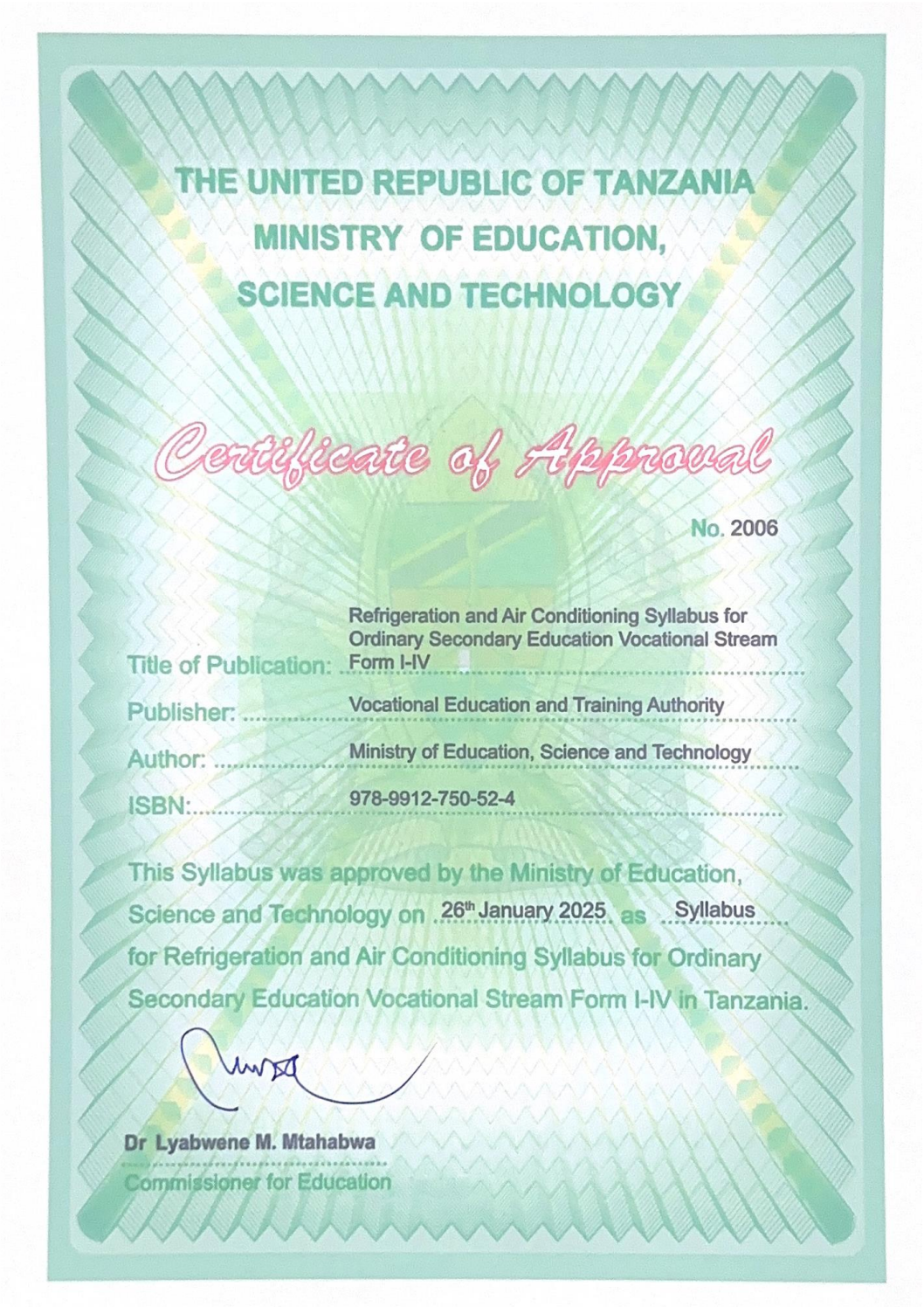
THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY



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Dr Lyabwene M. Mtahabwa
Commissioner for Education

REFRIGERATION AND AIR CONDITIONING SYLLABUS FOR ORDINARY SECONDARY EDUCATION VOCATIONAL STREAM FORM I–IV

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Abbreviations and Acronyms

AC	Alternating Current
CA	Continuous Assessment
CAD	Computer Added Designing
CAM	Computer Aided Manufacturing
CBET	Competence Based Education and Training
DC	Direct Current
DOL	Direct On-Line
FTNA	Form two National Assessment
GRN	Goods Receipt Note
ICT	Information Computer Technology
LPO	Local Purchase Order
MVR	Mechanical Vapor Recompression
NECTA	National Examination Council of Tanzania
NGOs	Non-Government Organisations
OSHA	Occupational Safety and Health Administration
OUS	Occupational Unit Standards
TIE	Tanzania Institute of Education
TEV	Thermostatic Expansion Valve
VETA	Vocational Education and Training Authority
VOM	Volt-Ohm Meter

Definition of Key Terms

Assessment: The process of collecting evidence and making judgments on whether competence has been achieved, or whether specific skills and knowledge have been achieved that will lead to the attainment of competence.

Circumstantial knowledge: Detailed knowledge, which allows the decision-making in regard to different circumstances and cross cutting issues.

Competence: The ability to use knowledge, understanding, practical, and thinking skills to perform effectively to the workplace standards required in employment.

Element: A sub- unit (step), which reflects learning sequence with the aim of achieving broad learning objectives of a unit.

Performance criteria: indicate the expected end results or outcome in form of evaluative statements.

Standard: A set of statements, which if proved true under working conditions, means that an individual is meeting an expected level and type of performance.

Underpinning Knowledge: This is essential knowledge needed in order to demonstrate competences that are associated in performing a given task.

Unit: A statement of broad learning objectives, which prescribe the requirements of a standard in form of practical skills, knowledge and appropriate attitudes.

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For and on behalf of:

Vocational Education and Training Authority

CPA. Antony M. Kasore

Director General

1.0. Introduction

Refrigeration and Air Conditioning is a vital occupation taught in the Ordinary Secondary Education Vocational Stream. Its importance lies in Tanzania's diverse climatic conditions and the growing demand for cooling systems in residential, commercial, and industrial sectors. This field presents significant opportunities to support the nation's economy by equipping students with practical skills to design, repair, service, replace, install, and maintain cooling systems, including refrigerators, air conditioners, and cold storage facilities. These competence help foster local industries, enhance food preservation, used in hospitals, clinics, and labs for storing blood, vaccines, and other temperature-sensitive materials, used in mortuary, storing perishable items like meat, dairy etc., and provide temperature comfortability to human being in the dedicated rooms such server room, and conference rooms. As a result, teaching refrigeration and air conditioning contributes to economic development, job creation, energy efficiency, improve hand-on skills, and improved living standards.

Through the program, students acquire both theoretical and practical knowledge, from understanding system components to mastering advanced troubleshooting and maintenance techniques. They also gain expertise in operating specialized equipment, designing energy-efficient systems, and implementing sustainable practices, all while adhering to strict safety standards. Moreover, students are equipped with business management skills to successfully run refrigeration and air conditioning workshop, ensuring quality and innovation across the industry.

Graduates of this program can pursue diverse employment opportunities in government and private sectors, including ministries, training institutions, research centers, energy agencies, refrigeration and air conditioning projects, NGOs, and small, medium, or large cooling industries. Self-employment is also a viable path, enabling graduates to contribute to the economy as entrepreneurs.

The Refrigeration and Air Conditioning Syllabus is designed to guide teaching and learning at the Ordinary Secondary Education Form I-IV Vocational Stream in the United Republic of Tanzania. It outlines the essential competence students need to develop, providing teachers with comprehensive guidance for effective instruction. By following this syllabus, teachers can ensure learners acquire the skills required to thrive in the dynamic field of refrigeration and air conditioning.

2.0.Main Objectives of Education in Tanzania

The main objectives of education in Tanzania are to enable every Tanzanian to:

(a) Develop and improve his or her personality so that he or she values himself or herself and develops self-confidence;

(b) Respect the culture, traditions, norms, and customs of Tanzania; cultural differences; dignity; human rights; attitudes, and inclusive actions;

(c) Advance knowledge and apply science and technology, creativity, critical thinking, innovation, cooperation, communication, and positive attitudes for his or her own development and the sustainable development of the nation and the world at large;

(d) Understand and protect national values, including dignity, patriotism, integrity, unity, transparency, honesty, accountability, and the national language;

(e) Develop life and work-related skills to increase efficiency in everyday life;

(f) Develop a habit of loving and valuing work to increase productivity and efficiency in production and service provision;

(g) Identify and consider cross-cutting issues, including the health and well-being of the society, gender equality, as well as the management, and sustainable conservation of the environment; and

(h) Develop national and international cooperation, peace, and justice per the Constitution of the United Republic of Tanzania and international conventions.

3.0.General Competence for Ordinary Secondary Education Vocational Stream

The general competence for Ordinary Secondary Education, Form I-IV, Vocational Education stream is to:

(a) Apply the knowledge, skills, and attitudes the students developed in the primary school stage to increase his/her understanding of technical skills;

(b) Apply technical skills in designing, inventing, and making various things to cope with life and solve challenges in society;

(c) Appreciate citizenship and national virtues;

(d) Use language skills;

(e) Demonstrate self-confidence in learning in various fields, including science and technology, technical knowledge, and technical skills;

(f) Apply technical knowledge and skills in designing, discovering, and making various things to solve challenges in society, including cross cutting issues;

(g) Appreciate procedures and safety rules in using technical tools correctly; and

(h) Apply the technical knowledge and skills acquired to develop oneself with vocational and technical education and join the workforce.

4.0.General Competences of the Occupation

Upon completion of this occupation, students are expected to have ability to:

(a) Maintaining workshop tools, equipment and safety;
(b) Perform preventive maintenance;
(c) Perform bench work;
(d) Building simple electric and electronic circuit;
(e) Maintain domestic refrigeration and air conditioning system;
(f) Building advanced refrigeration system;
(g) Design refrigeration and Air conditioning system;
(h) Maintaining industrial refrigeration and air conditioning system;
(i) Installation of commercial and industrial refrigeration and air condition system;
(j) Managing workshop activities.

5.0.Main and Specific Competences

The main and specific competences to be developed are presented in Table 1

Table 1: *Main and Specific Competences for Form I-IV*

Modules (Main Competence)	**Units (Specific competences)**
FORM ONE	
1.0 Maintaining workshop tools, equipment, and safety	1.1 Maintaining workshop safety 1.2 Maintaining tools 1.3 Maintaining equipment and machines

Modules (Main Competence)	Units (Specific competences)
	1.4 Perform First Aid
2.0 Performing preventive maintenance of tools, equipment, and machines	2.1 Performing preventive maintenance of electrical tools 2.2 Performing preventive maintenance of electrical equipment 2.3 Maintaining machines
3.0 Performing bench works	3.1 Performing metal cutting 3.2 Performing drilling 3.3 Performing metal filling 3.4 Performing metal bending 3.5 Performing thread 3.6 Performing basic spray painting 3.7 Performing non fusion joints 3.8 Performing pipe joints
FORM TWO	
1.0 Building simple electric circuits	1.1 Performing cold electrical joints 1.2 Performing hot electrical joints 1.3 Constructing resistive circuits 1.4 Constructing capacitive circuits 1.5 Constructing inductive circuits 1.6 Constructive RLC circuits 1.7 Measuring electric quantities 1.8 Testing electro-mechanical components
2.0 Building simple electronic circuits	2.1 Determining characteristic of active electronic devices 2.2 Building rectifier circuits 2.3 Performing measurement on simple low/high frequency circuits 2.4 Performing voltage measurements
3.0 Maintaining domestic Refrigeration systems	3.1 Servicing domestic refrigerators 3.2 Servicing domestic freezers 3.3 Servicing liquid coolers 3.4 Repairing domestic refrigerators 3.5 Repairing domestic freezers 3.6 Repairing liquid coolers
FORM THREE	
1.0 Maintaining refrigeration systems	1.1 Servicing commercial refrigerators 1.2 Servicing ice maker 1.3 Servicing absorption system refrigerators 1.4 Repairing commercial refrigerators 1.5 Repairing ice maker 1.6 Repairing absorption system refrigerators
2.0 Maintaining air conditioning systems	2.1 Servicing self-contained air conditioners 2.2 Servicing split unit air conditioners 2.3 Servicing car air conditioners 2.4 Repairing elf-contained air conditioners 2.5 Repairing split unit air conditioners 2.6 Repairing car air conditioners
3.0 Installing air conditioning systems	3.1 Installing self-contained air conditioners 3.2 Installing split unit air conditioners

Modules (Main Competence)	Units (Specific competences)
	3.3 Installing cassette type air conditioners
4.0 Building advanced refrigeration systems	4.1 Installing control of AC machines 4.2 Installing compression system refrigerant control circuits
FORM FOUR	
1.0 Design domestic refrigeration systems	1.1 Design and making domestic refrigerator 1.2 Design and making domestic freezers 1.3 Design and making ice making machine 1.4 Design and construct small cold room 1.5 Design and making liquid coolers
2.0 Maintaining industrial air conditioning and refrigeration systems	2.1 Servicing cold rooms 2.2 Servicing chillers 2.3 Servicing central air conditioners 2.4 Repairing cold rooms 2.5 Repairing chillers 2.6 Repairing central cooling systems 2.7 Servicing compressor above 60 kW 2.8 Servicing receiver tank 2.9 Repairing receiver tank
3.0 Appling advanced material joining techniques	3.1 Performing arc welding 3.2 Performing resistance welding 3.3 Performing aluminium welding
4. 0 Managing safe working environment	4.1 Managing Hazards 4.2 Carrying out risk assessment 4.3 Managing environment
5.0 Managing preventive maintenance	5.1 Planning preventive maintenance 5.2 Supervising preventive maintenance
6.0 Installing commercial and industrial refrigeration and air conditioning systems	6.1 Installing cold room 6.2 Installing chilling plants 6.3 Installing small central air conditioners
7.0 Manging workshop activities	7.1 Designing workshop layout 7.2 controlling tools and equipment 7.3 Estimating material and labour cost 7.4 Training subordinates 7.5 Preparing reports 7.6 Managing workshop business

6.0. The Roles of Teachers, Students, and Parents in Teaching and Learning

Good relationships between teachers, students and parents, or guardians is fundamental to ensuring successful learning. This section outlines the roles of each participant in facilitating effective teaching and learning of Refrigeration and Air conditioning

7.0. The teacher

The teacher is expected to:

(a) Help the students to learn and develop the intended competences in Refrigeration and Air conditioning

(b) Use teaching and learning approaches that will allow students with different needs and abilities to:

(i) Develops the competences needed in the 21st Century; and

(ii) Actively participate in the teaching and learning process.

(c) Use students centered instructional strategies that make the students a center of learning which allow them to think, reflect and search for information from various sources;

(d) Create a friendly teaching and learning environment;

(e) Prepare and improvise teaching and learning resources;

(f) Conduct formative assessment regularly by using tools and methods which assess theory and practice;

(g) Treat all the students according to their learning needs and abilities;

(h) Protect the students from the risky environment while he or she is at school;

(i) Keep track of the student's daily progress;

(j) Identify individual student's needs and provide the proper intervention;

(k) Involve parents/guardians and the society at large in the student's learning process; and

(l) Integrate cross-cutting issues and ICT in the teaching and learning process.

8.0. The student

The student is expected to:

(a) Develop the intended competences by participating actively in various learning activities inside and outside the classroom; and

(b) Participate in the search for knowledge from various sources, including textbooks, reference books and other publications in online libraries.

9.0. The parent/guardian

The Parents/Guardian is expected to:

(a) Monitor the child's academic progress in school;

(b) Where possible, provide a child with the needed academic support;

(c) Provide a child with a safe and friendly home environment which is conducive for learning;

(d) Keep track of a child's progress in behaviour;

(e) Provide the child with any necessary materials required in the learning process; and

(f) Instil in a child a sense of commitment and positive value towards education and work.

10.0. Teaching and Learning Methods

The teaching and learning methods are instrumental in developing students's competences. This Syllabus suggests teaching and learning methods for each activity which includes but not limited to demonstration, practical/hands-on activities, observations, role play, simulation, group works, peer teaching/learning, discussions, presentations, field visits, research, and project works. However, a teacher is advised to plan and use other appropriate methods based on the environment or context. All the teaching and learning methods should be integrated with the everyday lives of students. The focus is expected to be on practical application and developing cognitive, affective, and psychomotor skills through learner-centred methods. Vocational teachers act as facilitators, incorporating both school base teaching and project work supervision.

11.0. Teaching and Learning Resources

The process of teaching and learning requires different resources. In that regard, both a teacher and student should work together to collect or improvise alternative resources available in the school and home environment when needed. Teachers and students are expected to constantly seek for information from various sources to effectively facilitate the teaching and learning process. The list of approved textbooks and reference books shall be provided by the TIE.

12.0. Assessment

Assessment is important in teaching and learning of Refrigeration and Air conditioning. It is divided into formative and summative assessments. Formative assessment informs both the teacher and students on the progress of teaching and learning, and in making decisions on improving the teaching and learning process. Teachers are therefore, expected to apply a wide range of formative assessment methods which include but not limited to demonstration, discussions, presentations, oral questions, experiments, observations, practical assignments, and projects.

Summative assessment, on the other hand, will focus on determining students's achievement of learning. Teachers are expected to use a variety of summative assessments including Form Two National Assessment, terminal examination, annual examination, mock examination, and project. The scores obtained from these assessments will be used

as Continuous Assessment (CA). Therefore, the continuous assessments shall contribute 60% and the National Form IV Examination shall be 40% as indicated in Table 2.

9.1. Project work

Project work is a carefully planned and clearly defined task or problem that a student's undertake, either alone or in a group, to enhance and apply the skills and knowledge gained in the classroom, workshop, kitchen, or laboratory. It is based on the principles of "Learning by Doing" and "Learning by Living." In this context, the implementation of project work in secondary schools' vocational streams is essential. Projects in the vocational stream should be conducted in the core subject (occupation). To ensure its success, the supervision and assessment of students project work must be consistent with the established guidelines provided by National Examinations Council of Tanzania (NECTA).

Table 2: *Contribution of Continuous Assessment and National Examination in the final score*

Assessment Category	**Weight (%)**	**National Examination**
Form Two National Assessment (FTNA)	6.0	40
Form Three Terminal Examination	5.0	
Form Three Annual Examination	5.0	
Form Four Mock Examination	7.0	
Project	7.0	
Form Two Practical	10.0	
Form Three Practical	10.0	
Form Four Practical	10.0	
Total	**60**	

13.0. Number of Periods

The Refrigeration and Airconditioning Syllabus for Ordinary Secondary Education Vocational Stream Form I-IV provides time estimates for teaching and learning each specific competence. The estimates consider the complexity of the specific competences and the learning activities. Eight (08) periods of 40 minutes each have been allocated per week, whereby two (02) periods will be used for theory and 6 for practical sessions which may require double periods (e.g., 80). Double periods will allow sufficient time for hands-on activities.

14.0. Teaching and Learning Contents

The contents of the Syllabus are organised into a matrix with seven (07) columns which are main competences, specific competences, learning activities, suggested teaching and learning methods, assessment criteria which is dived into (process assessment, products/service assessment and underpinning knowledge), suggested teaching and learning resources and number of periods as presented in Table 3 to 6.

