion - observation - lecture	- rear axle - third differential - limited slip differential - differential lock - *reference books*	- oral question - written exercises - CATs
AUTOMATIC TRANSMISSION	At the end of this module unit, the trainee should be able to: a) describe the construction and operation of a fluid flywheel b) describe the construction and operation of the torque converter c) describe the construction and operation of the automatic gear box	• Describing the construction and operation of fluid flywheel • Describing the construction and operation of torque converter • Describing the construction and operation of automatic gearbox	- discussion - illustrations - notes taking	- fluid flywheel - torque converter - automatic gearbox - automatic transmission fluid (atf) - charts - reference books	- oral questions - written exercises - cats - structured questions

COURSE TITLE: **MOTOR VEHICLE TECHNOLOGY**

LEVEL: **II**

CODE: **14.2.6**

TIME: **174 HOURS**

14.2.6.01 **MODULE TITLE: AUTOMOBILE ELECTRICAL AND ELECTRONIC SYSTEMS**

14.2.6.02 **MODULE DESCRIPTION**

The module is designed to equip the trainee with the
necessary skills, knowledge and attitude to be repair, service and maintain vehicle electrical and electronic systems of both old and new vehicle models. The module provides advanced skills and knowledge suitable for a graduate of level I. The trainees are exposed to modern vehicle technology

14.2.6.03 **PURPOSE**

The module is intended to provide the trainee with relevant competencies to enable them work on vehicle electrical and electronic system.

14.2.6.04 **SPECIAL PRE-REQUISITE**

Trainee should have covered modules on Auto electric and electronics at Level I or have a proof of work experiences.

14.2.6.05 **GENERAL OBJECTIVES**

The aim of this module is to enable the trainee to:

a) understand the fundamentals of electronic and electrical principles
b) understand the engine management systems
c) understand the dynamics on electrically controlled transmission and road wheels control systems
d) understand the operation principles of transmission and supplemented restraint systems
e) appreciate the importance of safety precautions

MODULE UNIT	SPECIFIC OBJECTIVES/LEARNING OUTCOMES	LEARNING ACTIVITIES	SUGGECTED TEACHING METHODS	SUGGECTED LEARNING RESOURCES	ASSESSMENT
MOTOR VEHICLE ELECTRICAL/ELECTRONICS SYSTEMS	At the end of this module unit, the trainee should be able to: a) define electrical parameters b) state the use of electrical symbols c) name electrical units d) define Ohms's law e) explain the use of measuring and rest instruments f) name vehicle components operated by electricity g) describe the basic electrical circuits in a motor vehicle h) explain the importance of protecting vehicle electrical circuits i) describe cable sizes for various electrical circuits j) describe cable colours used by Lucas for wiring cables k) describe the construction and operation of a headlamp l) explain the principle of operation of a flasher unit m) describe the trouble shooting of lighting system	• Defining electrical parameters • Stating electrical symbols • Naming electrical units • Defining Ohm's law • Explaining testing and measuring instruments • Naming vehicle components operated by electricity • Describing basic electrical circuits in a vehicle • Explaining protection of vehicle electrical systems • Describing cable sizes • Cable types • Describing cable colours • Describing head lamp • Explaining Flasher unit • Describing lighting system • Describing electrical horn • Explaining relays and switches	- discussion - lecture - observation - question and answer	- flasher unit - circuit board - vehicle with lighting system - relays - switches - text books	- discussion - lecture - oral/written tests

	n) describe the construction and operation of an electric horn				
ELECTROMAG NETISM	At the end of this module unit, the trainee should be able to: a) define electromagnetism b) explain electromagnetic induction c) explain rules/laws of magnetic induction d) explain e.m.f induced in a coil in a coil e) explain the applications of electromagnetism in vehicle electrical systems f) differentiate between motors and generators	• Defining electromagnetism • Explaining electromagnetic induction • Explaining Rule/Law of magnetic Induction • Explaining e.m.f induced in a coil • Explaining applications of electromagnetism			
ELECTRICAL CIRCUITS AND SEMI CONDUCTORS	At the end of this module unit, the trainee should be able to: a) explain semi-conductor theory b) name types of electrical circuits c) explain the function of semi conductors d) explain the applications of semi-conductor components in vehicle electrical circuits	• Stating Ohm's law • Naming electrical circuits • Explaining semi conductors • Applications of semi conductors	- discussion - lecture - observation - question and answer	- magnets - electro magnets - battery - electrical wires - bulbs - resistors - diodes - transistors - thryristors - zener diode - ammeter - voltameter - insulator tester - reference books	- oral questions - cats - exams - assignments
BATTERY	At the end of this module unit, trainee should be	• Stating the purpose of a car battery	- Discussion - Lecture	- battery - ac main supply	- oral questions - cats