Form One

Table 3: *Detailed contents for Form One*

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
1.0 Maintaining workshop tools, equipment, and Safety	1.1 Maintaining workshop safety	(a) Performing firefighting	**Guest speaker:** invite facilitator to describe on fire classes, fire extinguish and the ways of fighting with fire **Demonstration:** Demonstrate to the students how to perform firefighting and how to use equipment **Practical work:** Organise the students into manageable groups to perform firefighting in your school/workplace	• Operate firefighting equipment • Identify types of fire • Identify the firefighting equipment	Cleaned workshops conform to rules and regulations	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain different ways of Performing firefighting **Principles:** The student should explain the principles related to: Performing firefighting **Theories:** The student should explain: • Different classes of fire • The use of fire alarm • Different firefighting appliances • Workshop rules and regulations • Personal protective equipment	The following tools, equipment and safety gear are to be available: • Goggles • Safety boots • Overall • Gloves • Helmet • Firefighting equipment • Cobweb brush • Brooms • Dust bins • Mop • Teaching aid • Projector	112

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						Circumstantial knowledge **Detailed knowledge about:** Safety precautions to be observed when working		
		(b) Performing safe keeping of gas cylinder	**Discussion:** Guide the students to discuss the ways of safe keeping of gas cylinder **Demonstration:** Demonstrate to the students how to perform f safe keeping of gas cylinder and how to use equipment **Practical work:** Organise the students into manageable groups to perform safe keeping of gas cylinder in your school/workplace	• Remove cobwebs • Remove dust • Clean floor	Cleaned workshops conform to rules and regulations	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain different ways of performing safe keeping of gas cylinder **Principles:** The student should explain the principles related to: performing safe keeping of gas cylinder **Theories:** The student should explain: • Different types of gas cylinders • The uses of gas cylinder • Different ways of keeping gas cylinders • Personal protective equipment **Circumstantial knowledge** **Detailed knowledge about:**		

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						Safety precautions to be observed when working Keeping gas cylinder		
	1.2 Maintaining tools	(a) Maintaining cutting tools	**Discussion:** Guide the students to discuss the ways of Maintaining cutting tools **Demonstration:** Demonstrate to the students how to Maintain cutting tools and how to use equipment **Practical work:** Organise the students into manageable groups to Maintain cutting tools in your school/workplace	• Categorize tools • Properly handle the cutting tools • Identify faults at early stages • Sharpen blunt tools	Maintained tools conform to manufacturer's specifications and workshop guideline	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain different ways of maintaining cutting tools **Principles:** The student should explain the principles related to maintaining cutting tools **Theories:** The student should explain • Types of maintenance • Steps of sharpening • Types of greasing • Types of oiling **Circumstantial knowledge** **Detailed knowledge about** safety precautions to be observed when greasing, oiling and sharpening	The following tools, equipment and safety gear are to be available: • Stock and die • Hacksaws • Tin snip • Try square • Spirit level • Steel rule • Hammer • Vice • Overall • Gloves • Safety boots • Goggles • Oil can • Greasing gun	42
		(b) Maintaining laying tools	**Discussion:** Guide the students to discuss the ways of	• Perform greasing • Perform oiling	Maintained tools conform to manufacturer's specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain	The following tools, safety gears, equipment	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Maintaining laying tools **Demonstration:** Demonstrate to the students how to Maintain laying tools and how to use equipment **Practical work:** Organise the students into manageable groups to Maintain laying tools in your school/workplace	• Store tools in a proper arrangement `		different ways of Maintain laying tools **Principles:** The student should explain the principles related to maintaining laying tools **Theories:** The student should explain: • Laying tools • Types of greasing • Types of oiling **Circumstantial knowledge** **Detailed knowledge about** safety precautions to be observed when greasing, oiling and sharpening	are be available: - • Stock and die • Hacksaws • Tin snip • Try square • Spirit level • Steel rule • Hammer • Vice • Overall • Gloves • Safety boots • Goggles • Oil can • Greasing gun	
		(c) Maintaining measuring tools	**Discussion:** Guide the students to discuss the ways of Maintaining measuring tools **Demonstration:** Demonstrate to the students how to Maintain measuring tools and how to use equipment **Practical work:**	• Identify different types of measuring tools • Understand application of measuring tools • Store tools in a proper arrangement	Maintained tools conform to manufacturer's specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain different ways of maintaining tools **Principles:** The student should explain the principles related to: Maintaining measuring tools **Theories:** The student should explain:	The following tools, equipment and safety gear are to be available: • Stock and die • Hacksaws • Tin snip • Try square • Spirit level • Steel rule • Hammer	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Organise the students into manageable groups to Maintain measuring tools in your school/workplace			• The meaning of measuring tools • Types of measuring tools **Circumstantial knowledge** **Detailed knowledge about** safety precautions to be observed when greasing, oiling and sharpening	• Vice • Overall • Gloves • Safety boots • Goggles • Oil can • Greasing gun	
		(d) Maintaining hammering tools	**Discussion:** Guide the students to discuss ways of maintaining hammering tools and their application **Demonstration:** Demonstrate to the students how to Maintain hammering tools and to handle tools and equipment **Practical work:** Organise the students into manageable groups of students to Maintain hammering tools in working place	• Different hammering tools • Arrangement of hammering tools tools in a proper arrangement	Maintained tools conform to manufacturer's specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain different ways of maintaining hammering tools **Principles:** The student should explain the principles related to maintaining hammering tools **Theories:** The student should explain: • Types of hammering • Application of hammering **Circumstantial knowledge** **Detailed knowledge about** safety precautions to be observed when	The following tools, safety gears, equipment are to be available: - • Hammer • Vice • Overall • Gloves • Safety boots • Goggles • Oil can	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						hammering tools application		
	1.3 Maintain equipment and machines	(a) Maintaining power operated machine	**Discussion:** Guide the students in discussing the definition of a power operated machine and their application **Demonstration:** Demonstrate to the students how to Maintain power operated machine and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Maintain power operated machine in working place	• Detect faults at early stage • Perform greasing • Perform oiling • Sharpen blade/cutting tools • Sharpen cold chisel • Clean and store tools • Sharpen twist drill bits	Maintained equipment/machine conforms to manufacturer's specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain different ways of maintaining power operated machine **Principles:** The student should explain principles related to power operated machine **Theories:** The student should explain: • Types of greasing power operated machines • Viscosity of oil **Circumstantial knowledge detailed** **Knowledge about** safety precautions to be observed when greasing or sharpening	The following tools, safety gears and equipment are to be available: - • Electric cutting machines • Electric/manual threading machines • Electric/manual bending machines • Electric/manual rolling machines • Electric welding machines • Grooving machine • Grinding machines • Drilling machines • Shearing machines • Pop-riveting machines	72

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
							• Goggles • Grease gun • Oil can • Gloves • Overall and safety boots	
		(b) Maintaining manual machines	**Discussion:** Guide the students to discuss the definition of manual machine and their application **Demonstration:** Demonstrate to the students how to Maintain manual machines and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Maintain manual machines in working place	• Sharpen cold chisel • Perform greasing • Perform oiling • Sharpen blade/cutting tools • Remove mushroom • Clean and store tools	Maintained equipment/machine conforms to manufacturer's specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain different ways of maintaining manual machines **Principles:** The student should explain principles related to maintaining manual machines **Theories:** The student should explain: • Types of manual machines • Material used to maintain manual machines • Viscosity of oil **Circumstantial knowledge detailed knowledge about** safety precautions to be observed when greasing or sharpening	The following tools, safety gears and equipment are to be available: - • Electric cutting machines • Electric/manual threading machines • Electric/manual bending machines • Electric/manual rolling machines • Electric welding machines • Grooving machine • Grinding machines • Drilling machines	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
							• Shearing machines • Pop-riveting machines • Goggles • Grease gun • Oil can • Gloves • Overall and safety boots	
	1.5 Performing first aid	(a) Performing artificial respiration	**Interactive simulation and animation:** Guide students through an interactive simulation and animation to help them visualize the producers for Performing artificial respiration **Demonstration:** Demonstrate to the students how to Perform artificial respiration and to handle tools and equipment **Practical work:**	• Identify types of injuries • Select proper methods of treatment • Perform artificial respiration	The first aid offered conforms to medical specifications and requirements	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain different ways of Performing artificial respiration • **Principles:** The student should explain the principles related to performing artificial respiration **Theories:** The student should explain: - • Types of artificial respiration • Steps of artificial respiration • The use of accessories in a first aid kit	The following tools, safety gears and equipment are to be available: - • First aid Kit • Light blanket • Sterilizer • Overall • Safety • boots • Gloves • Cotton wool • Smart TV • White board • Power point • Internet	82

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Organise the students into manageable groups to Perform artificial respiration in working place			**Circumstantial knowledge** **Detailed knowledge about:** Safety precautions to be observed while performing artificial respiration		
		(b) Performing first aid to minor wounds and scratches	**Discussion:** Guide the students to discuss the definition of first aid to minor wounds and scratches and their application **Demonstration:** Demonstrate to the students how to provide first aid to minor wounds and scratches machines and to handle tools and equipment **Practical work:** Organise the students into manageable groups to provide first aid to minor wounds and	• Identify types of injuries • Select proper methods of treatment • Perform first aid • Sterilize first aid tools • Store first aid kit	The first aid offered conforms to medical specifications and requirements	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain different ways of providing first aid to minor wounds and scratches **Principles:** The student should explain principles related to: - first aid to minor wounds and scratches • Bandaging • Providing first aid **Theories:** The student should explain: - • Different types of wounds • Different types of accidents • Rescue a person with electric shock	The following tools, safety gears and equipment are to be available: - • First aid Kit • Light blanket • Sterilizer • Overall • Safety • boots • Gloves • Cotton wool	

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				Process Assessment	Product/Services Assessment	Knowledge assessment		
			scratches in working place			• The use of accessories in a first aid kit **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions to be observed while offering first aid • Firefighting techniques • Environmental requirement		
2.0 Performing preventive maintenance of tools & equipment	2.1 Performing preventive maintenance of electrical tools	(a) Maintaining Workshop safety gears	**Brainstorm:** Guide the students to define Workshop safety gears and scratches and their application **Demonstration:** Use video to demonstrate to the students how to maintaining Workshop safety gears and to handle tools and equipment **Practical work:** Organise the students into	• Select safety gears • Inspect safety gears • Identify dirt and grime • Perform repairs Safely • Observe safety precautions • Clean safety gears • Store safety gears	Maintained safety gears functions as per manufacturer's specifications	**Knowledge evidence:** **Detailed Knowledge of:** **Method used:** The student should explain different ways of maintaining workshop safety gears **Principles:** The student should explain principles related to maintaining Workshop safety gears **Theories:** The student should explain: • The meaning of workshop • Different types of safety gears	The following tools, safety gears and equipment are to be available: - • hand tools • Maintenance schedule chart • Blower • Safety clear glasses • Gloves • Over Coat • White board • Power point • Internet • Smart TV	57

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			manageable groups to maintaining Workshop safety gears in working place			• How to replace the safety gears • Proper way of maintaining safety gears **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions to be observed while maintaining workshop safety gears • Safe handling of safety gears		
		(b) Maintaining electrical hand tools	**Discussion:** Guide the students to discuss definition of electrical hand tools and their application **Demonstration:** Guide students to use video to show students how to maintaining electrical hand tools and to handle tools and equipment	• Select tools • Interpret maintenance schedule chart • Identify faults • Observe safety precautions • Clean tools, equipment, machine and workplace	Maintained equipment/machine functions as per manufacturer's specifications	**Knowledge evidence:** **Detailed Knowledge of:** **Method used:** The student should explain different ways of maintaining electrical hand tools **Principles:** The student should explain principles related to maintaining electrical tools **Theories:** The student should explain: • Electrical hand tools	The following tools, safety gears and equipment are to be available: - • Maintenance schedule chart • Waste bin • Blower • Sprit can • Safety clear glasses • Gloves • Over Coat	

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				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Practical work: Organise the students into manageable groups in maintaining electrical hand tools in working place	• Store tools and equipment		• Importance of maintenance schedule • Preparation of warning tags **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions to be observed while maintaining electrical hand tool		
		(c) Maintaining measuring tools	**Discussion:** Guide the students to discuss definition of measuring tools and their application **Demonstration:** Demonstrate to the students how to maintaining measuring tools and to handle tools and equipment **Practical work:** Organise the students into manageable groups to	• Select tools • Interpret maintenance schedule chart • Identify faults • Observe safety precautions • Clean tools, equipment, machine and workplace • Store tools and equipment	Maintained equipment/machine functions as per manufacturer's specifications	**Knowledge evidence:** **Detailed Knowledge of:** **Method used:** The student should explain different ways of maintaining measuring tools **Principles:** The student should explain principles related to maintaining measuring tools **Theories:** The student should explain: • The concept of measuring tools • Importance of maintenance schedule	The following tools, safety gears and equipment are to be available: - • Assorted power operated hand tools • Assorted automatic tool kits • Maintenance schedule chart • Waste bin • Blower • Sprit can	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			measuring tools in working place			• Preparation of warning tags **Circumstantial knowledge** **Detailed knowledge about:** Safety precautions to be observed while maintaining equipment/machines	• Safety clear glasses • Gloves • Over Coat	
	2.2 Performing preventive maintenance of electrical equipment's	(a) Maintaining passive equipment	**Discussion:** Guide the students to discuss definition of passive equipment and their application **Demonstration:** Use video to demonstrate to the students how to Maintaining passive equipment and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Maintaining passive equipment in working place	• Select tools, equipment and safety gears • Categorize equipment • Identify equipment faults • Rectify faulty equipment • Observe safety precautions • Clean tools and equipment • Store tools and equipment	Maintained equipment conform to manufacturer's specifications	**Knowledge evidence:** **Detailed Knowledge of:** **Method used:** The student should explain different ways of maintaining passive equipment **Principles:** The student should explain the principles of: • maintaining passive equipment **Theories:** The student should explain: • the concept of passive equipment • Types of passives • equipment • Application of every equipment in the workshop	The following tools, equipment and safety gears, are to be available: - • Store room • Tool racks • Cabinets • Toolboxes • Tool shelves • Work bench • Vice • Sprit can • Over-coat • Gloves • Safety clear glasses • White board • Power point • Internet • Smart TV	56

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				Process Assessment	Product/Services Assessment	Knowledge assessment		
						Circumstantial knowledge **Detailed knowledge about:** • Safety precautions to be observed while maintaining tools • Waste disposal		

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
		(b) Maintaining active equipment	**Brainstorm:** Guide the students to define active equipment and their application **Demonstration:** Use video to demonstrate to the students how to maintaining active equipment and to handle tools and equipment **Practical work:** Organise the students into manageable groups to maintaining active equipment in working place	• Select tools, equipment and safety gears • Categorize equipment • Identify equipment faults • Rectify faulty equipment • Observe safety precautions • Clean tools and equipment • Store tools and equipment	Maintained equipment conform to manufacturer's specifications	**Knowledge evidence: Detailed Knowledge of: Method used:** The student should explain different ways of maintaining equipment **Principles:** The student should explain the principles of: • Passive equipment • Active equipment **Theories:** The student should explain on how to Maintaining active equipment **Circumstantial knowledge Detailed knowledge about:** • Safety precautions to be observed while maintaining tools • Waste disposal	This element/activity can be achieved at a workplace or training institution The following tools, equipment and safety gear are to be available: • Store room • Tool racks • Cabinets • Toolboxes • Store ledgers • Vice • Sprit can • Over-coat • Gloves • Safety clear glasses • White board • Power point • Internet • Smart TV	
	2.3 Maintaining machine	(a) Maintaining power machines	**Brainstorm:** Guide the students in defining measuring tools and their application	• Interpret machine manual • Prepare maintenance schedule	All maintained machines and equipment maintained conform to	**Knowledge evidence: Detailed knowledge of: Method used:** The student should explain different ways of	The following tools, equipment and safety gear are to be available:	55

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				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Demonstration: Demonstrate to the students how to maintaining measuring tools and to handle tools and equipment **Practical work:** Organise the students into manageable groups to measuring tools in working place	• Detect machine faults • Perform oiling • Grease machine • Sharpen cutting tools • Perform greasing • Clean working place • Dusting off machines	manufacture specifications	maintaining machine/equipment **Principles:** The student should explain the principle of performing maintenance to machines **Theories:** The student should explain: • Parts of machines and their maintenance • Types of maintenance in each machine part • The role of lubricants in machines **Circumstantial knowledge** **Detailed knowledge about:** • Safety aspect related to machine maintenance • Environmental issues	• Powered machine • Mechanical machine • Air compressor • Lubricating equipment	
		(b) Maintaining manual machines	**Brainstorm:** Guide the students to define measuring tools and their application **Demonstration:** Demonstrate to the students how to maintaining	• Interpret machine manual • Prepare maintenance schedule • Detect machine faults	All maintained machines and equipment maintained conform to manufacture specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain different ways of maintaining machine/equipment **Principles:** The student should explain the	The following tools, safety gears, equipment and are to be available: - • Powered machine • Mechanical machine	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			measuring tools and to handle tools and equipment **Practical work:** Organise the students into manageable groups to measuring tools in working place	• Perform oiling • Grease machine • Sharpen cutting tools • Perform greasing • Clean working place • Dusting off machines		principle of performing maintenance to machines **Theories:** The student should explain: • Parts of machines and their maintenance • Types of maintenance in each machine part • The role of lubricants in machines **Circumstantial knowledge** **Detailed knowledge about:** • Safety aspect related to machine maintenance • Environmental issues	• Air compressor • Lubricating equipment	
3.0 Performing bench work	3.1 Performing cutting	(a) Cutting flat bars	**Brainstorm:** Guide the students in defining flat bars and their application **Demonstration:** Demonstrate to the students metal cutting techniques using tools like hacksaws, files, or power tools, emphasizing	• Interpret drawings • Select proper materials • Mark out the work piece • Cut pieces to the required shapes and sizes	Cut pieces of material conform to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to cut work pieces in different shapes **Principles:** The student should explain the principals involved in: • Taking measurements • Marking work piece • Cutting process	The following tools, safety gears and equipment are to be available: • Steel rule • Scriber • T-Square • Divider • Mallet • Ball pein hammer • Anvil	91

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				Process Assessment	Product/Services Assessment	Knowledge assessment		
			safety and precision **Hands-On workshops** Hands-on activities allow students to apply knowledge and build confidence **Gamified Learning** Create challenges to the students, such as cutting a specific shape or achieving the smoothest edge within a time limit **Practical work:** Organise the students into manageable groups and assign activity requiring metal cutting, such as crafting a simple tool or decorative object	• Check for accuracy • Clean tools, work piece and workplace • Store tools and equipment safely		**Theories:** The student should explain: • Different types of materials and their properties • Explain application of different materials • Proper use of cutting tools and equipment **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions when performing cutting process • Safe handling of working tools and equipment	• Chisels • Hand shear • Shearing machine • Centre punch • Goggles • Gloves • Safety boots • Overall • Hacksaw • Power hacksaw	
		(b) Cuting metal sheets	**Brainstorm:**	• Interpret drawings	Cut pieces of material conform	**Knowledge evidence:** **Detailed knowledge of:**	The following tools, safety	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
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			Guide the students to define flat bars and their application **Demonstration:** Demonstrate to the students metal cutting techniques using tools like hacksaws, files, or power tools, emphasizing safety and precision **Hands-On workshops** Hands-on activities allow students to apply knowledge and build confidence **Gamified Learning** Create challenges to the students, such as cutting a specific shape or achieving the smoothest edge	• Select proper materials • Mark out the work piece • Cut pieces to the required shapes and sizes • Check for accuracy • Clean tools, work piece and workplace • Store tools and equipment safely	to technical specifications	**Method used:** The student should explain how to cut work pieces in different shapes **Principles:** The student should explain the principals involved in: • Taking measurements • Marking work piece • Cutting process **Theories:** The student should explain: • Different types of materials and their properties • Explain application of different materials • Proper use of cutting tools and equipment **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions when performing cutting process • Safe handling of working tools and equipment	gears and equipment are to be available: • Steel rule • Scriber • T-Square • Divider • Mallet • Ball pein hammer • Anvil • Chisels • Hand shear • Shearing machine • Centre punch • Goggles • Gloves • Safety boots • Overall • Hacksaw • Power hacksaw	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			within a time limit **Practical work:** Organise the students into manageable groups and assign activity requiring metal cutting, such as crafting a simple tool or decorative object					
		(c) Cuting round bars	**Brainstorm:** Guide the students to define flat bars and their application **Demonstration:** Demonstrate to the students metal cutting techniques using tools like hacksaws, files, or power tools, emphasizing safety and precision **Hands-On workshops**	• Interpret drawings • Select proper materials • Mark out the work piece • Cut pieces to the required shapes and sizes • Check for accuracy • Clean tools, work piece and workplace	Cut pieces of material conform to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to cut work pieces in different shapes **Principles:** The student should explain the principals involved in: • Taking measurements • Marking work piece • Cutting process **Theories:** The student should explain: • Different types of materials and their properties	The following tools, safety gears and equipment are to be available: • Steel rule • Scriber • T-Square • Divider • Mallet • Ball pen hammer • Anvil • Chisels • Hand shear • Shearing machine • Centre punch	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Hands-on activities allow students to apply knowledge and build confidence **Gamified Learning** Create challenges to the students, such as cutting a specific shape or achieving the smoothest edge within a time limit **Practical work:** Organise the students into manageable groups and assign activity requiring metal cutting, such as crafting a simple tool or decorative object	• Store tools and equipment safely		• Explain application of different materials • Proper use of cutting tools and equipment **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions when performing cutting process Safe handling of working tools and equipment	• Goggles • Gloves • Safety boots • Overall • Hacksaw • Power hacksaw	
		(d) Cuting hollow material	**Brainstorm:** Guide the students in defining flat bars and their application **Demonstration:** Demonstrate to the students metal	• Interpret drawings • Select proper materials	Cut pieces of material conform to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to cut work pieces in different shapes	The following tools, safety gears and equipment are to be available: • Steel rule • Scriber	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			cutting techniques using tools like hacksaws, files, or power tools, emphasizing safety and precision **Hands-On workshops** Hands-on activities allow students to apply knowledge and build confidence **Gamified Learning** Create challenges to the students, such as cutting a specific shape or achieving the smoothest edge within a time limit **Practical work:** Organise the students into manageable groups and assign activity requiring	• Mark out the workpiece • Cut pieces to the required shapes and sizes • Check for accuracy • Clean tools, work piece and workplace • Store tools and equipment safely		**Principles:** The student should explain the principles involved in: • Taking measurements • Marking work piece • Cutting process **Theories:** The student are explain: • Different types of materials and their properties • Explain application of different materials • Proper use of cutting tools and equipment **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions when performing cutting process • Safe handling of working tools and equipment	• T-Square • Divider • Mallet • Ball pen hammer • Anvil • Chisels • Hand shear • Shearing machine • Centre punch • Goggles • Gloves • Safety boots • Overall • Hacksaw • Power hacksaw	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			metal cutting, such as crafting a simple tool or decorative object					
	3.2 Perform drilling	(a) Carrying out drilling	**Brainstorm:** Guide the students to define flat bars and their application **Demonstration:** Demonstrate to the students metal cutting techniques using tools like hacksaws, files, or power tools, emphasizing safety and precision **Hands-On workshops** Hands-on activities allow students to apply knowledge and build confidence **Gamified Learning** Create challenges to the students,	• Select proper tools and materials • Interpret drawings • Mark the material • Cut to size the material • Locate the centre • Drill the hole • Perform reaming to the correct size • Clean tools and the machine • Store tools in proper storage	The materials drilled conform to specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain: • The process of drilling different sizes of holes • How to perform reaming on a drilled hole • How to calculate drilling speeds **Principles:** The student should explain the principles involved in: • Drilling a hole • Selection of drilling speed on the machine **Theories:** The student should explain: • The procedures of drilling a hole • The use of coolants in a drilling process	The following tools, safety gears and equipment are to be available: • Hand drilling machine • Centre punch • Hammer (Ball peen hammer) • Scriber • Steel rule • Try square • Power supply • Drill bits of different sizes • Bench drilling machine and accessories • Bench machine vice	74

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			such as cutting a specific shape or achieving the smoothest edge within a time limit **Practical work:** Organise the students into manageable groups and assign activity requiring metal cutting, such as crafting a simple tool or decorative object			• Materials used to manufacture drill bits **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions when using tools and drilling machines • Safe handling and disposal of metal chips	• Hacksaw • Wire brush • Calculator • Safety goggles • Gloves • Safety boots • Overalls • Reamers	
		(b) Carrying out reaming	**Brainstorm:** Guide the students to define flat bars and their application **Demonstration:** Demonstrate to the students metal cutting techniques using tools like hacksaws, files, or power tools, emphasizing safety and precision **Hands-On workshops**	• Select proper tools and materials • Interpret drawings • Mark the material • Cut to size the material • Locate the centre • Perform reaming to the correct size	The materials drilled conform to specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain: • How to perform reaming on a drilled hole • How to calculate drilling speeds **Principles:** The student should explain the principles involved in: • Drilling a hole • Selection of drilling speed on the machine	This element/activity can be achieved at workplace or training institution The following tools, safety gears and equipment are to be available: • Hand drilling machine • Centre punch	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Hands-on activities allow students to apply knowledge and build confidence **Gamified Learning** Create challenges to the students, such as cutting a specific shape or achieving the smoothest edge within a time limit **Practical work:** Organise the students into manageable groups and assign activity requiring metal cutting, such as crafting a simple tool or decorative object	• Clean tools and the machine • Store tools in proper storage		**Theories:** The student should explain: • The procedures of drilling a hole • The use of coolants in a drilling process • Materials used to manufacture drill bits **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions when using tools and drilling machines • Safe handling and disposal of metal chips	• Hammer (Ball peen hammer) • Scriber • Steel rule • Try square • Power supply • Drill bits of different sizes • Bench drilling machine and accessories • Bench machine vice • Hacksaw • Wire brush • Calculator • Safety goggles • Gloves • Safety boots • Overalls • Reamers	
	3.3 Performing filing	(a) File flat materials	**Brainstorm:** Guide the students to define flat bars	• Interpret drawings • Take measuremen	Filed pieces/surfaces conform to	**Knowledge evidence:** **Detailed knowledge of:**	The following tools, safety gears and	77

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				Process Assessment	Product/Services Assessment	Knowledge assessment		
			and their application **Demonstration:** Demonstrate to the students metal cutting techniques using tools like hacksaws, files, or power tools, emphasizing safety and precision **Hands-On workshops** Hands-on activities allow students to apply knowledge and build confidence **Gamified Learning** Create challenges to the students, such as cutting a specific shape or achieving the smoothest edge within a time limit **Practical work:**	ts and marking • File pieces to the required shapes and sizes • Grind pieces to required shapes and sizes • Check for accuracy • Clean tools, work piece and workplace • Store tools and equipment safely	technical specifications	**Method used:** The student should explain how to: • Mark the work • File work piece in different sizes and shapes **Principles:** The student should explain the principals involved in: • Taking measurements • Marking work piece • Filing and grinding work piece **Theories:** The student should: • Identify different types of materials and their properties • Explain applications of different materials • Describe proper use of files and equipment • List materials used to manufacture files • Explain different types of files and their uses	equipment are to be available: • File card • Bench vice • Try square • Steel rule • Centre punch • Scriber • Drill bits of different sizes • Gloves • Safety boots • Overall • Safety goggles • Grinder • Divider • Hacksaw	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Organise the students into manageable groups and assign activity requiring metal cutting, such as crafting a simple tool or decorative object			**Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions pertaining to filing • Safe handling of working tools and equipment		
		(b) File corner materials	**Brainstorm:** Guide the students to define flat bars and their application **Demonstration:** Demonstrate to the students on metal cutting techniques using tools like hacksaws, files, or power tools, emphasizing safety and precision **Hands-On workshops** Hands-on activities allow students to apply	• Interpret drawings • Take measurements and marking • File pieces to the required shapes and sizes • Grind pieces to required shapes and sizes • Check for accuracy • Clean tools, work piece and workplace	Filed pieces/surfaces conform to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Mark the work • File work piece in different sizes and shapes **Principles:** The student should explain the principals involved in: • Taking measurements • Marking work piece • Filing and grinding work piece **Theories:** The student should: • Identify different types of materials and their properties	The following tools, safety gears and equipment are to be available: • File card • Bench vice • Try square • Steel rule • Centre punch • Scriber • Drill bits of different sizes • Gloves • Safety boots • Overall • Safety goggles • Grinder • Divider	

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				Process Assessment	Product/Services Assessment	Knowledge assessment		
			knowledge and build confidence **Gamified Learning** Create challenges to the students, such as cutting a specific shape or achieving the smoothest edge within a time limit **Practical work:** Organise the students into manageable groups and assign activity requiring metal cutting, such as crafting a simple tool or decorative object	• Store tools and equipment safely		• Explain applications of different materials • Describe proper use of files and equipment • List materials used to manufacture files • Explain different types of files and their uses **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions pertaining to filing • Safe handling of working tools and equipment	• Hacksaw	
		(c) File hollow materials	**Brainstorm:** Guide the students to define flat bars and their application **Demonstration:** Demonstrate to the students metal cutting techniques using tools like hacksaws, files, or	• Interpret drawings • Take measurements and marking • File pieces to the required shapes and sizes	Filed pieces/surfaces conform to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Mark the work • File work piece in different sizes and shapes	The following tools, safety gears and equipment are to be available: • File card • Bench vice • Try square • Steel rule	

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				Process Assessment	Product/Services Assessment	Knowledge assessment		
			power tools, emphasizing safety and precision **Hands-On workshops** Hands-on activities allow students to apply knowledge and build confidence **Gamified Learning** Create challenges to the students, such as cutting a specific shape or achieving the smoothest edge within a time limit **Practical work:** Organise the students into manageable groups and assign activity requiring metal cutting, such as crafting a simple tool or decorative object	• Grind pieces to required shapes and sizes • Check for accuracy • Clean tools, work piece and workplace • Store tools and equipment safely		**Principles:** The student should explain the principals involved in: • Taking measurements • Marking work piece • Filing and grinding work piece **Theories:** The student should: • Identify different types of materials and their properties • Explain applications of different materials • Describe proper use of files and equipment • List materials used to manufacture files • Explain different types of files and their uses **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions pertaining to filing	• Centre punch • Scriber • Drill bits of different sizes • Gloves • Safety boots • Overall • Safety goggles • Grinder • Divider • Hacksaw	

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				Process Assessment	Product/Services Assessment	Knowledge assessment		
						• Safe handling of working tools and equipment		
		(d) File round materials	**Brainstorm:** Guide the students to define flat bars and their application **Demonstration:** Demonstrate to the students metal cutting techniques using tools like hacksaws, files, or power tools, emphasizing safety and precision **Hands-On workshops** Hands-on activities allow students to apply knowledge and build confidence **Gamified Learning** Create challenges to the students, such as cutting a	• Interpret drawings • Take measurements and marking • File pieces to the required shapes and sizes • Grind pieces to required shapes and sizes • Check for accuracy • Clean tools, work piece and workplace • Store tools and equipment safely	Filed pieces/surfaces conform to technical specifications	**Knowledge evidence: Detailed knowledge of: Method used:** The student should explain how to: • Mark the work • File work piece in different sizes and shapes **Principles:** The student should explain the principals involved in: • Taking measurements • Marking work piece • Filing and grinding work piece **Theories:** The student should: • Identify different types of materials and their properties • Explain applications of different materials • Describe proper use of files and equipment	The following tools, safety gears and equipment are to be available: • File card • Bench vice • Try square • Steel rule • Centre punch • Scriber • Drill bits of different sizes • Gloves • Safety boots • Overall • Safety goggles • Grinder • Divider • Hacksaw	

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				Process Assessment	Product/Services Assessment	Knowledge assessment		
			specific shape or achieving the smoothest edge within a time limit **Practical work:** Organise the students into manageable groups and assign activity requiring metal cutting, such as crafting a simple tool or decorative object			• List materials used to manufacture files • Explain different types of files and their uses **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions pertaining to filing • Safe handling of working tools and equipment		
	3.4 Performing bending	(a) Bending flat materials	**Hands-On Experiments and Demonstrations:** Provide students with different materials (e.g., metal wires, plastic rulers, wooden sticks) to test their bending properties **Problem-Solving Tasks and Challenges:** Present real-world problems, such as designing a	• Interpret given drawing • Select the required work piece • Prepare required tools and equipment for bending • Mark the work piece according to the technical drawing	Work piece bent conforms to given technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to bend a work piece **Principles:** The student should explain the principles of: • Holding the work piece • Bending process • Making allowances for bending **Theories:** The student should explain:	The following tools, safety gears and equipment are to be available: • Work bench • Bench vice • Try square • Vernier calliper • Steel rule • Hacksaw • Level protractor • Spring divider • Scriber	127

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			bendable yet strong product **Field visits and expert talks:** Visit factories, workshops, or construction sites to observe bending processes (e.g., bending steel rods or sheets). **Interactive class discussions** Use thought-provoking questions like: *Why do some materials break when bent while others don't? or how can bending properties be useful in design?* **Practical work:** Organise the students into manageable groups and assign activity requiring metal cutting, such as crafting a	• Clamp the work piece on the bench vice • Bend the work piece according to given technical specifications • Clean the workplace and work piece • Store tools, equipment and the work piece		• Types of machines and equipment used for bending • Calculations required • Uses of various bending tools and equipment • How to read measuring tools **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions while bending • First aid requirements • Environmental requirements • Firefighting techniques	• Centre punch • Hammer • Radius gauges • Leather gloves • Overall • Safety boots • Safety glasses • Bending spring • Pipe bender	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			simple tool or decorative object					
		(b) Bending hollow materials	**Hands-On Experiments and Demonstrations:** Provide students with different materials (e.g., metal wires, plastic rulers, wooden sticks) to test their bending properties **Problem-Solving Tasks and Challenges:** Present real-world problems, such as designing a bendable yet strong product **Field visits and expert talks:** Visit factories, workshops, or construction sites to observe bending processes (e.g., bending steel rods or sheets).	• Interpret given drawing • Select the required work piece • Prepare required tools and equipment for bending • Mark the work piece according to the technical drawing • Clamp the work piece on the bench vice • Bend the work piece according to given technical specifications • Clean the workplace	Work piece bent conforms to given technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to bend a work piece **Principles:** The student should explain the principles of: • Holding the work piece • Bending process • Making allowances for bending **Theories:** The student should explain: • Types of machines and equipment used for bending • Calculations required • Uses of various bending tools and equipment • How to read measuring tools **Circumstantial knowledge** **Detailed knowledge about:**	The following tools, safety gears and equipment are to be available: • Work bench • Bench vice • Try square • Vernier calliper • Steel rule • Hacksaw • Level protractor • Spring divider • Scriber • Centre punch • Hammer • Radius gauges • Leather gloves • Overall • Safety boots • Safety glasses • Bending spring	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Interactive class discussions Use thought-provoking questions like: *Why do some materials break when bent while others don't? or how can bending properties be useful in design?* **Practical work:** Organise the students into manageable groups and assign activity requiring metal cutting, such as crafting a simple tool or decorative object	and work piece • Store tools, equipment and the work piece		• Safety precautions while bending • First aid requirements • Environmental requirements • Firefighting techniques	• Pipe bender	
		(c) Bending round materials	**Hands-On Experiments and Demonstrations:** Provide students with different materials (e.g., metal wires, plastic rulers, wooden sticks) to test their bending properties	• Interpret given drawing • Select the required work piece • Prepare required tools and equipment for bending	Work piece bent conforms to given technical specifications	**Knowledge evidence: Detailed knowledge of: Method used:** The student should explain how to bend a work piece **Principles:** The student should explain the principles of: • Holding the work piece	The following tools, equipment and safety gear are to be available: • Work bench • Bench vice • Try square • Vernier calliper	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Problem-Solving Tasks and Challenges: Present real-world problems, such as designing a bendable yet strong product **Field visits and expert talks:** Visit factories, workshops, or construction sites to observe bending processes (e.g., bending steel rods or sheets). **Interactive class discussions** Use thought-provoking questions like: *Why do some materials break when bent while others don't? or how can bending properties be useful in design?*	• Mark the work piece according to the technical drawing • Clamp the work piece on the bench vice • Bend the work piece according to given technical specificatio ns • Clean the workplace and work piece • Store tools, equipment and the work piece		• Bending process • Making allowances for bending **Theories:** The student should explain: • Types of machines and equipment used for bending • Calculations required • Uses of various bending tools and equipment • How to read measuring tools **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions while bending • First aid requirements • Environmental requirements • Firefighting techniques	• Steel rule • Hacksaw • Level protractor • Spring divider • Scriber • Centre punch • Hammer • Radius gauges • Leather gloves • Overall • Safety boots • Safety glasses • Bending spring • Pipe bender	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Practical work: Organise the students into manageable groups and assign activity requiring metal cutting, such as crafting a simple tool or decorative object					
		(d) Bending sheet metal	**Hands-On Experiments and Demonstrations:** Provide students with different materials (e.g., metal wires, plastic rulers, wooden sticks) to test their bending properties **Problem-Solving Tasks and Challenges:** Present real-world problems, such as designing a bendable yet strong product	• Interpret given drawing • Select the required work piece • Prepare required tools and equipment for bending • Mark the work piece according to the technical drawing • Clamp the work piece on the bench vice • Bend the work piece	Work piece bent conforms to given technical specifications	**Knowledge evidence: Detailed knowledge of: Method used:** The student should explain how to bend a work piece **Principles:** The student should explain the principles of: • Holding the work piece • Bending process • Making allowances for bending **Theories:** The student should explain: • Types of machines and equipment used for bending • Calculations required	The following tools, equipment and safety gear are to be available: • Work bench • Bench vice • Try square • Vernier calliper • Steel rule • Hacksaw • Level protractor • Spring divider • Scriber • Centre punch • Hammer • Radius gauges	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Field visits and expert talks: Visit factories, workshops, or construction sites to observe bending processes (e.g., bending steel rods or sheets). **Interactive class discussions** Use thought-provoking questions like: *Why do some materials break when bent while others don't? or how can bending properties be useful in design?* **Practical work:** Organise the students into manageable groups and assign activity requiring metal cutting, such as crafting a simple tool or decorative object	according to given technical specifications • Clean the workplace and work piece • Store tools, equipment and the work piece		• Uses of various bending tools and equipment • How to read measuring tools **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions while bending • First aid requirements • Environmental requirements • Firefighting techniques	• Leather gloves • Overall • Safety boots • Safety glasses • Bending spring • Pipe bender	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
	3.5 Performing threading	(a) Making external thread	**Hands-On Practice:** Provide students with threading tools let them practice creating external threads under teacher's guidance **Demonstration:** Demonstrate to the students how to make external thread and to handle tools and equipment **Practical work:** Present scenarios where students need to create external threads to solve practical problems, such as repairing a bolt or creating a custom part for a machine	• Identify tools, equipment and material required • Interpret the technical drawing • Clamp the work piece on a bench vice • Perform cutting of internal and external threads • Clean the workplace and work piece • Store tools, equipment and materials	Threads made conform to the given specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to make manual threads **Principles:** The student should explain the principles of: • Holding the work piece • Thread cutting • Sequencing the taps • Making allowances for die cutting **Theories:** The student should explain: • The types of taps in a set • Materials used for the manufacture of taps and dies • The importance of applying oil when threading • Standard threads • Measurements • How to calculate tap drill size (TDS) • The uses of various tools and equipment	The following tools, equipment and safety gear are to be available: • Work bench • Drilling machine • Bench vice • Vernier calliper • Steel rule • Set of screw driver • Centre punch • Scriber • Oil can • Thread pitch gauge • Thread ring gauge • Safety goggles • Safety boots • Overall • Gloves • Die stock set • Drill bit set • Taps • Dies • Workpieces	109

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						Circumstantial knowledge **Detailed knowledge about:** • Safety precautions while thread cutting • First aid requirements • Environmental requirements		
		(b) Making internal thread	**Hands-On Practice:** Provide students with threading tools let them practice creating internal threads under teacher's guidance **Demonstration:** Demonstrate to the students how to make internal thread and to handle tools and equipment **Practical work:** Present scenarios where students need to create	• Identify tools, equipment and material required • Interpret the technical drawing • Clamp the work piece on a bench vice • Perform cutting of internal and external threads • Clean the workplace and work piece	Threads made conform to the given specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to make manual threads **Principles:** The student should explain the principles of: • Holding the work piece • Thread cutting • Sequencing the taps • Making allowances for die cutting **Theories:** The student should explain: • The types of taps in a set • Materials used for the manufacture of taps and dies	The following tools, equipment and safety gear are to be available: • Work bench • Drilling machine • Bench vice • Vernier calliper • Steel rule • Set of screw driver • Centre punch • Scriber • Oil can • Thread pitch gauge • Thread ring gauge	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			internal threads to solve practical problems, such as repairing a bolt or creating a custom part for a machine	• Store tools, equipment and materials		• The importance of applying oil when threading • Standard threads • Measurements • How to calculate tap drill size (TDS) • The uses of various tools and equipment **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions while thread cutting • First aid requirements • Environmental requirements	• Safety goggles • Safety boots • Overall • Gloves • Die stock set • Drill bit set	
	3.6 Performing basic spray painting	(a) Preparing surface	**Brainstorm**: Guide the students on how to surface **Demonstration:** Demonstrate to the students how to prepare surface and to handle tools and equipment **Practical work:** Organise the students into manageable	• Interpret instructions • Select tools • Select materials • Apply second coats of undercoat • Apply one to two coats of finishing coats • Clean tools	A panel sprayed conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain methods used in panel spray painting **Principles:** The student should explain the principles of: • Masking • Undercoat • Finish paint	The following tools, equipment and safety gear are to be available: • Beating file • Hammer • Simple doll • Anvil • Orbital sander • Compressor • Spray gun	98