	able to: a) state the purpose of battery b) state types of battery c) explain the operating principle of a lead acid battery d) explain the function and construction of a lead – acid battery e) explain the term battery capacity f) explain the principle of battery charging g) describe methods of battery charging h) explain how to determine polarity of leads i) explain how to charge a battery from AC main supply j) calculate approximate charging time k) describe the advantages of alkaline batteries over lead – acids batteries l) describe how to maintain a battery	• Stating types of batteries • Explaining a Lead acid battery • Explaining a Lead acid battery • Explaining a battery Capacity • Describing a battery charging • Describing Principal methods • Explaining Polarity of leads • Explaining charging from AC main supply • Calculating charging time • Describing advantages of alkaline batteries over lead acid batteries • Describing battery maintenance	- Questions and answer	- battery charger - alkaline batteries - battery trouble shooting - chart - vaseline	- exams - assignments
ENGINE MANAGEMENT	At the end of this module unit, the trainee should be able to: a) state the function and principle of air induction b) explain the operation principles of digital and electronic engine control	• Stating function and principles • Explaining digital and electronic engine control • Describing Engine fuelling terms • Describing open and closed loop • Listing types of electronic	- demonstration - lecture - discussion - question and answer	- overhead projector - LCD - lesson plan	- written exercises - oral test - cats - exams

	systems c) describe the terms used in engine fuelling d) describe the operation of electronic ignition system e) list types of electronic ignition system f) describe the procedure of engine tune-up g) develop culture of maintenance of institute training facilities	ignition system • Developing Tune up of engine • Describing culture of maintenance			
ROAD WHEELS CONTROL SYSTEMS	At the end of this module unit, the trainee should be able to: a) explain the construction of electronically controlled transmission b) describe the principle of operation of electronically controlled transmission c) explain the construction of cruise control systems d) describe principle operation of cruise control system	• Explaining construction • Describing principle operation • Explaining construction • Describing principle operation	- demonstration - discussion - practice	- resources - vehicle equipped with modern transmission units	- oral questions - cats - exams - assignments
TRANSMISSION AND SUPPLEMENTAL RESTRAIN SYSTEMS	At the end of this module unit, the trainee should be able to: a) explain the layout of automatic transmission b) describe the operation of automatic transmissions c) explain the layout of Anti-lock Brake System (ABS)	• Explaining automatic transmission • Describing principles of operation • Explaining layout of ABS • Explaining principles of operation • Describing Component of supplemented restrain system	- demonstration - discussion - practice	- resources - vehicle equipped with modern transmission units	- oral questions - CATs - exams - assignments

	d)explain the principle of operation of the Anti-lock Braking System e)describe the components of supplemented restrain systems in a motor vehicle				
FUNDAMENTAL OF ELECTRICAL AND ELECTRONICS	At the end of this module unit, the trainee should be able to: a)carryout the wiring exercises on a wiring board. b)determine values related to electrical circuits using Ohm's Law c)carryout experiments to *illustrate the laws of* magnetism d)carryout experiments to illustrate the principles of magnetic induction e)measure capacitance f) charge and discharge a capacitance g)carryout diodes tester h)carryout transistor tests i) identify various types of batteries used in motor vehicle j) carryout vehicle battery maintenance k)repair and service motor vehicle electrical systems l) prepare electronic cable joints and solder m) prepare an electrical	• Carrying out Electrical circuits • Determining of values • Carrying magnetic Law • Carrying magnetic induction • Determining of capacitance values • Charging and discharging capacitors • Carrying out diodes testing • Identifying types of batteries • Carrying out maintenance of battery • Identifying types of joints	- discussion - demonstration	- testing meters - voltmeters - ammeter - ohmmeter - insurance resistance tester - magnetic capacity - lab with relevant *functions* - battery - coil - horse magnet - electrical electronic laboratory - capacitors - capacitor testing equipment - diode tester - measuring instrument - transistor tester	- practical tests - assignments - report writing - phase tests