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			groups to Prepare surface in working place	• Store tools in safe custody		**Theories:** The student should explain: • Properties of materials • Area measurements • Bending techniques **Circumstantial knowledge** **Detailed knowledge about:** • Environment regulation on refrigerant • Safety precautions while performing spray painting	• Empty container • Paint strainer • Palette knife • Wire brush • Disc sander • Rubber block • Blow lamp • Gas torch • Paint kettle • Air duster • Shave hook • Universal scraper • Screw driver • Nose mask • Safety goggles	
		(b) Carrying out spray painting	**Interactive demonstrations:** Guide the students on live spray-painting techniques, showcasing proper handling, application methods, and safety protocols	• Interpret instructions • Select tools • Select materials • Apply second coats of undercoat • Apply one to two coats of finishing coats	A panel sprayed conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain methods used in panel spray painting **Principles:** The student should explain the principles of: • Masking • Undercoat • Finish paint	The following tools, equipment and safety gear are to be available: • Beating file • Hammer • Simple doll • Anvil • Orbital sander	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Hands-on practice: Provide each student with spray paint cans, protective gear, and surfaces (e.g., cardboard or small wooden panels) to practice on **Practical work:** Organise the students into manageable groups in a collaborative task where students work in teams to create a mural or spray-painted designs.	• Clean tools • Store tools in safe custody		**Theories:** The student should explain: • Properties of materials • Area measurements • Bending techniques **Circumstantial knowledge** **Detailed knowledge about:** • Environment regulation on refrigerant • Safety precautions while performing spray painting	• Compressor • Spray gun • Empty container • Paint strainer • Palette knife • Wire brush • Disc sander • Rubber block • Blow lamp • Gas torch • Paint kettle • Air duster • Shave hook • Universal scraper • Screw driver • Nose mask • Safety goggles	
	3.7 Performing non-fusion joints	(a) Carrying out soldering	**Brainstorm:** Guide the students classifying soldering technique and their application **Demonstration:** Demonstrate to the students how	• Select tools and equipment • Choose appropriate jointing system • Take measurements	A number of work pieces joined conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Take linear measurements • Join similar and dissimilar metals	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Welding goggles	121

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			to carry out soldering and to handle tools and equipment **Practical work:** Organise the students into manageable groups in carrying out soldering in working place	• Perform pipe cutting • Perform filing • Perform swaging • Perform pipe bending • Perform even and correct heating • Perform soldering • Perform initial seaming • Store tools and equipment • Clean workplace and joints		• Choose appropriate method for different material **Principles:** The student should explain the principles of: capillary action **Theories:** The student should explain: • Alloyed copper brazing properties • Effects of excess flux on joints • Material composition suitable for brazing or soldering **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of tools and equipment • Restrictions on spot brazing • Prevention of scale formation inside pipe joints • Preparation of surfaces for brazing or soldering	• Spark lighter • Spindle key • Mechanical toolbox • Wire brush • Welding apron • Safety boots • Pop rivet machine • Hand drill • Set of drill bits • Marking out tools • Hand shears and snip • Pipe cutter	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						• When to apply hard or soft solder		
		(b) Carrying out seaming	**Brainstorm:** Guide the students in describing how to carry out seaming **Demonstration:** Demonstrate to the students how to carry out seaming and properly handle tools and equipment **Practical work:** Organise the students into manageable groups to Carry out seaming in working place	• Select tools and equipment • Choose appropriate jointing system • Take measurements • Perform pipe cutting • Perform filing • Perform swaging • Perform pipe bending • Perform even and correct heating • Perform initial seaming • Store tools and equipment	A number of work pieces joined conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Take linear measurements • Join similar and dissimilar metals • Choose appropriate method for different material **Principles:** The student should explain the principles of: capillary action **Theories:** The student should explain: • Alloyed copper brazing properties • Effects of excess flux on joints • Material composition suitable for brazing or soldering	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Welding goggles • Spark lighter • Spindle key • Mechanical toolbox • Wire brush • Welding apron • Safety boots • Pop rivet machine • Hand drill • Set of drill bits • Marking out tools • Hand shears and snip • Pipe cutter	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Clean workplace and joints		**Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of tools and equipment • Restrictions on spot brazing • Prevention of scale formation inside pipe joints • Preparation of surfaces for brazing or soldering • When to apply hard or soft solder		
		(c) Carrying out riveting	**Interactive Demonstrations:** Demonstrate to the students the reverting techniques, emphasizing tool usage, heat control, and safety procedures, while allowing the students come close to observe the process, ask questions, and even try small	• Select tools and equipment • Choose appropriate jointing system • Take measurements • Perform pipe cutting • Perform filing • Perform swaging	A number of work pieces joined conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Take linear measurements • Join similar and dissimilar metals • Choose appropriate method for different material **Principles:** The student should explain the principles of: capillary action	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Welding goggles • Spark lighter • Spindle key • Mechanical toolbox • Wire brush	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			parts under supervision **Hands-on practice:** Provide students with proper tools and materials to practice reverting under guidance. **Practical work:** Assign a group activity for students such as creating a simple structure (e.g., a box or frame) using reverting techniques	• Perform pipe bending • Perform even and correct heating • drilling • Perform pop riveting • Store tools and equipment • Clean workplace and joints		**Theories:** The student should explain: • Alloyed copper brazing properties • Effects of excess flux on joints • Material composition suitable for brazing or soldering **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of tools and equipment • Restrictions on spot brazing • Prevention of scale formation inside pipe joints • Preparation of surfaces for brazing or soldering • When to apply hard or soft solder	• Welding apron • Safety boots • Pop rivet machine • Hand drill • Set of drill bits • Marking out tools • Hand shears and snip • Pipe cutter	
		(d) Carrying out brazing	**Interactive Demonstrations:** Demonstrate to the students the brazing techniques,	• Select tools and equipment • Choose appropriate	A number of work pieces joined conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to:	The following tools, equipment and safety gear are to be available:	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			emphasizing tool usage, heat control, and safety procedures while allowing the students come close to observe the process, ask questions, and even try small parts under supervision **Hands-on practice:** Provide students with proper tools and materials to practice reverting under guidance. **Practical work:** Assign a group activity for students such as creating a simple structure (e.g., a box or frame) using brazing techniques	• jointing system • Take measurements • Perform pipe cutting • Perform filing • Perform swaging • Perform pipe bending • Perform even and correct heating • Perform brazing • Store tools and equipment • Clean workplace and joints		• Take linear measurements • Join similar and dissimilar metals • Choose appropriate method for different materials **Principles:** The student should explain the principles of: capillary action **Theories:** The student should explain: • Alloyed copper brazing properties • Effects of excess flux on joints • Material composition suitable for brazing or soldering **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of tools and equipment • Restrictions on spot brazing • Prevention of scale formation inside pipe joints	• Oxy-acetylene welding set • Welding goggles • Spark lighter • Spindle key • Mechanical toolbox • Wire brush • Welding apron • Safety boots • Pop rivet machine • Hand drill • Set of drill bits • Marking out tools • Hand shears and snip • Pipe cutter	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						• Preparation of surfaces for brazing or soldering • When to apply hard or soft solder		
	3.8 Performing pipe joints	(a) Joining similar material pipes	**Interactive Demonstrations:** Demonstrate to the students the joining techniques, emphasizing tool usage, heat control, and safety procedures while allowing the students come close to observe the process, ask questions, and even try small parts under supervision **Hands-on practice:** Provide students with proper tools and materials to practice reverting under guidance. **Practical work:**	• Interpret working drawing • Select materials • Take measurements • Cut pipe squarely • Clamp the work piece on a pipe vice • Perform joining on copper tubes, steels and plastic pipes • Clean the work area and work piece • Store the tools and work piece	The joined pipe conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain different ways of joining pipes **Principles:** The student should explain principles of: • Joining steel pipes • Welding plastic pipes • Joining copper pipes • Taking measurements • Soldering **Theories:** The student should explain: - • Types of joints used on copper tubes • Joints used on steel pipes • The difference between soldering and welding • Joints used on plastic pipes • The use of flux when soldering	The following tools, equipment and safety gear are to be available: • Work bench • Pipe vice • Steel rule • Hacksaw • Wheel cutter • Flaring tools • File • Reamer • Blow lamp • Plastic welding machine • Stock and dies • Oil can • Gloves, safety boots, overall, goggles • Pipe wrenches	86

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Assign a group activity for students such as creating a simple structure	at a safe place		• Types of soldering processes • The difference between capillary joints and screwed joints **Circumstantial knowledge** **Detailed knowledge about:** • Observe safety precautions while joining pipes First aid • Awareness on Environmental issues	• Adjustable spanners • Wire brush • Soldering iron	
		(b) Joining mixed material	**Brainstorm:** Guide the students to define Joining mixed material and their application **Demonstration:** Demonstrate to the students how to Joining mixed material and to handle tools and equipment **Practical work:** Organise the students into	• Interpret working drawing • Select materials • Take measurements • Cut pipe squarely • Clamp the work piece on a pipe vice	The joined pipe conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain different ways of joining pipes **Principles:** The student should explain principles of: • Joining steel pipes • Welding plastic pipes • Joining copper pipes • Taking measurements • Soldering	The following tools, equipment and safety gear are to be available: • Work bench • Pipe vice • Steel rule • Hacksaw • Wheel cutter • Flaring tools • File • Reamer • Blow lamp	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			manageable groups to Join mixed material in working place	• Perform joining on copper tubes, steels and plastic pipes • Clean the work area and work piece • Store the tools and work piece at a safe place		**Theories:** The student should explain: - • Types of joints used on copper tubes • Joints used on steel pipes • The difference between soldering and welding • Joints used on plastic pipes • The use of flux when soldering • Types of soldering processes • The difference between capillary joints and screwed joints **Circumstantial knowledge** **Detailed knowledge about:** • Observe Safety precautions while joining pipes • Administer First aid • Be aware of Environmental issues	• Plastic welding machine • Stock and dies • Oil can • Gloves, safety boots, overall, goggles • Pipe wrenches • Adjustable spanners • Wire brush • Soldering iron	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
		(c) Performing Flaring	**Brainstorm:** Guide the students to define Flaring and their application **Demonstration:** Demonstrate to the students how to Perform Flaring and to handle tools and equipment **Practical work:** Organise the students into manageable groups in Performing Flaring in working place	• Interpret working drawing • Select materials • Take measurements • Cut pipe squarely • Clamp the work piece on a pipe vice • Perform joining on copper tubes, steels and plastic pipes • Clean the work area and work piece • Store the tools and work piece at a safe place	The joined pipe conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain different ways of joining pipes **Principles:** The student should explain principles of: • Joining steel pipes • Welding plastic pipes • Joining copper pipes • Taking measurements • Soldering **Theories:** The student should explain: - • Types of joints used on copper tubes • Joints used on steel pipes • The difference between soldering and welding • Joints used on plastic pipes • The use of flux when soldering • Types of soldering processes • The difference between capillary	The following tools, equipment and safety gear are to be available: • Work bench • Pipe vice • Steel rule • Hacksaw • Wheel cutter • Flaring tools • File • Reamer • Blow lamp • Plastic welding machine • Stock and dies • Oil can • Gloves, safety boots, overall, goggles • Pipe wrenches • Adjustable spanners • Wire brush • Soldering iron	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						joints and screwed joints **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions to be observed while joining pipes • Administer First aid • Awareness of Environmental issues		
		(d) Performing Swaging	**Brainstorm:** Guide the students in describing swaging technique **Demonstration:** Demonstrate to the students how to perform swaging and to handle tools and equipment **Practical work:** Organise the students into manageable groups to perform swaging in working place	• Interpret working drawing • Select materials • Take measurements • Cut pipe squarely • Clamp the work piece on a pipe vice • Perform joining on copper	The joined pipe conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain different ways of joining pipes **Principles:** The student should explain principles of: • Joining steel pipes • Welding plastic pipes • Joining copper pipes • Taking measurements • Soldering **Theories:** The student should explain: -	The following tools, equipment and safety gear are to be available: • Work bench • Pipe vice • Steel rule • Hacksaw • Wheel cutter • Flaring tools • File • Reamer • Blow lamp • Plastic welding machine	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				tubes, steels and plastic pipes • Clean the work area and work piece • Store the tools and work piece at a safe place		• Types of joints used on copper tubes • Joints used on steel pipes • The difference between soldering and welding • Joints used on plastic pipes • The use of flux when soldering • Types of soldering processes • The difference between capillary joints and screwed joints **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions to be observed while joining pipes • Administer First aid • Awareness Environmental issues	• Stock and dies • Oil can • Gloves, safety boots, overall, goggles • Pipe wrenches • Adjustable spanners • Wire brush • Soldering iron	
		(e) Performing aluminium joint	**Brainstorm:** Guide the students to define	• Interpret working drawing	The joined pipe conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain	The following tools, equipment and safety gear	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			aluminium joint technique **Demonstration:** Demonstrate to the students how to perform aluminium joint and to handle tools and equipment **Practical work:** Organise the students into manageable groups to perform aluminium joint in working place	• Select materials • Take measurements • Cut pipe squarely • Clamp the work piece on a pipe vice • Perform joining on copper tubes, steels and plastic pipes • Clean the work area and work piece • Store the tools and work piece at a safe place		different ways of joining pipes **Principles:** The student should explain principles of: • Joining steel pipes • Welding plastic pipes • Joining copper pipes • Taking measurements • Soldering **Theories:** The student should explain: - • Types of joints used on copper tubes • Joints used on steel pipes • The difference between soldering and welding • Joints used on plastic pipes • The use of flux when soldering • Types of soldering processes • The difference between capillary joints and screwed joints	are to be available: • Work bench • Pipe vice • Steel rule • Hacksaw • Wheel cutter • Flaring tools • File • Reamer • Blow lamp • Plastic welding machine • Stock and dies • Oil can • Gloves, safety boots, overall, goggles • Pipe wrenches • Adjustable spanners • Wire brush • Soldering iron	

Module Title (Main Competence)	Unit Title (Specific Competence)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						Circumstantial knowledge **Detailed knowledge about:** • Safety precautions to be observed while joining pipes • Administer First aid • Awareness of Environmental issues		

Form Two

Table 4*: Detailed Contents for Form Two*

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
1.0 Building simple electric circuits	1.1 Performing cold electrical joints	(a) Making eyelet joint	**Demonstration and guided Practice:** Demonstrate to the students step-by-step process of making an eyelet joint, using clear instructions and proper tools **Hands-on practice with teacher observation:** Provide the students with materials to practice making the eyelet joint individually **Practical work:**	• Select tools, equipment and materials required • Prepare cables for joint making • Make eyelet joints • Insulate joints • Terminate • Clean workplace and tools • Store tools, equipment and excess/remaining materials	The joint made is mechanically and electrically correct conforming to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Strip a cable • Make eyelet joints • Insulate joints **Principles:** The student should explain principle of: • Making eyelet joints • Stripping a cable • Termination **Theories:** The student should explain: • Different types of eyelet joints	The following tools, equipment and safety gear are to be available: • Diagonal cutting pliers • Combination pliers • Electrician knife • Measuring tape • Long nose pliers • Analog and digital multimeter • Safety goggles • Safety boots • Overalls • Work bench • Crimping tool and die set	54

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Organise the students into manageable groups to assign students a small activity that involves using an eyelet joint, such as creating a simple frame or structure and present their finished work to the class			• Different materials used in joint making • Tools for stripping and cutting a cable • Different types of insulating materials **Circumstantial knowledge** **Detailed knowledge about:** • Performing termination • Handling soldering materials		
		(b) Making crimp joint	**Demonstration and guided Practice:** Demonstrate to the students step-by-step process of making a crimp joint, using clear instructions and proper tools	• Select tools, equipment and materials required • Prepare cables for joint making • Make crimp joints • Insulate joints • Terminate • Clean workplace and tools	The joint made is mechanically and electrically correct conforming to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Strip a cable • Make crimp joints	The following tools, equipment and safety gear are to be available: • Diagonal cutting pliers • Combination pliers • Electrician knife • Measuring tape • Long nose pliers • Analog and digital multimeter • Safety goggles • Safety boots	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Hands-on practice with teacher observation: Provide the students with materials to practice making the crimp joint individually **Practical work:** Organise the students into manageable groups to assign students a small activity that involves using a crimp joint, such as creating a simple frame or structure and present their finished work to the class	Store tools, equipment and excess/remaining materials		• Insulate joints **Principles:** The student should explain principle of: • Making crimp joints • Stripping a cable • Termination **Theories:** The student should explain: • Different types of joints • Different materials used in crimp joint making • Tools for stripping and cutting a cable • Different types of insulating materials **Circumstantial knowledge** **Detailed knowledge about:**	• Overalls • Work bench • Crimping tool and die set	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Performing termination • Handling soldering materials		
		(d) Making parallel groove clamp joint	**Demonstration and guided Practice:** Demonstrate to the students step-by-step process of making a parallel groove clamp joint, using clear instructions and proper tools **Hands-on practice with teacher observation:** Provide the students with materials to practice making the parallel groove clamp	• Select tools, equipment, and materials required • Prepare cables for making parallel groove clamp joint • Insulate joints • Terminate • Clean workplace and tools Store tools, equipment and excess/remaining materials	The joint made is mechanically and electrically correct conforming to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Strip a cable • Make parallel groove clamp joints • Insulate joints **Principles:** The student should explain principle of: • Making parallel groove clamp joints • Stripping a cable • Termination	The following tools, equipment and safety gear are to be available: • Diagonal cutting pliers • Combination pliers • Set of spanners • Electrician knife • Measuring tape • Long nose pliers • Analog and digital multimeter • Safety goggles • Safety boots • Overalls • Work bench • Crimping tool and die set	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			joint individually **Practical work:** Organise the students into manageable groups to assign students a small activity that involves using a parallel groove clamp joint, such as creating a simple frame or structure and present their finished work to the class			**Theories:** The student should explain: • Different types of joints • Different materials used in parallel groove clamp joint making • Tools for stripping and cutting a cable • Different types of insulating materials **Circumstantial knowledge** **Detailed knowledge about:** • Performing termination • Handling soldering materials		
		(d) Making bolt joints	**Demonstration and guided Practice:**	• Select tools, equipment and materials required	The joint made is mechanically and	**Knowledge evidence:**	The following tools, equipment and safety gear are to be available: • Diagonal cutting pliers	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Demonstrate to the students step-by-step process of making bolt joint, using clear instructions and proper tools **Hands-on practice with teacher observation:** Provide the students with materials to practice making the bolt joint individually **Practical work:** Organise the students into manageable groups to assign students a small activity that involves using bolt joint, such as creating a simple frame	• Prepare cables for joint making • Make bolt joints • Insulate joints • Terminate • Clean workplace and tools Store tools, equipment and excess/remaining materials	electrically correct conforming to technical specifications	**Detailed knowledge of:** **Method used:** The student should explain how to: • Strip a cable • Make bolt joints • Insulate joints **Principles:** The student should explain principle of: • Making bolt joints • Stripping a cable • Termination **Theories:** The student should explain: • Different types of joints • Different materials used in joint making • Tools for stripping and cutting a cable	• Combination pliers • Electrician knife • Set of spanners • Measuring tape • Long nose pliers • Analog and digital multimeter • Safety goggles • Safety boots • Overalls • Work bench	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			or structure and present their finished work to the class			• Different types of insulating materials **Circumstantial knowledge** **Detailed knowledge about:** • Performing termination • Handling soldering materials		
	1.2 Performing hot electrical joints	(a) Making twist joint	**Demonstration and guided Practice:** Demonstrate to the students step-by-step process of making twist joint, using clear instructions and proper tools **Hands-on practice with teacher observation:** Provide the students with	• Select tools and equipment required • Prepare cables for termination • Make twist joints • Solder cable joints • Insulate joints • Clean workplace and tools Store tools, equipment and excess materials	The joint made is mechanically and electrically correct conforming to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Perform twist joint • Insulate joints **Principles:** The student should explain principle of Making twist joints	The following tools, equipment and safety gear are to be available: • Diagonal cutting plier • Combination plier • Electrician knife • Measuring tape • Long nose plier • Soldering iron • Soldering gun • Pot and ladle • Blow lamp • Analog and digital Multimeters • Safety goggles • Safety boots • Overall	39

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			materials to practice making twist joint individually **Practical work:** Organise the students into manageable groups to assign students a small activity that involves using a twist joint, such as creating a simple frame or structure and present their finished work to the class			**Theories:** The student should explain: • Different types of twist joints and their application • Different materials used in making twist joint making • Different types of insulating materials **Circumstantial knowledge** **Detailed knowledge about:** • Safety measures involved in making twist joints • Safe handling of work tools	Work bench	
		(b) Making tee joints	**Demonstration and guided Practice:**	• Select tools and equipment required	The joint made is mechanically and	**Knowledge evidence:**	The following tools, equipment and safety gear are to be available: • Diagonal cutting plier	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Demonstrate to the students' step-by-step process of making tee joint, using clear instructions and proper tools **Hands-on practice with teacher observation:** Provide the students with materials to practice making tee joint individually **Practical work:** Organise the students into manageable groups to assign students a small activity that involves using a tee joint, such as creating a simple frame or structure and	• Prepare cables for termination • Make tee joints • Solder cable joints • Insulate joints • Clean workplace and tools store tools, equipment and excess materials	electrically correct conforming to technical specifications	**Detailed knowledge of:** **Method used:** The student should explain how to: • Perform tee joint • Insulate joints **Principles:** The student should explain principle of Making tee joints **Theories:** The student should explain: • Different types of tee joints and their application • Different materials used in making tee joint making • Different types of insulating materials **Circumstantial knowledge**	• Combination plier • Electrician knife • Measuring tape • Long nose plier • Soldering iron • Soldering gun • Pot and ladle • Blow lamp • Analog and digital multimeter • Safety goggles • Safety boots • Overall Work bench	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			present their finished work to the class			**Detailed knowledge about:** • Safety measures involved in making twist joints • Safe handling of work tools		
		(c) Making married joints	**Demonstration and guided Practice:** Demonstrate to students step-by-step process of making married joint, using clear instructions and proper tools **Hands-on practice with teacher observation:** Provide the students with materials to practice making	• Select tools and equipment required • Prepare cables for termination • Make married joints • Solder cable joints • Insulate joints • Clean workplace and tools Store tools, equipment and excess materials	The joint made is mechanically and electrically correct conforming to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Perform married joint • Insulate joints **Principles:** The student should explain principle of Making married joints	The following tools, equipment and safety gear are to be available: • Diagonal cutting plier • Combination plier • Electrician knife • Measuring tape • Long nose plier • Soldering iron • Soldering gun • Pot and ladle • Blow lamp • Analog and digital Multimeter • Work bench • Safety goggles • Safety boots • Overall	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			married joint individually **Practical work:** Organise the students into manageable groups to assign students a small activity that involves using a married joint, such as creating a simple frame or structure and present their finished work to the class			**Theories:** The student should explain: • Different types of joints and their application • Different materials used in making married joint making • Different types married joint **Circumstantial knowledge** **Detailed knowledge about:** • Safety measures involved in making married joints • Safe handling of work tools		
	1.3 Constructing resistive circuits	(a) Building single resistor circuit	**Hands-on demonstration and guided practice:**	• Interpret given circuit drawing of the single resistor circuit	The resistive circuits constructed conform to	**Knowledge evidence:**	The following tools, equipment and safety gear are to be available: • Work bench • Proto board	39

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Guide the students on how to demonstrate, where you build a single resistor circuit step-by-step, explaining the purpose of each component (battery, resistor, wires, and switch). **Integration with ICT Tools:** Use interactive quizzes or circuit-building tutorials on platforms like Kahoot or google Classroom **Discussions and Feedback:** Hold a class discussion where students share their experiences,	• Identify equipment, tools and material required for: Make single resistor circuit and wires for termination • Build a single resistor circuit • Solder the built circuits • Test built circuits • Clean work area, tools and equipment • Store tools, equipment and materials	technical specifications	**Detailed knowledge of:** **Method used:** The student should explain how to: • Measure the electrical quantities in single resistor circuit resistors • Read resistor values by colour codes **Principles:** The student should explain principle of: • Constructing resistive circuits • Carrying out measurements in resistive circuits **Theories:** The student should explain: • Types of resistors	• Soldering iron/gun • Electrician knife • Combination pliers • Diagonal cutting pliers • Long nose plier • Analogue and digital multimeter • Measuring tape • Overalls • Safety goggles • Safety boot • Electrical gloves	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			challenges, and solutions **Brainstorming:** Guide the students to explore uses of various resistor circuit			• Electrical symbols used to draw the resistive circuit • The application of the various types of resistive circuits • The use of various tools and equipment **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools and equipment • Awareness of Electrical hazards • First aid		
		(b) Building series circuit	**Hands-on demonstration and guided practice:** Guide the students on how to demonstrate,	• Interpret given circuit drawing of Build series circuit • Identify equipment, tools and material required	The series circuits constructed conform to technical specifications	**Knowledge evidence:** **Detailed knowledge of:**	The following tools, equipment and safety gear are to be available: • Work bench • Soldering iron/gun • Electrician knife • Combination pliers • Diagonal cutting pliers	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			building a series resistor circuit step-by-step, explaining the purpose of each component (battery, resistor, wires, and switch). **Integration with ICT Tools:** Use interactive quizzes or circuit-building tutorials on platforms like Kahoot or google Classroom **Discussions and Feedback:** Hold a class discussion where students share their experiences, challenges, and solutions	• Prepare resistors and wires for termination • Build series circuit • Solder the built circuits • Test built circuits • Clean work area, tools and equipment • Store tools, equipment and materials		**Method used:** The student should explain how to: • Measure the electrical quantities of the built series circuit • Read resistance values by • Calculate the value of resistance in series **Principles:** The student should explain principle of series circuit **Theories:** The student should explain: • Types of circuit • Electrical symbols used to draw the series circuit • The series resistive circuit	• Long nose plier • Analogue and digital multimeter • Measuring tape • Overalls • Safety goggles • Safety boots • Electrical gloves	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Brainstorming: Guide the students to explore uses of various series resistor circuit			and its behaviour • The application of the various types of resistive circuits • The use of various tools and equipment **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools and equipment • Awareness of Electrical hazards • First aid		
		(c)Building parallel circuit	**Hands-on demonstration and guided practice:** Guide the students how to demonstrate	• Interpret given circuit drawing of the single resistor circuit • Identify equipment, tools and material required	The resistive circuits constructed conform to technical specifications	**Knowledge evidence:** **Detailed knowledge of:**	The following tools, equipment and safety gear are to be available: • Work bench • Proto board • Soldering iron/gun • Electrician knife • Combination pliers	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			building a parallel resistor circuit step-by-step, explaining the purpose of each component (battery, resistor, wires, and switch). **Integration with ICT Tools:** Use interactive quizzes or circuit-building tutorials on platforms like Kahoot or google Classroom **Discussions and Feedback:** Hold a class discussion where students share their experiences, challenges, and solutions	• Prepare resistors and wires for termination • Build a single resistor circuit • Build a single resistor circuit • Build a parallel resistive circuit • Build a series parallel circuit • Solder the built circuits • Test built circuits • Clean work area, tools and equipment • Store tools, equipment and materials		**Method used:** The student should explain how to: • Measure the electrical quantities of the built circuit resistors • Read resistor values by colour codes • Calculate the value of resistance in parallel circuit **Principles:** The student should explain principle of: • Constructing resistive circuits • Carrying out measurements in resistive circuits **Theories:** The student should explain: • Types of resistors	• Diagonal cutting pliers • Long nose plier • Analogue and digital multimeter • Measuring tape • Overalls • Safety goggles • Safety boot • Electrical gloves	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Brainstorming: Guide students to explore uses of various parallel resistor circuit			• Electrical symbols used to draw the resistive circuit • The application of the various types of resistive circuits • The use of various tools and equipment **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools and equipment • Awareness of Electrical hazards • First aid		
		(d) Building series parallel circuit	**Hands-on demonstration and guided practice:**	• Interpret given circuit drawing of the single resistor circuit • Identify equipment, tools	The resistive circuits constructed conform to	**Knowledge evidence:** **Detailed knowledge of:**	The following tools, equipment and safety gear are to be available: • Work bench • Proto board • Soldering iron/gun	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Guide the students how to demonstrate, building a series parallel resistor circuit step-by-step, explaining the purpose of each component (battery, resistor, wires, and switch). **Integration with ICT Tools:** Use interactive quizzes or circuit-building tutorials on platforms like Kahoot or google Classroom **Discussions and Feedback:** Hold a class discussion where students share their experiences,	and material required • Prepare resistors and wires for termination • Build a series parallel circuit • Solder the built circuits • Test built circuits • Clean work area, tools and equipment • Store tools, equipment and materials	technical specifications	**Method used:** The student should explain how to: • Measure the electrical quantities of the built circuit resistors • Read resistor values by colour codes • Calculate the value of resistance in series parallel circuit **Principles:** The student should explain principle of: • Constructing resistive circuits • Carrying out measurements in resistive circuits **Theories:** The student should explain:	• Electrician knife • Combination pliers • Diagonal cutting pliers • Long nose plier • Analogue and digital multimeter • Measuring tape • Power point • White board • Overalls • Safety goggles • Safety boot • Electrical gloves	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			challenges, and solutions **Brainstorming:** Guide the students to explore uses of various series parallel resistor circuit			• Types of resistors • Electrical symbols used to draw the resistive circuit • The series-parallel resistive circuit and its behaviour • The application of the various types of resistive circuits • The use of various tools and equipment **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools and equipment • Awareness of Electrical hazards • First aid		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
	1.4 Constructing capacitive circuits	(a) Building single capacitor circuits	**Hands-on demonstration and guided practice:** Guide the students how to demonstrate, building a single capacitor circuit step-by-step, explaining the purpose of each component (battery, resistor, wires, and switch). **Integration with ICT Tools:** Use interactive quizzes or circuit-building tutorials on platforms like Kahoot or google Classroom **Discussions and Feedback:**	• Interpret the given circuit diagram of a capacitive circuit • Identify equipment, tools and material required • Prepare capacitors and wires for termination • Build a single capacitor circuit • Solder the built circuits • Test the built circuits • Clean work area, tools and equipment • Store tools, equipment and the materials	The capacitive circuits constructed conform to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Construct capacitive circuits • Measure capacitive reactance of the built circuit • Identify different types of capacitors (Polarized, non-polarized) • Calculate the value capacitance **Principles:** The student should explain the principles of: • Constructing single	The following tools, equipment and safety gear are to be available: • Proto board • Electrician knife • Combination pliers • Diagonal cutting pliers • Long nose pliers • Analog and digital multimeter • Measuring tape • Overalls • Safety goggles • Work bench • Safety boots • Soldering iron/gun	46

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Hold a class discussion where students share their experiences, challenges, and solutions **Brainstorming:** Guide students to explore uses of various single capacitor circuit			capacitive circuits • Carrying out measurement of capacitance and voltage in single capacitive circuit **Theories:** The student should explain: • Symbols for capacitor • Types of capacitors • The application of the various types of capacitive circuit **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions in capacitive circuits		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						Safe handling of working tools, equipment		
		(b) Building series circuits	**Hands-on demonstration and guided practice:** Guide the students how to demonstrate, building a series capacitor circuit step-by-step, explaining the purpose of each component (battery, resistor, wires, and switch). **Integration with ICT Tools:** Use interactive quizzes or circuit-building tutorials on platforms like Kahoot or	• Interpret the given circuit diagram of a capacitive circuit • Identify equipment, tools and material required • Prepare capacitors and wires for termination • Build a capacitive circuit in series • Solder the built circuits • Test the built circuits • Clean work area, tools and equipment • Store tools, equipment and the materials	The capacitive circuits constructed conform to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Construct capacitive circuits • Measure capacitive reactance of the built circuit • Identify different types of capacitors (Polarized, non-polarized) • Calculate the value capacitance **Principles:** The student should	The following tools, equipment and safety gear are to be available: • Proto board • Electrician knife • Combination pliers • Diagonal cutting pliers • Long nose pliers • Analog and digital multimeter • Measuring tape • Overalls • Safety goggles • Work bench • Safety boots • Soldering iron/gun	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			google Classroom **Discussions and Feedback:** Hold a class discussion where students share their experiences, challenges, and solutions **Brainstorming:** Guide students to explore uses of various series capacitor circuit			explain the principles of: • Constructing capacitive circuits • Carrying out measurement of capacitance and voltage in capacitive circuit **Theories:** The student should explain: • Symbols for capacitor • Types of capacitors • The series capacitive circuits and its behaviour • The application of the various types of capacitive circuit **Circumstantial knowledge**		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						Detailed knowledge about: • Safety precautions in capacitive circuits Safe handling of working tools, equipment		
		(c) Building parallel circuits	**Hands-on demonstration and guided practice:** Guide the students how to demonstrate, building a parallel capacitor circuit step-by-step, explaining the purpose of each component (battery, resistor, wires, and switch). **Integration with ICT Tools:**	• Interpret the given circuit diagram of a capacitive circuit • Identify equipment, tools and material required • Prepare capacitors and wires for termination • Build a capacitive circuit in parallel • Solder the built circuits • Test the built circuits	The capacitive circuits constructed conform to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Construct capacitive circuits • Measure capacitive reactance of the built circuit • Identify different types of capacitors (Polarized, non-polarized)	The following tools, equipment and safety gear are to be available: • Proto board • Electrician knife • Combination pliers • Diagonal cutting pliers • Long nose pliers • Analog and digital multimeter • Measuring tape • Overalls • Safety goggles • Work bench • Safety boots • Soldering iron/gun	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Use interactive quizzes or circuit-building tutorials on platforms like Kahoot or google Classroom **Discussions and Feedback:** Hold a class discussion where students share their experiences, challenges, and solutions **Brainstorming:** Guide students to explore uses of various parallel capacitor circuit	• Clean work area, tools and equipment • Store tools, equipment and the materials		• Calculate the value capacitance **Principles:** The student should explain the principles of: • Constructing capacitive circuits • Carrying out measurement of capacitance and voltage in capacitive circuit **Theories:** The student should explain: • Symbols for capacitor • Types of capacitors • The parallel capacitive circuit and its behaviour • The application of the various		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						types of capacitive circuit **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions in capacitive circuits Safe handling of working tools, equipment		
		(d) Building combined series parallel circuits	**Hands-on demonstration and guided practice:** Guide the students on how to demonstrate, building a series parallel capacitor circuit step-by-step, explaining the purpose of each component (battery,	• Interpret the given circuit diagram of a capacitive circuit • Identify equipment, tools and material required • Prepare capacitors and wires for termination • Build a capacitive series parallel circuit	The capacitive circuits constructed conform to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Construct capacitive circuits • Measure capacitive	The following tools, equipment and safety gear are to be available: • Proto board • Electrician knife • Combination pliers • Diagonal cutting pliers • Long nose pliers • Analog and digital multimeter • Measuring tape • Overalls • Safety goggles • Work bench • Safety boots	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			resistor, wires, and switch). **Integration with ICT Tools:** Use interactive quizzes or circuit-building tutorials on platforms like Kahoot or google Classroom **Discussions and Feedback:** Hold a class discussion where students share their experiences, challenges, and solutions **Brainstorming:** Guide students to explore uses of various series parallel capacitor circuit	• Solder the built circuits • Test the built circuits • Clean work area, tools and equipment • Store tools, equipment and the materials		reactance of the built circuit • Identify different types of capacitors (Polarized, non-polarized) • Calculate the value capacitance **Principles:** The student should explain the principles of: • Constructing capacitive circuits • Carrying out measurement of capacitance and voltage in capacitive circuit **Theories:** The student should explain: • Symbols for capacitor • Types of capacitors	Soldering iron/gun	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• The series-parallel capacitive circuit and its behaviours • The application of the various types of capacitive circuit **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions in capacitive circuits • Safe handling of working tools, equipment		
	1.5 Constructing inductive circuits	(a) Building single inductor circuits	**Hands-on demonstration and guided practice:** Guide the students on how to build a single inductor circuit	• Interpret the given circuit diagram of the inductive circuit • Select equipment, tools and material required	The inductive circuits constructed as per technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to:	The following tools, equipment and safety gear are to be available: • Proto board • Electrician knife • Combination pliers • Diagonal cutting pliers • Long nose pliers	47

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			step-by-step, explaining the purpose of each component (battery, resistor, wires, and switch). **Integration with ICT Tools:** Use interactive quizzes or circuit-building tutorials on platforms like Kahoot or google Classroom **Discussions and Feedback:** Hold a class discussion where students share their experiences, challenges, and solutions **Brainstorming:** Guide students	• Prepare inductors and wires for termination • Build a single inductor circuit • Solder the built circuits • Test the built inductive circuits • Clean work area, tools and equipment • Store tools, equipment and excess materials		• Construct inductive circuits • Identify an inductor • Calculate the value of inductance **Principles:** The student should explain the principles of: • Constructing inductive circuits • Carrying out measurement of voltage across an inductive circuit **Theories:** The student should explain: • The application of the various types of inductive circuit **Circumstantial knowledge**	• Analog and digital multimeter • Measuring tape • Overalls • Safety goggles • Work bench • Safety boot • Soldering iron/gun	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			to explore uses of various single inductor circuit			**Detailed knowledge about:** • Safety precaution in inductive circuits Safe handling of working tools, equipment and the inductors		
		(b) Building series circuits	**Hands-on demonstration and guided practice:** Guide the students on how to demonstrate, building a series inductor circuit step-by-step, explaining the purpose of each component (battery, resistor, wires, and switch). **Integration with ICT Tools:**	• Interpret the given circuit diagram of the inductive circuit • Select equipment, tools and material required • Prepare inductors and wires for termination • Build an inductive circuit in series • Solder the built circuits • Test the built inductive circuits	The inductive circuits constructed as per technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Construct inductive circuits • Identify an inductor • Calculate the value of inductance **Principles:** The student should	The following tools, equipment and safety gear are to be available: • Proto board • Electrician knife • Combination pliers • Diagonal cutting pliers • Long nose pliers • Analog and digital multimeter • Measuring tape • Overalls • Safety goggles • Work bench • Safety boot Soldering iron/gun	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Use interactive quizzes or circuit-building tutorials on platforms like Kahoot or google Classroom **Discussions and Feedback:** Hold a class discussion where students share their experiences, challenges, and solutions **Brainstorming:** Guide students to explore uses of various series inductor circuit	• Clean work area, tools and equipment • Store tools, equipment and excess materials		explain the principles of: • Constructing inductive circuits • Carrying out measurement of voltage across an inductive circuit **Theories:** The student should explain: • The series inductive circuit and its behaviour • The application of the various types of inductive circuit **Circumstantial knowledge** **Detailed knowledge about:** • Safety precaution in		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						inductive circuits Safe handling of working tools, equipment and the inductors		
		(c) Building parallel circuits	**Hands-on demonstration and guided practice:** Guide the students on how to demonstrate, where you build a parallel inductor circuit step-by-step, explaining the purpose of each component (battery, resistor, wires, and switch). **Integration with ICT Tools:** Use interactive quizzes or circuit-building tutorials on	• Interpret the given circuit diagram of the inductive circuit • Select equipment, tools and material required • Prepare inductors and wires for termination • Build a parallel inductive circuit • Solder the built circuits • Test the built inductive circuits • Clean work area, tools and equipment • Store tools, equipment and excess materials	The inductive circuits constructed as per technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Construct inductive circuits • Identify an inductor • Calculate the value of inductance **Principles:** The student should explain the principles of: • Constructing inductive circuits	The following tools, equipment and safety gear are to be available: • Proto board • Electrician knife • Combination pliers • Diagonal cutting pliers • Long nose pliers • Analog and digital multimeter • Measuring tape • Overalls • Safety goggles • Work bench • Safety boot • Soldering iron/gun	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			platforms like Kahoot or google Classroom **Discussions and Feedback:** Hold a class discussion where students share their experiences, challenges, and solutions **Brainstorming:** Guide students to explore uses of various parallel inductor circuit			• Carrying out measurement of voltage across an inductive circuit **Theories:** The student should explain: • The parallel inductive circuit and its behaviour • The application of the various types of inductive circuit **Circumstantial knowledge** **Detailed knowledge about:** • Safety precaution in inductive circuits Safe handling of working tools, equipment and the inductors		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
		(d) Building combined series parallel circuits	**Hands-on demonstration and guided practice:** Guide the students on how to demonstrate, building a series parallel inductor circuit step-by-step, explaining the purpose of each component (battery, resistor, wires, and switch). **Integration with ICT Tools:** Use interactive quizzes or circuit-building tutorials on platforms like Kahoot or google Classroom **Discussions and Feedback:**	• Interpret the given circuit diagram of the inductive circuit • Select equipment, tools and material required • Prepare inductors and wires for termination • Build a series-parallel inductive circuit • Solder the built circuits • Test the built inductive circuits • Clean work area, tools and equipment • Store tools, equipment and excess materials	The inductive circuits constructed as per technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Construct inductive circuits • Identify an inductor • Calculate the value of inductance **Principles:** The student should explain the principles of: • Constructing inductive circuits • Carrying out measurement of voltage across an inductive circuit	The following tools, equipment and safety gear are to be available: • Proto board • Electrician knife • Combination pliers • Diagonal cutting pliers • Long nose pliers • Analog and digital multimeter • Measuring tape • Overalls • Safety goggles • Work bench • Safety boot • Soldering iron/gun	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Hold a class discussion where students share their experiences, challenges, and solutions **Brainstorming:** Guide students to explore uses of various series parallel inductor circuit			**Theories:** The student should explain: • The series-parallel inductive circuit and its behaviour • The application of the various types of inductive circuit **Circumstantial knowledge** **Detailed knowledge about:** • Safety precaution in inductive circuits • Safe handling of working tools, equipment and the inductors		
	1.6 Constructing RLC circuit	(a) Building a resistance and capacitance circuit	**Hands-on demonstration and guided practice:**	• Interpret given diagram of the RLC circuit • Select equipment,	The RLC circuit constructed conforms to	**Knowledge evidence:** **Detailed knowledge of:**	The following tools, equipment and safety gear are to be available: • Proto board • Electrician knife	49