	circuit incorporating a relay and a switch				
ENGINE MANAGEMENT PRACTICE	At the end of this module unit, the trainee should be able to: a) service air induction systems b) service petrol injection c) service diesel injection d) identify and inspect engine sensors e) carryout servicing of activators f) carryout engine fuelling checks and tests g) service and test electronic ignition systems h) carryout trouble shooting and tune-up for EFI engine	• Servicing air cleaner • Servicing petrol injector • Servicing diesel injection • Identifying and testing of sensors • Servicing and testing of activators • Carrying engine fuelling checks and service • Carrying tests • Servicing trouble shooting • Carrying Tune up	- group discussion - demonstration	- air induction system - petrol inject pump - diesel injector pump - hand tools - cleaning agent - digital and electronic engine control (complete) - complete efi engine - relevant test equipment - gas analysers	- practical tests - phase tests - assignments - report writing
ROAD WHEELS CONTROL SYSTEM	At the end of this module unit, the trainee should be able to: a) carryout maintenance procedures of Electronically controlled transmissions b) carryout tests and repairs on cruise controls systems c) carryout tests, repairs and maintenance of power steering systems	• Carrying electrically controlled transmissions • Carrying out maintenance • Carrying tests • Carrying tests, repairs and maintenance	- group discussion - demonstration	- functional electronically controlled transmissions - hand tools - testing equipment functional - cruise control systems - testing equipment	- practical tests - reports - assignments

COURSE TITLE: MOTOR VEHICLE TECHNOLOGY

LEVEL: II

CODE: 14.2.7

TIME: 212 HOURS

14.2.7.01 **MODULE TITLE:** **AUTOMOTIVE VENTILATION, HEATING AND AIR-CONDITIONING**

14.2.7.02 **MODULE DESCRIPTION**

This module covers ventilation, heating and air-conditioning in automotive to provide comfort in passenger compartment. The module is designed to equip the trainee with the necessary knowledge, skills and attitude that will allow him/her to service and maintenance of ventilation, heating and air-conditioning systems of the vehicle.

After completion of the module the trainee is able to test, service, maintain and install an air-conditioning unit.

14.2.7.03 **PURPOSE**

To produce a skilled mechanic who has the ability to test, service, maintain and install an air-conditioner

14.2.7.04 **SPECIAL REQUIREMENT**

The trainee requires to have a background knowledge in science. The basic scientific principles learn are put into application in this module.

14.2.7.05 **GENERAL OBJECTIVES:**

The aim of this module is to enable the trainee to:

a) understand the basic principles of ventilation, heating, air conditioning and refrigeration
b) understand the operation of the compressor and the control valves.
c) understand the operation of evaporation pressure control system
d) understand the general maintenance process of automotive air conditioning
e) demonstrate ability to maintain and install an air- conditioner in a vehicle

MODULE UNIT	SPECIFIC OBJECTIVES/LEARNING OUTCOMES	LEARNING ACTIVITIES	SUGGECTED TEACHING METHODS	SUGGECTED LEARNING RESOURCES	ASSESSMENT
VENTILLATION	At the end of this module unit, the trainee should be able to: a) explain the need for ventilating vehicle passenger compartment b) state the process of ventilation c) name methods of car ventilation d) explain when uncontrolled ventilation is needed e) state types of controlled ventilation system f) name the basic component of ram – air ventilation system g) name the parts of a power ventilating system h) explain the operation of ram – air system i) explain the operation of power ventilating system	• Stating need for ventilation • Stating process of ventilation • Stating methods of ventilation a car • Stating uncontrolled ventilation • Stating controlled ventilation system • Naming basic components of ram – air ventilating system • Naming part of power ventilating system • Explaining operating of ram air system • Explaining the operation of power ventilating system	- discussion - lecture - question and answer - illustrations	- car with ventilation, heating and air-conditioning - charts - chalkboard - car manual	- oral questions - written assignments - assignments
HEATING	At the end of this module unit, the trainee should be able to: a) state the purpose of a heater in the car heating system b) state types of doors in a car heater c) explain the operation of a	• Stating purpose of a heater • Stating types of doors in a car heater • Explaining operation of car heating system	- discussion - question and answer - lecture - note taking	- car heater - car with air condition system - charts - chalkboard	- oral questions - written tests