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Guide the students on how to demonstrate, building a resistance and capacitance circuit step-by-step, explaining the purpose of each component (battery, resistor, wires, and switch). **Integration with ICT Tools:** Use interactive quizzes or circuit-building tutorials on platforms like Kahoot or google Classroom **Discussions and Feedback:** Hold a class discussion where students share their	tools and material required • Prepare inductors, capacitors, resistors and wire for termination • Build resistance and capacitance circuit • Solder the built circuits • Test the built circuits • Clean the work area, tools and equipment Store tools, equipment and the excess materials	technical specifications	**Method used:** The student should explain how to construct RLC circuits **Principles:** The student should explain the principles of: • Constructing RLC circuit • Carrying out measurement of voltage in an RLCL circuit **Theories:** The student should explain: • The RLC circuit and its behaviour • The application of the various types of Inductive circuits **Circumstantial knowledge**	• Combination pliers • Diagonal cutting pliers • Long nose pliers • Analog and digital multimeter • Measuring tape • Overalls • Safety goggles • Work bench • Safety boots • Soldering iron/gun	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			experiences, challenges, and solutions **Brainstorming:** Guide students to explore uses of various resistance and capacitance circuit			**Detailed knowledge about:** • Safety precaution when soldering RLC circuits • Safe handling of working tools, equipment and RLC components		

		(b) Building a resistance and inductance circuit	**Hands-on demonstration and guided practice:**
			
			Guide the students on how to demonstrate, building a resistance and inductance circuit step-by-step, explaining the purpose of each component (battery, resistor, wires, and switch). **Integration**
				• Interpret given diagram of the RLC circuit
				  • Select equipment, tools and material required
				  • Prepare inductors, capacitors, resistors and wire for termination
				  • Build resistance and inductance
					The RLC circuit constructed conforms to technical specifications	**Knowledge evidence:**
						
						Detailed knowledge of:
						
						Method used: The student should explain how to construct RLC circuits
						
						Principles: The student should explain the principles of:
						
						• Constructing RLC circuit
							The following tools, equipment and safety gear are to be available:
							• Proto board
							• Electrician knife
							• Combination pliers
							• Diagonal cutting pliers
							• Long nose pliers
							• Analog and digital multimeter
							• Measuring tape
							• Overalls
							• Safety goggles
							• Work bench
							• Safety boots
							Soldering iron/gun	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			with ICT Tools: Use interactive quizzes or circuit-building tutorials on platforms like Kahoot or google Classroom **Discussions and Feedback:** Hold a class discussion where students share their experiences, challenges, and solutions **Brainstorming:** Guide students to explore uses of various resistance and inductance circuit	circuit Solder the built circuits • Test the built circuits • Clean the work area, tools and equipment • Store tools, equipment and the excess materials		• Carrying out measurement of voltage in an RLCL circuit **Theories:** The student should explain: • The RLC circuit and its behaviour • The application of the various types of Inductive circuits **Circumstantial knowledge** **Detailed knowledge about:** • Safety precaution when soldering RLC circuits • Safe handling of working tools, equipment and RLC components		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
		(c) Building a resistance inductance and capacitance circuits	**Hands-on demonstration and guided practice:** Guide the students to demonstrate, on building a resistance, inductance and capacitance circuit step-by-step, explaining the purpose of each component (battery, resistor, wires, and switch). **Integration with ICT Tools:** Use interactive quizzes or circuit-building tutorials on platforms like Kahoot or google Classroom	• Interpret given diagram of the RLC circuit • Select equipment, tools and material required • Prepare inductors, capacitors, resistors and wire for termination • Build inductor, capacitor and resistor circuit • Solder the built circuits • Test the built circuits • Clean the work area, tools and equipment Store tools, equipment and the	The RLC circuit constructed conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to construct RLC circuits **Principles:** The student should explain the principles of: • Constructing RLC circuit • Carrying out measurement of voltage in an RLCL circuit **Theories:** The student should explain: • The RLC circuit and its behaviour	The following tools, equipment and safety gear are to be available: • Proto board • Electrician knife • Combination pliers • Diagonal cutting pliers • Long nose pliers • Analog and digital multimeter • Measuring tape • Overalls • Safety goggles • Work bench • Safety boots • Soldering iron/gun	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Discussions and Feedback: Hold a class discussion where students share their experiences, challenges, and solutions **Brainstorming:** Guide students to explore uses of various resistance, inductance and capacitance circuit	excess materials		• The application of the various types of Inductive circuits **Circumstantial knowledge** **Detailed knowledge about:** • Safety precaution when soldering RLC circuits • Safe handling of working tools, equipment and RLC components		
	1.7 Measuring electric quantities	(a) Measuring voltage in the circuit	**Hands-on Experiments:** Provide the students with simple electrical circuit kits containing a power source and measure voltage in real circuits	• Determine component values • Connect simple electric circuits • Perform soldering • Measure voltage in the circuit • Clean workplace and tools	Electrical quantities measured conform to IEEE standards	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The students should explain how to:	The following tools, equipment and safety gear are to be available: • Electrical components • Tool kit • Work bench • Power supply • Safety boots • HT safety gloves • Overalls • Batteries	26

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Simulations and Virtual Labs: Guide the students to use technology to visualize circuit behaviour **Use of animations and videos:** Show animations of how electrons move in a circuit and how a voltmeter detects voltage differences **Collaborative group work:** Assign tasks to group of students such as designing a circuit to achieve a specific	• Store tools, materials and equipment		• Measure component values • Read colour codes • Calculate electric quantities • Determine the values of components using colours codes • Measure voltage and current **Principles:** The student should explain principle of: • Connecting electrical circuits in • Taking voltage measurements in the circuit **Theories:** The student should explain: • Different component ratings	• Resistors • Wires • voltmeter/multimeter.	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			voltage reading **Formative Assessment Through Peer Teaching:** After learning the basics, guide students to work in pairs or groups to teach each other how to measure voltage correctly.			• Types of electric circuit connections • Verification of electric rules and laws • Importance of component ratings • Types and uses of measuring and testing instruments **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools Safe handling of measuring instruments		
		(b) Measuring current in the circuit	**Hands-on Experiments:** Provide the students with simple electrical circuit kits containing a	• Determine component values • Connect simple electric circuits • Perform soldering	Electrical quantities measured conform to IEEE standards	**Knowledge evidence:** **Detailed knowledge of:**	The following tools, equipment and safety gear are to be available: • Electrical components • Analog and digital Multimeters • Tool kit	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			power source and measure current in real circuits **Simulations and Virtual Labs:** Guide the students to use technology to visualize circuit behaviour **Use of animations and videos:** Show animations of how electrons move in a circuit and how an amp's meter detects current differences **Collaborative group work:** Assign tasks to group of students such	• Measure electric quantities • Clean workplace and tools • Store tools, materials and equipment		**Method used:** The student should explain how to: • Measure component values • Read colour codes • Calculate electric quantities • Determine the values of components using colours codes • Measure current **Principles:** The student should explain principle of: • Connecting electrical circuits in combination **Theories:** The student should explain:	• Work bench • Power supply • Safety boots • HT safety gloves • Overalls	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			as designing a circuit to achieve a specific current reading **Formative Assessment Through Peer Teaching:** After learning the basics, guide students to work in pairs or groups to teach each other how to measure current correctly			• Different component ratings • Types of electric circuit connections • Verification of electric rules and laws • Importance of component ratings • Types and uses of measuring and testing instruments **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools Safe handling of measuring instruments		
		(c) Measuring resistance in the circuit	**Hands-on Experiments:** Provide the students with	• Determine component values	Electrical quantities measured conform to	**Knowledge evidence:**	The following tools, equipment and safety gear are to be available: • Electrical components	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			simple electrical circuit kits containing a power source and measure resistance in real circuits **Simulations and Virtual Labs:** Guide the students to use technology to visualize circuit behaviour **Use of animations and videos:** Show animations of how electrons move in a circuit and how an Ohm's meter detects resistance differences	• Connect simple electric circuits • Perform soldering • Measure electric quantities • Clean workplace and tools • Store tools, materials and equipment	IEEE standards	**Detailed knowledge of:** **Method used:** The student should explain how to: • Measure component values • Read colour codes • Calculate electric quantities • Measure voltage and current **Principles:** The student should explain principle of: • Connecting electrical circuits in • Taking different measurements of electric quantities **Theories:** The student should explain:	• Analog and digital Multimeters • Tool kit • Work bench • Power supply • Safety boots • HT safety gloves • Overalls	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Collaborative group work: Assign tasks to group of students such as designing a circuit to achieve a specific resistance reading **Formative Assessment Through Peer Teaching:** After learning the basics, guide students to work in pairs or groups to teach each other how to measure resistance correctly			• Different component ratings • Types of electric circuit connections • Verification of electric rules and laws • Importance of component ratings • Types and uses of measuring and testing instruments **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools Safe handling of measuring instruments		
		(d) Carrying out insulation test	**Hands-on practical demonstration:**	• Determine component values	Electrical quantities measured conform to	**Knowledge evidence:**	The following tools, equipment and safety gear are to be available: • Electrical components	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Guide to demonstrate how to operate an insulation tester (megger) on different electrical systems or cables. **Demonstration:** Use simulations to show how insulation testing works in various scenarios, such as detecting faults in cables or systems **Group work and peer teaching:** Divide students into small groups and assign each group a task, such as testing	• Carry out insulation test • Perform soldering • Measure electric quantities • Clean workplace and tools • Store tools, materials and equipment	IEEE standards	**Detailed knowledge of:** **Method used:** The student should explain how to: • Measure component values • Read colour codes • Calculate electric quantities • Determine the values of components using colours codes • Measure voltage and current **Principles:** The student should explain principle of: • Carry out insulation test • Taking different measurements of electric quantities	• Analog and digital Multimeters • Tool kit • Work bench • Work bench light • Power supply • Safety boots • HT safety gloves • Overalls	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			specific cables or appliances. **Discussion:** Guide the students to discuss where insulation testing is used, such as in household wiring, industrial machines, or electronics			**Theories:** The student should explain: • Different insulation materials • Types of electric circuit connections • Verification of electric rules and laws • Importance of component ratings • Types and uses of measuring and testing instruments **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools • Safe handling of measuring instruments		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
		(d) Carrying out earthling test	**Hands-on practical demonstration:** Guide the students to demonstrate on how to operate an earthling teste on different electrical systems or cables. **Demonstration:** Use simulations to show how insulation testing works in various scenarios, such as detecting faults in earthling or systems **Group work and peer teaching:**	• Determine component values • Connect simple electric circuits • Perform soldering • Measure electric quantities • Clean workplace and tools • Store tools, materials and equipment	Electrical quantities measured conform to IEEE standards	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Measure component values • Read colour codes • Calculate electric quantities • Carry out earthling and current **Principles:** The student should explain principle of: • Connecting electrical circuits in parallel, series and combination • Taking different measurements	The following tools, equipment and safety gear are to be available: • Electrical components • Analog and digital multimeter • Tool kit • Work bench • Work bench light • Power supply • Safety boots • HT safety gloves • Overalls	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Divide students into small groups and assign each group a task, such as testing specific earthling or appliances. **Discussion:** Guide the students to discuss where earthling testing is used, such as in household wiring, industrial machines, or electronics			of electric quantities **Theories:** The student should explain: • Different component ratings • Types of electric circuit connections • Verification of electric rules and laws • Importance of component ratings • Types and uses of measuring and testing instruments **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						Safe handling of measuring instruments		
	1.8 Testing electro-mechanical components	(a)Testing thermostat	**Hands-on demonstration and guided practice:** Guide students to demonstrate how to testing thermostat step-by-step, explaining the purpose of each component, wires, and switch. **Integration with ICT Tools:** Use interactive quizzes or circuit-building tutorials on platforms like Kahoot or google Classroom	• Select tools, equipment and materials • Test thermostat • Apply safety gears • Clean workplace, tools and equipment • Store tools and equipment	Test thermostat, electrical and mechanical faults as per conforms	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Use analog and digital Multimeter • Apply different types of test circuits **Principles:** The student should explain the principle of operating characteristics of thermostat **Theories:** The student should explain:	The following tools, equipment and safety gear are to be available: • Set of screw drivers • Digital Multimeter • Mechanical hand tools kit • Wooden board • Overalls • Safety boots • gloves • Combination plier • Wire striper Wire cutter	30

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Discussions and Feedback: Hold a class discussion where students share their experiences, challenges, and solutions **Brainstorming:** Guide students to explore uses of various Test thermostat			• The types and identification of thermostat **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of measuring instruments • Safe handling of tools, equipment		
		(b) Testing relays and overload	**Hands-on demonstration and guided practice:** Guide the students to demonstrate how to test relay and overload step-by-step, explaining the purpose of each component, wires, and	• Select tools, equipment and materials • Test relay and overload • Apply safety gears • Clean workplace, tools and equipment • Store tools and equipment	Test electrical and mechanical faults as per conforms	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Use analog and digital Multimeter • Identify different types	The following tools, equipment and safety gear are to be available: • Set of screw drivers • Digital Multimeter • Mechanical hand tools kit • Wooden board • Overalls • Safety boots • Combination plier • Wire striper • Wire cutter	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			switch. **Integration with ICT Tools:** Use interactive quizzes or circuit-building tutorials on platforms like Kahoot or google Classroom **Discussions and Feedback:** Hold a class discussion where students share their experiences, challenges, and solutions **Brainstorming:** Guide students to explore uses of various test of relays and overloads			of relays and overload **Principles:** The student should explain the principle of operating characteristics of relay and overload **Theories:** The student should explain: • The types and identification of Relays and overload **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of measuring instruments • Safe handling of tools, equipment		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
		(c) Testing capacitors	**Hands-on demonstration and guided practice:** Guide the students to demonstrate how to testing capacitor step-by-step, explaining the purpose of each component, wires, and switch. **Integration with ICT Tools:** Use interactive quizzes or circuit-building tutorials on platforms like Kahoot or google Classroom **Discussions and Feedback:**	• Select tools, equipment and materials • Test capacitors • Apply safety gears • Clean workplace, tools and equipment • Store tools and equipment	Test electrical and mechanical faults as per conforms	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Use analog and digital Multimeter Apply different types of capacitors **Principles:** The student should explain the principle of operating characteristics of capacitor **Theories:** The student should explain: • The types and identification of Capacitor and capacitance **Circumstantial knowledge**	The following tools, equipment and safety gear are to be available: • Set of screw drivers • Digital Multimeter • Mechanical hand tools kit • Wooden board • Overalls • Safety boots • Combination plier • Wire striper • Wire cutter	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Hold a class discussion where students share their experiences, challenges, and solutions **Brainstorming:** Guide the students to explore uses of various test of capacitor			**Detailed knowledge about:** • Safe handling of measuring instruments • Safe handling of tools, equipment		
		(d) Testing compressor	**Hands-on demonstration and guided practice:** Guide the students to demonstrate how to test compressor step-by-step, explaining the purpose of each component, wires, and switch. **Integration**	• Select tools, equipment and materials • Make electric circuits diagram of test compressor • Test compressor motor pump • Apply safety gears • Clean workplace, tools and equipment • Store tools and equipment	Test electrical and mechanical faults as per conforms	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Use analog and digital Multimeter • Apply different types of test compressor **Principles:** The student should	The following tools, equipment and safety gear are to be available: • Set of screw drivers • Digital Multimeter • Mechanical hand tools kit • Wooden board • Overalls • Safety boots • Combination plier • Wire striper • Wire cutter	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			with ICT Tools: Use interactive quizzes or circuit-building tutorials on platforms like Kahoot or google Classroom **Discussions and Feedback:** Hold a class discussion where students share their experiences, challenges, and solutions **Brainstorming:** Guide students to explore uses of various test of compressor			explain the principle of operating characteristics of the compressor **Theories:** The student should explain: • Compressor types **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of measuring instruments • Safe handling of tools, equipment		
		(e) Testing defrost timer	**Hands-on demonstration and guided practice:**	• Select tools, equipment and materials	Test electrical and mechanical	**Knowledge evidence:**	The following tools, equipment and safety gear are to be available:	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Guide the students to demonstrate how to testing defrost timer step-by-step, explaining the purpose of each component, wires, and switch. **Integration with ICT Tools:** Use interactive quizzes or circuit-building tutorials on platforms like Kahoot or google Classroom **Discussions and Feedback:** Hold a class discussion where students share their experiences,	• Make electric circuits diagram of Test defrost time • Test defrost timer • Apply safety gears • Clean workplace, tools and equipment • Store tools and equipment	faults as per conforms	**Detailed knowledge of:** **Method used:** The student should explain how to: • Use an a log and digital Multimeter • Apply different types of tests defrost timer **Principles:** The student should explain the principle of operating characteristics of the defrost timer **Theories:** The student should explain: • The types of Defrost timers and its operations **Circumstantial knowledge**	• Set of screw drivers • Digital Multimeter • Mechanical hand tools kit • Wooden board • Overalls • Safety boots • Combination plier • Wire striper • Wire cutter	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			challenges, and solutions **Brainstorming:** Guide the students to explore uses of various test of defrost timer			**Detailed knowledge about:** • Safe handling of measuring instruments • Safe handling of tools, equipment		
2.0 Building simple electronic circuits	2.1 Determine characteristics of active electronic devices	(a) Testing characteristics of diodes	**Inquiry-Based Learning:** Guide the students with questions, such as: "How can we test the characteristics of a diode in a circuit? **Hands-on experiments:** Equip them with components like diodes, multimeter, resistors, and breadboards in constructing	• Select tools and equipment • Select electronic components • Construct circuit for Test characteristics of diodes • Component testing • Test electronic component • Record test results • Interpret standard test results • Observe safety regulations • Clean tools, equipment and workplace	Tested components bear characteristics that conform to specifications as given in component data books	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to test characteristics of diodes **Principles:** The student should explain the principles of: • Operating test equipment and measuring instruments	The following tools, equipment and safety gear are to be available: • Digital and analogue multimeters • Oscilloscope • Curve tracer • Tool kit • Work bench • Gloves • Overcoat • Overall	57

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			circuits to test forward and reverse bias **Practical work:** Organise the students into manageable groups of students to link diode characteristics to real-world uses. **Guided Problem-Solving** Challenge students to troubleshoot a faulty diode in a given circuit.	• Store tools, equipment and components		Testing characteristics of diodes **Theories:** The student should explain: • Types of diodes • The difference between passive and active electronic components • Characteristics of diode in electronic • Variation of component performance with temperature **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions in electronic work		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Safe handling of tools, test equipment and measuring instruments Safe handling of electronic components		
		(b) Testing characteristics of transistors	**Inquiry-Based Learning:** Ask the students questions, such as: "How can we test the characteristics of a transistors in a circuit? **Hands-on experiments:** Equip them with components like transistor, multimeter and breadboards **Practical work:**	• Select tools and equipment • Select electronic components • Construct circuit for Testing characteristics of transistors • Test electronic component • Record test results • Interpret standard test results • Observe safety regulations • Clean tools, equipment and workplace	Test components bear characteristics that conform to specifications as given in component data books	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to Test characteristics of transistors components **Principles:** The student should explain the principles of: • Operating test equipment and measuring instruments • Testing components	The following tools, equipment and safety gear are to be available: • Digital and analogue multimeters • Oscilloscope • Curve tracer • Tool kit • Work bench • Gloves • Overcoat • Overall	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Organise the students into manageable groups to link thyristors characteristics to real-world uses. **Guided Problem-Solving** Challenge students to troubleshoot a faulty on transistor in a given circuit	• Store tools, equipment and components		**Theories:** The student should explain: • Types of transistors in electronic components • The difference between passive and active electronic components • Variation of component performance with temperature **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions in electronic work • Safe handling of tools, test equipment and measuring instruments		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						Safe handling of electronic components		
		(c) Testing characteristics of thyristors	**Inquiry-Based Learning:** Ask the students questions, such as: "How can we test the characteristics of thyristors in a circuit? **Hands-on experiments:** Equip them with components like thyristors, multimeter, **Practical work:** Organise the students into manageable groups to link thyristors characteristics	• Select tools and equipment • Select electronic components • Construct circuit for component testing • Test characteristics of thyristors • Record test results • Interpret standard test results • Observe safety regulations • Clean tools, equipment and workplace • Store tools, equipment and components	Test components bear characteristics that conform to specifications as given in component data books	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to Test characteristics of thyristors **Principles:** The student should explain the principles of: • Operating test equipment and measuring instruments • Testing components **Theories:** The student should explain: • Types of thyristors in	The following tools, equipment and safety gear are to be available: • Digital and analogue multimeter • Oscilloscope • Curve tracer • Tool kit • Work bench • Gloves • Overcoat • Overall	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			to real-world uses. **Guided Problem-Solving** Challenge students to troubleshoot a faulty of thyristors in a given circuit.			electronic components • The difference between passive and active electronic components • Variation of component performance with temperature **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions in electronic work • Safe handling of tools, test equipment and measuring instruments • Safe handling of electronic components		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
		(d) Testing characteristics of opto-electronic devices	**Inquiry-Based Learning:** Ask the students questions, such as: "How can we test the characteristics of opto-electronic devices in a circuit? **Hands-on experiments:** Equip them with components like opto-electronic devices, multimeter, **Practical work:** Organise the students into manageable groups to link opto-electronic devices characteristics	• Select tools and equipment • Select electronic components • Construct circuit for test characteristics of opto-electronic devices • Test electronic component • Record test results • Interpret standard test results • Observe safety regulations • Clean tools, equipment and workplace • Store tools, equipment and components	Test components bear characteristics that conform to specifications as given in component data books	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to test characteristics of opto-electronic devices **Principles:** The student should explain the principles of: • Operating test equipment and measuring instruments • Testing components **Theories:** The student should explain: • Types of opto-electronic devices • Characteristics of opto-	The following tools, equipment and safety gear are to be available: • Digital and analogue multimeter • Oscilloscope • Curve tracer • Tool kit • Work bench • Gloves • Overcoat • Overall	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			to real-world uses. **Guided Problem-Solving** Challenge students to troubleshoot a faulty of opto-electronic devices in a given circuit.			electronic devices • Variation of component performance with temperature **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions in electronic work • Safe handling of tools, test equipment and measuring instruments Safe handling of electronic components		
		(e)Testing characteristics of integrated circuits	**Inquiry-Based Learning:** Ask the students questions, such as: "How can we test the characteristics	• Select tools and equipment • Select electronic components • Construct circuit for component testing	Tested components bear characteristics that conform to specifications as given in	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should	The following tools, equipment and safety gear are to be available: • Digital and analogue multimeter • Oscilloscope • Curve tracer	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			of integrated circuits? **Hands-on experiments:** Equip them with components like integrated circuits, multimeter, **Practical work:** Organise the students into manageable groups to link integrated circuits characteristics to real-world uses. **Guided Problem-Solving** Challenge students to troubleshoot a faulty of	• Test electronic component • Record test results • Interpret standard test results • Observe safety regulations • Clean tools, equipment and workplace • Store tools, equipment and components	component data books	explain how to test components **Principles:** The t student should explain the principles of: • Operating test equipment and measuring instruments • Testing components **Theories:** The student should explain: • Types of active electronic components • The difference between passive and active electronic components • Characteristics of active electronic components • Variation of component	• Tool kit • Work bench • Gloves • Overcoat • Overall	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			integrated circuits in a given circuit.			performance with temperature **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions in electronic work • Safe handling of tools, test equipment and measuring instruments • Safe handling of electronic components		
	2.2 Building rectifier circuits	(a) Building half wave rectifier	**Brainstorm:** Guide the students to define half wave rectifier and their application **Demonstration:** Demonstrate to the students how to Build half	• Interpret the circuit diagram • Identify tools, equipment and materials • Prepare diodes capacitors transistors inductor and	Constructed rectifier circuits perform according to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Test a diode by an Ohmmeter	The following tools, equipment and safety gear are to be available: • Proto board • Electrician knife • Combination pliers • Diagonal cutting pliers • Long nose pliers • Digital multimeter • Tape measure	76

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			wave rectifier r and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Build half wave rectifier in working area	wires for termination • Build a rectifier circuit • Measure the output of rectifier • Clean work area, tools and equipment • Store tools, equipment and materials		• Build half and full wave rectifier circuits • Measure the output of the half and full wave rectifiers **Principles:** The student should explain the principles of: • Diode biasing • Build a rectifier circuit • Carry out measurement of the rectifier circuit **Theories:** The student should explain: • Electronics and electrical components used to build rectifier circuits	• Work bench • Oscilloscope • Soldering iron/gun • Safety goggles • Gloves • Overalls • Safety boots	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Conventional current flow theory **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools and equipment Safety precautions when using soldering iron and gun		
		(b) Building full wave rectifier centre tapped	**Brainstorm:** Guide the students to define full wave rectifier centre tapped and their application **Demonstration:** Demonstrate to the students on how to Build full wave rectifier centre	• Interpret the circuit diagram • Identify tools, equipment and materials • Prepare diodes capacitors transistors inductor and wires for termination	Constructed rectifier circuits perform according to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Test a diode by an Ohmmeter • Build half and full wave rectifier circuits	The following tools, equipment and safety gear are to be available: • Proto board • Electrician knife • Combination pliers • Diagonal cutting pliers • Long nose pliers • Digital multimeter • Tape measure • Work bench • Oscilloscope • Soldering iron/gun • Safety goggles • Gloves	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			tapped and to handle tools and equipment **Practical work:** Organise the students into manageable groups of students to Build full wave rectifier centre tapped in working area	• Build a rectifier circuit • Measure the output of rectifier • Clean work area, tools and equipment • Store tools, equipment and materials		• Measure the output of the half and full wave rectifiers **Principles:** The student should explain the principles of: • Diode biasing • Build a rectifier circuit • Carry out measurement of the rectifier circuit **Theories:** The student should explain: • Electronics and electrical components used to build rectifier circuits • Conventional current flow theory **Circumstantial knowledge**	• Overalls • Safety boots	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						Detailed knowledge about: • Safe handling of working tools and equipment • Safety precautions when using soldering iron and gun		
		(c) Building bridge rectifier	**Brainstorm:** Guide the students to define and their bridge rectifier application **Demonstration:** Demonstrate to the students how to Build bridge rectifier and to handle to tools and equipment **Practical work:** Organise the students into	• Interpret the circuit diagram • Identify tools, equipment and materials • Prepare diodes capacitors transistors inductor and wires for termination • Build a rectifier circuit • Measure the output of rectifier	Constructed rectifier circuits perform according to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Test a diode by an Ohmmeter • Build half and full wave rectifier circuits • Measure the output of the half and full wave rectifiers **Principles:** The student should	The following tools, equipment and safety gear are to be available: • Proto board • Electrician knife • Combination pliers • Diagonal cutting pliers • Long nose pliers • Digital multimeter • Tape measure • Work bench • Oscilloscope • Soldering iron/gun • Safety goggles • Gloves • Overalls • Safety boots	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			manageable groups to Build bridge rectifier in working area	• Clean work area, tools and equipment • Store tools, equipment and materials		explain the principles of: • Diode biasing • Build a rectifier circuit • Carry out measurement of the rectifier circuit **Theories:** The student should explain: • Electronics and electrical components used to build rectifier circuits • Conventional current flow theory **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools and equipment • Safety precautions		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						when using soldering iron and gun		
		(d) Building a smoothing circuit	**Brainstorm:** Guide the students to define smoothing circuit and their application **Demonstration:** Demonstrate to the students how to Build a smoothing circuit and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Build a smoothing circuit in working area,	• Interpret the circuit diagram • Identify tools, equipment and materials • Prepare diodes capacitors transistors inductor and wires for termination • Build a rectifier circuit • Measure the output of rectifier • Clean work area, tools and equipment • Store tools, equipment and materials	Constructed rectifier circuits perform according to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Test a diode by an Ohmmeter • Build half and full wave rectifier circuits • Measure the output of the half and full wave rectifiers **Principles:** The student should explain the principles of: • Diode biasing • Build a rectifier circuit • Carry out measurement of	The following tools, equipment and safety gear are to be available: • Proto board • Electrician knife • Combination pliers • Diagonal cutting pliers • Long nose pliers • Digital multimeter • Tape measure • Work bench • Oscilloscope • Soldering iron/gun • Safety goggles • Gloves • Overalls • Safety boots	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						the rectifier circuit **Theories:** The student should explain: • Electronics and electrical components used to build rectifier circuits • Conventional current flow theory **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools and equipment • Safety precautions when using soldering iron and gun		
	2.3 Performing measurements on simple	(a) Testing low frequency circuit	**Brainstorm:** Guide the students to define Test low	• Select tools and equipment	Measured circuit parameters conform to	**Knowledge evidence:**	The following tools, equipment and safety gear are to be available:	50

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
	low/high frequency circuits		frequency circuit and their application **Demonstration:** Demonstrate to the students how to Test low frequency circuit and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Test low frequency circuit in working area	• Select active electronic components • Construct low or high frequency circuit • Use test equipment • Measure the circuit parameters • Record measured results • Observe safety precautions • Clean tools, equipment and workplace • Store tools and equipment	technical specifications	**Detailed knowledge of:** **Method used:** The student should explain how to test low or high frequency circuit **Principles:** The student should explain the principles of: • Operating test equipment and measuring instruments • Testing electronic circuits **Theories:** The student should explain: • The difference between low and high frequency circuits • Characteristics of low	• Digital and analogue multimeter • Oscilloscope • Frequency meter • Curve tracer • Power supply unit • Tool kit • Work bench • Gloves • Overcoat or overall • Boots	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						frequency circuits • Characteristics of high frequency circuits **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions in electronic work • Safe handling of test equipment and measuring instruments		
		(b) Testing high frequency circuit	**Brainstorm:** Guide the students to define Test high frequency circuit and their application **Demonstration:** Demonstrate to the students how to Test high	• Select tools and equipment • Select active electronic components • Construct low or high frequency circuit • Use test equipment • Measure the circuit parameters	Measured circuit parameters conform to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to test low or high frequency circuit **Principles:** The student should	The following tools, equipment and safety gear are to be available: • Digital and analogue multimeters • Oscilloscope • Frequency meter • Curve tracer • Power supply unit • Tool kit • Work bench • Gloves • Overcoat or overall	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			frequency circuit and to handle tools and equipment **Practical work:** Organise the students into manageable groups of students to Test high frequency circuiting working area	• Record measured results • Observe safety precautions • Clean tools, equipment and workplace • Store tools and equipment		explain the principles of: • Operating test equipment and measuring instruments • Testing electronic circuits **Theories:** The student should explain: • The difference between low and high frequency circuits • Characteristics of low frequency circuits • Characteristics of high frequency circuits **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions in electronic work	• Boots	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Safe handling of test equipment and measuring instruments		
	2.4 Performing voltage measurements	(a) Carrying out output voltage measurements	**Brainstorm:** Guide the students to define Carry out output voltage measurements and their application **Demonstration:** Demonstrate to the students how to Carry out output voltage measurements and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Carry out output voltage	• Select tools, equipment and materials • Prepare batteries, battery charger and distilled water for charging • Connect the battery charger to the battery • Add distilled water to the battery • Check and replace the terminals of batteries • Charge the battery	Battery charged conforms to manufacturer's specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Charge by trickle method • Charge by heating method • Charge by constant current method • Charge by constant voltage method • Charge by motor generator set **Principles:** The student should explain the principles of:	The following tools, equipment and safety gear are to be available: • Safety glass • Battery charger unit • Set of rings spanners • Set of open-end spanners • Set of screw drivers • Hydrometer • Thermometer • Soft hammer • Analog and digital multimeter • Safety boots • Overall • Safety gloves	41

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			measurements in working area	• Check the state of the battery • Clean the workplace and tools • Store tools, equipment and the remained materials		• Charging and discharging batteries • Carrying out measurement of the specific gravity of the battery **Theories:** The student should explain: • Construction of the batteries • Battery characteristics • Conventional current flow theory • Electron flow theory • PN junction theory **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions on		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						charging equipment • Safety precautions on battery storage Safe handling of working tools and equipment		
		(b) Carrying out measurement of final DC output voltage	**Brainstorm:** Guide the students to define Carry out measurement of final DC output voltage and their application **Demonstration:** Demonstrate to the students how to Carry out measurement of final DC output voltage and to handle tools and equipment **Practical work:** Organise the students into	• Select tools, equipment and materials • Prepare batteries, battery charger and distilled water for charging • Connect the battery charger to the battery • Add distilled water to the battery • Check and replace the terminals of batteries	Battery charged conforms to manufacturer's specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Charge by trickle method • Charge by heating method • Charge by constant current method • Charge by constant voltage method • Charge by motor generator set	The following tools, equipment and safety gear are to be available: • Safety glass • Battery charger unit • Set of rings spanners • Set of open-end spanners • Set of screw drivers • Hydrometer • Thermometer • Soft hammer • Analog and digital multimeter • Safety boots • Overall • Safety gloves	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			manageable groups to Carry out measurement of final DC output voltage in working area	• Charge the battery • Check the state of the battery • Clean the workplace and tools • Store tools, equipment and the remained materials		**Principles:** The student should explain the principles of: • Charging and discharging batteries • Carrying out measurement of the specific gravity of the battery **Theories:** The student should explain: • Construction of the batteries • Battery characteristics • Conventional current flow theory • Electron flow theory • PN junction theory		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						Circumstantial knowledge **Detailed knowledge about:** • Safety precautions on battery electrolyte • Safety precautions on charging equipment • Safety precautions on battery storage Safe handling of working tools and equipment		
3.0 Maintaining domestic refrigeration systems	3.1 Servicing domestic refrigerators	(a) Servicing electric circuitry	**Brainstorm:** Guide the students to define electric circuitry and their application **Demonstration:** Demonstrate to the students how	• Select appropriate tools and equipment • Measure pressure and temperature quantities • Identify type of circuit	A record of values of the electrical quantities' readings conforming to the specified ratings	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Measure electric quantities	The following tools, equipment and safety gear are to be available: • Electrical mechanical toolbox • Clamp-on amps meter • Multimeter • Power supply • Safety boots • Overall • Hard brush	39

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			to Service electric circuitry and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Service electric circuitry in working area	• Determine correct quantity of electricity • Charge a system with refrigerant • Performing brazing • Connect simple electric circuits • Store tools and equipment • Clean workplace		• Measure pressure quantities • Connect simple electric circuits • Identify electric circuit types **Principles:** The student should explain the principles of: • Connecting electrical circuits in parallel, series and in combination • Taking different measurements of both electrical quantities **Theories:** The student should explain: • Types of electric circuit connections • Compressor rating	• Safety goggles • Screw drivers • Nose mask	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						Circumstantial knowledge **Detailed knowledge about:** • Safe handling of working tools • Safe handling of measuring instruments Environmental regulations		
		(b) Refilling refrigerant	**Brainstorm:** Guide the students to define Refill refrigerant and their application **Demonstration:** Demonstrate to the students how Refill refrigerant and to handle tools and equipment **Practical work:**	• Select appropriate tools and equipment • Measure pressure and temperature quantities • Identify type of refrigerant • Determine correct quantity of refrigerant • Charge a system with refrigerant • Performing brazing • Connect piping circuits	A record of values of the refrigerator cold chamber temperatures, electrical quantities and pressure gauges readings conforming to the specified ratings	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Measure electric quantities • Measure pressure quantities • Connect simple electric circuits • Identify refrigerant types	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Electrical mechanical toolbox • Vacuum pump • Pinch-off tool • Clamp-on amps meter • Dial type thermometer • Power supply • Safety boots • Overall • Hard brush • Safety goggles • Screw drivers	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Organise the students into manageable groups to Refill refrigerant in working area	• Store tools and equipment • Clean workplace		**Principles:** The student should explain the principles of: • Refilling a refrigerator with fresh refrigerant • Connecting electrical circuits in parallel, series and in combination • Making leak-proof brazed or soldered joints • Taking different measurements of both electrical quantities and pressure quantities **Theories:** The student should explain: • Compression refrigeration cycle	• Nose mask Leak detector	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Types of electric circuit connections • Compressor rating **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools • Safe handling of measuring instruments Environmental regulations		
	3.2 Servicing domestic freezers	(a) Replacing evaporator coil	**Brainstorm:** Guide the students to define Replace evaporator coil and their application **Demonstration:** Demonstrate to the students how to Replace	• Select appropriate tools and equipment • Measure pressure and temperature quantities • Determine the fault causes • Identify type of evaporator copper pipe	A record of values of cold chamber temperatures quantities and pressure gauges conforming to the specified ratings	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Measure pressure quantities	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Electrical mechanical toolbox • Vacuum pump • Pinch-off tool • Dial type thermometer • Rivet gun • Hand drill machine • Metal clips	84

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			evaporator coil and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Replace evaporator coil in working area	• Determine correct size of evaporator and copper pipe to be replaced • Charge a system with refrigerant • Perform brazing • Store tools and equipment • Clean workplace		• Copper pipe bending technique • Identify refrigerant types **Principles:** The student should explain the principles of: (a) Refilling a freezer with fresh refrigerant (b) Making leak-proof brazed or soldered joints (c) Taking different measurements of pressure quantities **Theories:** The student should explain: • Compression refrigeration cycle • Types of copper pipes • Compressor rating	• Power supply • Safety boots • Overall • Hard brush • Safety goggles • Screw drivers • Nose mask • Leak detector	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Freezers and assembly **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools • Safe handling of measuring instruments Environmental regulations		
		(b) Replacing compressor unit	**Brainstorm:** Guide the students to define compressor and their application **Demonstration:** Demonstrate to the students how to replace compressor and to handle tools and equipment	• Select tools and equipment • Perform diagnostic trouble shooting • Replace compressor • Repair scroll compressor • Charge refrigerant • Test run • Clean workplace • Store tools and equipment	Demonstrate the ability of identify size of compressor and replacing compressor in domestic refrigerator conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Control refrigerant being charged • Measure compressor electrical and	The following tools, equipment and safety gear are to be available: • Electro mechanical tool kit • Digital or analog multimeter • Oxy-acetylene welding set • Gauge manifold • Vacuum pump • Refrigerant leak detector • Recovery unit • Recovery cylinder • Refrigerant identifier	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Practical work: Organise the students into manageable groups s to replace compressor in domestic refrigerator			mechanical party • Perform leak detection • Join copper tubing **Principles:** The student should explain the principles of: (d) Heat transfer (e) Basic refrigerant cooling cycle (f) Scroll compressors (g) Reciprocating compressors **Theories:** The student should explain: • Replace concept **Circumstantial knowledge** **Detailed knowledge** **about:**	• Safety boots • Overall • Gloves • Goggles • Compressor valve key	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Different refrigerant application Refrigerant properties • Safe handling of refrigerants and tools		
		(c) Replacing control elements	**Brainstorm:** Guide the students to define 3 Replace control elements and their application **Demonstration:** Demonstrate to the students how to Replace control elements and to handle tools and equipment **Practical work:** Organise the students into manageable groups to	• Select appropriate tools and equipment • Measure pressure and temperature quantities • Identify type of refrigerant • Determine correct quantity of refrigerant • Charge a system with refrigerant • Perform brazing • Check electric circuits • Store tools and equipment • Clean workplace	A record of values of cold chamber temperatures, electrical quantities and pressure gauges conforming to the specified ratings	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Measure electric quantities • Measure pressure quantities • Connect simple electric circuits • Identify refrigerant types **Principles:** The student should explain the principles of:	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Electrical mechanical toolbox • Vacuum pump • Pinch-off tool • Clamp-on amps meter • Multimeter • Dial type thermometer • Power supply • Safety boots • Overall • Hard brush • Safety goggles • Screw drivers • Nose mask • Leak detector	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Replace control elements in working area			(h) Refilling a freezer with fresh refrigerant (i) Connecting electrical circuits in parallel, series and in combination (j) Making leak-proof brazed or soldered joints (k) Taking different measurements of both electrical quantities and pressure quantities **Theories:** The student should explain: • Compression refrigeration cycle • Types of electric circuit connections • Compressor rating		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Freezers and assembly **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools • Safe handling of measuring instruments Environmental regulations		
		(d) Charging with refrigerant	**Brainstorm:** Guide the students to define refrigerant and their application **Demonstration:** Demonstrate to the students how to charge with refrigerant and to handle tools and equipment	• Select tools and equipment • Perform diagnostic trouble shooting • Check refrigerant leaks • Repair refrigerant circuit coils • Repair damaged cabinet • Charge refrigerant • Test run • Clean workplace	Demonstrate the ability of charging required amount of refrigerant in freezer and charge with refrigerant in domestic freezer conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Control refrigerant being charged into freezer • Identify refrigerant	The following tools, equipment and safety gear are to be available: • Electro mechanical tool kit • Digital or analog clamp meter • Oxy-acetylene welding set • Gauge manifold • Vacuum pump • Charging scale • Refrigerant leak detector • Refrigerant identifier • Safety boots	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Practical work: Organise the students into manageable groups to charge with refrigerant in repair domestic freezer	• Store tools and equipment		ozone global warming free • Measure freezer pressure in pressure units • Perform leak detection **Principles:** The student should explain the principles of: (l) Heat transfer (m) Basic refrigerant cycle **Theories:** The student should explain: • Freezing concept • Properties of refrigerant gas • Sub cooling and super heating **Circumstantial knowledge** **Detailed knowledge** **about:**	• Overall	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Different refrigerant application • Refrigerant properties • Safe handling of refrigerants and tools		
	3.3 Servicing liquid coolers	(a) Performing trouble shooting	**Brainstorm:** Guide the students to define trouble shooting and their application **Demonstration:** Demonstrate to the students how to Perform trouble shooting and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Perform trouble	• Select appropriate tools and equipment • Measure pressure and temperature quantities • Identify type of refrigerant • Determine correct quantity of refrigerant • Charge a system with refrigerant • Perform brazing • Connect simple electric circuits • Store tools and equipment • Clean workplace	A record of values of cold chamber temperatures, electrical quantities and pressure gauges conforming to the specified ratings	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Measure electric quantities • Measure pressure quantities • Connect simple electric circuits • Identify refrigerant types **Principles:** The student should explain the principles of:	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Electrical mechanical toolbox • Vacuum pump • Pinch-off tool • Clamp-on amps meter • Multimeter • Dial type thermometer • Power supply • Safety boots • Overall • Hard brush • Safety goggles • Screw drivers • Nose mask Leak detector	89