	car heating system				
AIR CONDITIONING	At the end of this module unit, the trainee should be able to: a) state the function of air conditioner in vehicle air-conditioning b) name the basic parts of the refrigeration system c) sketch the basic refrigeration system	• Stating function of air conditioner in vehicle • Naming parts of the refrigeration system • Sketching refrigeration system	- discussion - lecture - question and answer - note taking	- charts - chalkboard - vehicle with air – con - charts - chalkboard - textbooks	- assignments - oral questions - written exercise
CONTROLS	At the end of this module unit, the trainee should be able to: a) state types of anti-icing control b) sketch a suction – throttling valve c) explain the operation anti – icing control	• Stating types of anti-icing control • Sketching sunction throttling valve • Explaining operation of anti-icing control	- oral questions - discussion	- charts - chalkboard - manuals - textbooks	- oral exercises - written exercises - assignments
AIR CONDITION SYSTEM SWITCHES	At the end of this module unit, the trainee should be able to: a) name types of Air-condition system switches b) state the function of electric pressure switch c) state the functions of thermostatic cycling switch d) name parts of a thermostatic cycling switch	• Stating air-conditioning switches • Stating function of electric pressure switch • Stating function of the thermostatic cycling switch • Stating parts of thermostatic cycling switch	- oral questions - discussion	- charts - chalkboard - car with air condition system	- written exercises - assignments - oral tests

COMPRESSOR	At the end of this module unit, the trainee should be able to: a) state types of Air-Con system compressors b) sketch a magnetic compressor clutch c) explain the operation of the magnetic compressor clutch	• Stating types of Air-Con compressors • Sketching magnetic compressor clutch • Explaining magnetic compressor clutch	- discussion - demonstration	- charts - compressor	- oral question - written exercises - assignments
SIGHT GLASS	At the end of this module unit, the trainee should be able to: a) state the function of the sight glass in Air-condition system b) describe the condition of liquid refrigerated c) sketch a basic refrigeration system	• Stating function of sight glass in Air-Condition system • Describing condition of liquid refrigerated • Sketching basic refrigeration system	- discussion - demonstration	- charts - chalkboard - posters	- oral questions - written exercises - assignment
RECEIVERS AND ACCUMULATORS	At the end of this module unit, the trainee should be able to: a) state the function of receivers and accumulators b) sketch a receiver drier (receiver-dehydrator)	• Stating function of receivers and accumulators • Sketching a receiver - dehydrator	- discussion - demonstration	- charts - chalkboard - posters	- oral question - written exercises - assignment
SAFETY DEVICES	By the end of this module unit, the trainee should be able to name the safety devices used in automotive air conditioners	• Naming safety devices	- discussion - demonstration	- charts - chalkboard - posters	- oral question - written exercises - assignment

REFRIGERANT	At the end of this module unit, the trainee should be able to: a) state the qualities of the refrigerant b) observe safety precaution when handling refrigerant or servicing the air-conditioner	• Stating qualities of the refrigerant • Observing safety precaution	- discussion - demonstration - question and answer	- charts - chalkboard - text books - posters - freon-12 - refrigerant R12 - goggles - charts - textbooks - refrigerant	- oral tests - written tests - assignment
COMPRESSOR LUBRICATION	At the end of this module unit, the trainee should be able to: a) state the purpose of lubricating a compressor b) name the properties of the refrigerant oil	• Stating lubricating a compressor • Naming properties of refrigerant oil	- discussion - demonstration - question and answer	- compressor lubricating oil - charts - textbooks - compressor	- CBY - exams - assignment - oral question
HEATER, CONDITIONERS SYSTEM CONTROL	At the end of this module unit, the trainee should be able to: a) state the operating modes in a manually controlled heater-air conditioner system b) state the operating modes in an automatic heater-air-conditioner system	• Stating operating modes • Stating operating modes	- discussion - demonstration - question and answer	- control panel heater system - vehicle with heater system - vehicle with Automatic heater system	- oral questions - written assignments
HEATER AND AIR-CONDITIONER SYSTEM SERVICE	At the end of this module unit, the trainee should be able to: a) check belt tension and adjust as necessary b) check blower motor operation By all speeds	• Checking belt tension • Checking blower motor operation • Discharging refrigerant from system • Evacuating refrigerant from system	- demonstration - discussion - group work - field visits	- vehicle with air – conditioner - handtools - electronic measuring instrument - electronic	- practical exercises - oral questions - written reports - assignments

	c) discharge the system off refrigerant d) evacuate the system off refrigerant e) use appropriate refrigerant and equipment to charge the system f) perform leakage test to determine that system is not leaking using electronic leak detector g) detect internal leaks using electronic equipment h) adjust thermostat valve i) install air conditioning unit and test for serviceability	• Using charge the system with refrigerant • Performing leakage test • Detecting internal leaks • Adjusting thermostat valve • Installing air conditioning unit		equipment (leaks) - refrigerant - construction sheets - manuals - garage	