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			shooting in working area			(n) Refilling liquid cooler with fresh refrigerant (o) Connecting electrical circuits in parallel, series and in combination (p) Making leak-proof brazed or soldered joints (q) Liquid dispensing (r) Taking different measurements of both electrical quantities and pressure quantities **Theories:** The student should explain: • Compression refrigeration cycle • Types of electric circuit connections		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Compressor rating • Liquid coolers and assembly **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools • Safe handling of measuring instruments Environmental regulations		
		(b) Cleaning liquid cooler inside and outside	**Brainstorm:** Guide the students to define liquid cooler and their application **Demonstration:** Demonstrate to the students how to Clean liquid cooler inside and outside and	• Select appropriate tools and equipment • Measure pressure and temperature quantities • Identify type of refrigerant • Determine correct quantity of refrigerant	A record of values of cold chamber temperatures, electrical quantities and pressure gauges conforming to the specified ratings	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Measure electric quantities • Measure pressure quantities	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Electrical mechanical toolbox • Vacuum pump • Pinch-off tool • Clamp-on amps meter • Multimeter • Dial type thermometer • Power supply	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			to handle tools and equipment **Practical work:** Organise the students into manageable groups to clean liquid cooler inside and outside in working area	• Charge a system with refrigerant • Perform brazing • Connect simple electric circuits • Store tools and equipment • Clean workplace		• Connect simple electric circuits • Identify refrigerant types **Principles:** The student should explain the principles of: (s) Refilling liquid cooler with fresh refrigerant (t) Connecting electrical circuits in parallel, series and in combination (u) Making leak-proof brazed or soldered joints (v) Liquid dispensing (w) Taking different measurements of both electrical quantities and pressure quantities	• Safety boots • Overall • Hard brush • Safety goggles • Screw drivers • Nose mask • Leak detector	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						Theories: The student should explain: • Compression refrigeration cycle • Types of electric circuit connections • Compressor rating • Liquid coolers and assembly **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools • Safe handling of measuring instruments • Environmental regulations		
		(c) Servicing circulation pump	**Brainstorm:** Guide the students to define Service	• Select appropriate tools and equipment	A record of values of cold chamber temperatures, electrical	**Knowledge evidence:**	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			circulation pump and their application **Demonstration:** Demonstrate to the students how to Service circulation pump and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Service circulation pump in working area	• Measure pressure and temperature quantities • Identify type of refrigerant • Determine correct quantity of refrigerant • Charge a system with refrigerant • Perform brazing • Connect simple electric circuits • Store tools and equipment • Clean workplace	quantities and pressure gauges conforming to the specified ratings	**Detailed knowledge of:** **Method used:** The student should explain how to: • Measure electric quantities • Measure pressure quantities • Connect simple electric circuits • Identify refrigerant types **Principles:** The student should explain the principles of: (x) Refilling liquid cooler with fresh refrigerant (y) Connecting electrical circuits in parallel, series and in combination (z) Making leak-proof brazed or soldered joints	• Electrical mechanical toolbox • Vacuum pump • Pinch-off tool • Clamp-on amps meter • Multimeter • Dial type thermometer • Power supply • Safety boots • Overall • Hard brush • Safety goggles • Screw drivers • Nose mask • Leak detector	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						(aa) Liquid dispensing (bb) Taking different measurements of both electrical quantities and pressure quantities **Theories:** The student should explain: • Compression refrigeration cycle • Types of electric circuit connections • Compressor rating • Liquid coolers and assembly **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Safe handling of measuring instruments • Environmental regulations		
		(d) Servicing electrical control units	**Brainstorm:** Guide the students to define electrical control units and their application **Demonstration:** Demonstrate to the students how Service electrical control units and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Service electrical	• Select appropriate tools and equipment • Measure pressure and temperature quantities • Identify type of refrigerant • Determine correct quantity of refrigerant • Charge a system with refrigerant • Perform brazing • Connect simple electric circuits • Store tools and equipment • Clean workplace	A record of values of cold chamber temperatures, electrical quantities and pressure gauges conforming to the specified ratings	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Measure electric quantities • Measure pressure quantities • Connect simple electric circuits • Identify refrigerant types **Principles:** The student should explain the principles of: • Refilling liquid cooler with fresh refrigerant	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Electrical mechanical toolbox • Vacuum pump • Pinch-off tool • Clamp-on amps meter • Multimeter • Dial type thermometer • Power supply • Safety boots • Overall • Hard brush • Safety goggles • Screw drivers • Nose mask Leak detector	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			control units in working area			• Connecting electrical circuits in parallel, series and in combination • Making leak-proof brazed or soldered joints • Liquid dispensing • Taking different measurements of both electrical quantities and pressure quantities **Theories:** The student should explain: • Compression refrigeration cycle • Types of electric circuit connections • Compressor rating • Liquid coolers and assembly		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						Circumstantial knowledge **Detailed knowledge about:** • Safe handling of working tools • Safe handling of measuring instruments • Environmental regulations		
	3.4 Repairing domestic refrigerators	(a) Repairing evaporator	**Brainstorm:** Guide the students to define evaporator and their application **Demonstration:** Demonstrate to the students on how to Repair evaporator and to handle tools and equipment **Practical work:**	• Select tools and equipment • Perform diagnostic trouble shooting • Clean and Repair damaged area • Repair evaporator by green stick, Eradiate or brazing rods • Charge refrigerant • Test for leak proof joint • Clean workplace	Demonstrate the ability of identify fault of evaporator coils and repair evaporator in domestic refrigerator conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Use refrigerant to perform leak testing • Measure pressure quantities to evaporator • Perform leak detection	The following tools, equipment and safety gear are to be available: • Electro mechanical tool kit • Oxy-acetylene welding set • Gauge manifold • Vacuum pump • Refrigerant leak detector • Safety boots • Overall	124

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Organise the students into manageable groups to Repair evaporator in working area	• Store tools and equipment		• **Principles:** The student should explain the principles of: Evaporator heat transfer • Basic refrigerant cycle **Theories:** The student should explain: • Repair concept • Concept of evaporator **Circumstantial knowledge** **Detailed knowledge about:** • Different ways of protecting evaporator against damage • Safe handling of evaporator and working tools		
		(b) Repairing control equipment	**Brainstorm:** Guide the students to	• Select tools and equipment	Demonstrate the ability of identify fault of control	**Knowledge evidence:**	The following tools, equipment and safety gear are to be available:	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			define control equipment and their application **Demonstration:** Demonstrate to the students how to repair control equipment and to handle tools and equipment **Practical work:** Organise the students into manageable groups to repair control equipment in domestic refrigerator	• Perform diagnostic trouble shooting • Repair refrigerant leaks • Repair damaged cabinet • Repair thermostatic expansion valve • Test run • Clean workplace • Store tools and equipment	equipment and repair control equipment in domestic refrigerator conforms to technical specifications	**Detailed knowledge of:** **Method used:** The student should explain how to: • Control refrigerant floor • Measure pressure quantities • Perform leak detection **Principles:** The students should explain the principles of: • Control equipment • Basic refrigerant cycle **Theories:** The student should explain: • Repair concept **Circumstantial knowledge** **Detailed knowledge**	• Electro mechanical tool kit • Oxy-acetylene welding set • Gauge manifold • Vacuum pump • Refrigerant leak detector • Safety boots • Overall	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						about: • Different refrigerant application in control equipment • Refrigerant properties • Electrical circuits • Safe handling of control equipment and working tools		
		(c) Repairing electrical circuit	**Brainstorm:** Guide the students to define and their electrical circuits application **Demonstration:** Demonstrate to the students how to and to handle to repair electrical	• Select tools and equipment • Perform diagnostic trouble shooting • Repair electric circuits • Test run • Clean workplace • Store tools and equipment	Demonstrate the ability of identify fault of electrical circuits and repair electrical circuits in domestic refrigerator conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Identify electrical circuit fault • Measure electrical quantity **Principles:** The student should	The following tools, equipment and safety gear are to be available: • Electro mechanical tool kit • Digital or analog multimeter • Insulation tape • Phase tester • Safety boots • Overall • Electrical gloves	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			circuits ls and equipment **Practical work:** Organise the students into manageable groups to repair electrical circuits in domestic refrigerator			explain the principles of: (cc) Electric floor in the circuit **Theories:** The student should explain: • Repair concept • Liquid cooler • Electric circuits **Circumstantial knowledge** **Detailed knowledge about** • Electrical circuits • Safe handling of electricity when perfuming repair		
		(d) Repairing/Replacing compressor	**Brainstorm:** Guide the students to define compressor and their application	• Select tools and equipment • Perform diagnostic trouble shooting • Replace compressor	Demonstrate the ability of identify size of compressor and replacing compressor in domestic refrigerator	**Knowledge evidence:** **Detailed knowledge of:**	The following tools, equipment and safety gear are to be available: • Electro mechanical tool kit • Digital or analog multimeter	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Demonstration: Demonstrate to the students how to replace compressor and to handle tools and equipment **Practical work:** Organise the students into manageable groups to replace compressor in domestic refrigerator	• Repair scroll compressor • Charge refrigerant • Test run • Clean workplace • Store tools and equipment	conforms to technical specifications	**Method used:** The student should explain how to: • Control refrigerant being charged • Measure compressor electrical and mechanical party • Perform leak detection • Join copper tubing **Principles:** The student should explain the principles of: (dd) Heat transfer (ee) Basic refrigerant cooling cycle (ff) Scroll compressors (gg) Reciprocating compressors **Theories:** The student should explain:	• Oxy-acetylene welding set • Gauge manifold • Vacuum pump • Refrigerant leak detector • Recovery unit • Recovery cylinder • Refrigerant identifier • Safety boots • Overall • Gloves • Goggles • Compressor valve key	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Replace concept **Circumstantial knowledge** **Detailed knowledge about:** • Different refrigerant application • Refrigerant properties • Safe handling of refrigerants and tools		
		(e) Replacing door gasket	**Brainstorm:** Guide the students to define door gasket and their application **Demonstration:** Demonstrate to the students how to replace door gasket and to handle tools and equipment	• Select tools and equipment • Perform diagnostic trouble shooting to know cause of door gasket damage • Repair air leaks • Repair damaged cabinet • Replace door gasket • Clean workplace • Store tools and equipment	Demonstrate the ability of identify fault of door gasket coils and replace door gasket in domestic refrigerator conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Control air leak **Principles:** The student should explain the principles of: • Heat transfer	The following tools, equipment and safety gear are to be available: • Electro mechanical tool kit • Air leak detector • Knife • gasket • Safety boots • Overall	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Practical work: Organise the students into manageable groups to replace door gasket in domestic refrigerator			**Theories:** The student should explain: • Concept replace door gasket **Circumstantial knowledge** **Detailed knowledge about:** • Door gasket application • Safe handling of refrigerants and tools		
		(f) Replacing default electronic card	**Brainstorm:** Guide the students to define electronic card and their application **Demonstration:** Demonstrate to the students how to Replace default electronic card and to handle	• Select tools and equipment • Perform diagnostic trouble shooting • Repair refrigerant leaks • Repair electric wiring • Remove damage electronic card • Repair non-frost electric control circuits	Demonstrate the ability of identify fault of electronic card and replace electronics card in electronics card conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Measure electric quantities **Principles:** The student should	The following tools, equipment and safety gear are to be available: • Electro mechanical tool kit • Digital or analog multimeter • Leak detector • Small painting soft brush • Safety boots • Overall	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			tools and equipment **Practical work:** Organise the students into manageable groups to Replace default electronic card in working area	• Repair damaged cabinet • Replacing electronic card • Connect electronic card • Test run • Clean workplace • Store tools and equipment		explain the principles of: **Theories:** The student should explain: • Repair concept • Material science **Circumstantial knowledge** **Detailed knowledge** **about:** • Different refrigerant application • Refrigerant properties • Electrical circuits • Safe handling of refrigerants and tools		
	3.5 Repairing domestic freezers	(a) Replacing evaporator coil	**Brainstorm:** Guide the students to define evaporator coil	• Select tools and equipment • Perform diagnostic trouble shooting of evaporator coils	Demonstrate the ability of identify fault of evaporator coils and replace evaporator	**Knowledge evidence:** **Detailed knowledge of:**	The following tools, equipment and safety gear are to be available: • Electro mechanical tool kit • Oxy-acetylene welding set	89

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				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			and their application **Demonstration:** Demonstrate to the students how to replace evaporator coils and to handle tools and equipment **Practical work:** Organise the students into manageable groups to replace evaporator coils in domestic freezer	• Apply copper tubing bending technique • Replace evaporator coil • Riveting evaporator coil • Charge refrigerant • Test run • Clean workplace • Store tools and equipment	coils in domestic freezer conforms to technical specifications	**Method used:** The student should explain how to: • Control refrigerant being charged • Perform leak detection • Join copper tubing **Principles:** The student should explain the principles of: • Basic refrigerant cooling cycle **Theories:** The student should explain: • Replace concept **Circumstantial knowledge** **Detailed knowledge about:** • Different copper tube application	• Gauge manifold • Vacuum pump • Refrigerant leak detector • Rivet gun • Hand drill machine • Safety boots • Overall •	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Refrigerant properties • Piping circuits Safe handling of refrigerants and tools		
		(b) Replacing compressor unit	**Discussion:** Guide the students to discuss the procedure on how to replace compressor unit **Demonstration:** Demonstrate to the students on how to replace compressor unit and how to use tools and equipment **Practical work:** Organise the students into manageable groups to replace	• Select tools and equipment • Perform diagnostic trouble shooting • Replace compressor • Repair scroll compressor • Charge refrigerant • Test run • Clean workplace • Store tools and equipment	Demonstrate the ability of identify size of compressor and replacing compressor in domestic freezer conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Control refrigerant being charged • Measure compressor electrical and mechanical party • Perform leak detection • Join copper tubing **Principles:** The student should	The following tools, equipment and safety gear are to be available: • Electro mechanical tool kit • Digital or analog multimeter • Oxy-acetylene welding set • Gauge manifold • Vacuum pump • Refrigerant leak detector • Recovery unit • Recovery cylinder • Refrigerant identifier • Safety boots • Overall • Gloves • Goggles • Compressor valve key	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			compressor unit in domestic freezer			explain the principles of: • Heat transfer • Basic refrigerant cooling cycle • Scroll compressors • Reciprocating compressors **Theories:** The student should explain: • Replace concept **Circumstantial knowledge** **Detailed knowledge** **about:** • Different refrigerant application • Refrigerant properties Safe handling of refrigerants and tools		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
		(c) Replacing Temperature control	**Brainstorm:** Guide the students to define temperature control and their application **Demonstration:** Demonstrate to the students how to replace temperature control and to handle tools and equipment **Practical work:** Organise the students into manageable groups to replace temperature control in domestic freezers	• Interpret drawing on how to testing temperature control automatically • Select tools and equipment • Select material • Perform diagnostic trouble shooting • Replace temperature control (Thermostat) • Test run • Clean workplace • Store tools and equipment	Demonstrate the ability of Temperature control and replace temperature control in domestic freezer conforms to technical specifications ns	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Measure electric and test temperature control automatically • **Principles:** The student should explain the principles of: • Heat transfer through sensing bulb • Temperature control **Theories:** The student should explain: • Freezing concept **Circumstantial knowledge**	The following tools, equipment and safety gear are to be available: • Electro mechanical tool kit • Digital or analog multimeter • Charging hose • Refrigerant or Ice block • Safety boots • Overall	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						Detailed knowledge about: • Safe handling of working tools, equipment and materials		
		(d) Charging with refrigerant	**Brainstorm:** Guide the students to define refrigerant and their application **Demonstration:** Demonstrate to the students how to charge with refrigerant and to handle tools and equipment **Practical work:** Organise the students into manageable groups to charge with refrigerant	• Select tools and equipment • Perform diagnostic trouble shooting • Check refrigerant leaks • Repair refrigerant circuit coils • Repair damaged cabinet • Charge refrigerant • Test run • Clean workplace • Store tools and equipment	Demonstrate the ability of charging required amount of refrigerant in freezer and charge with refrigerant in domestic freezer conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Control refrigerant being charged into freezer • Identify refrigerant ozone global warming free • Measure freezer pressure in pressure units • Perform leak detection **Principles:** The student should	The following tools, equipment and safety gear are to be available: • Electro mechanical tool kit • Digital or analog clamp meter • Oxy-acetylene welding set • Gauge manifold • Vacuum pump • Charging scale • Refrigerant leak detector • Refrigerant identifier • Safety boots • Overall	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			in repair domestic freezer			explain the principles of: • Heat transfer • Basic refrigerant cycle **Theories:** The student should explain: • Freezing concept • Properties of refrigerant gas • Sub cooling and super heating **Circumstantial knowledge** **Detailed knowledge about:** • Different refrigerant application • Refrigerant properties • Safe handling of refrigerants and tools		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
	3.6 Repairing liquid coolers	(a) Replacing compressor unit	**Brainstorm:** Guide the students to define compressor unit and their application **Demonstration:** Demonstrate to the students how to replace compressor unit and to handle tools and equipment **Practical work:** Organise the students into manageable groups to replace compressor unit in Liquid cooler	• Select tools and equipment • Perform diagnostic trouble shooting • Replace compressor • Repair scroll compressor • Charge refrigerant • Test run • Clean workplace • Store tools and equipment	Demonstrate the ability of identify size of compressor and replacing compressor in liquid cooler conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Control refrigerant being charged • Measure compressor electrical and mechanical party • Perform leak detection • Join copper tubing **Principles:** The student should explain the principles of: • Heat transfer • Basic refrigerant cooling cycle Scroll compressors	The following tools, equipment and safety gear are to be available: • Electro mechanical tool kit • Digital or analog multimeter • Oxy-acetylene welding set • Gauge manifold • Vacuum pump • Refrigerant leak detector • Recovery unit • Recovery cylinder • Refrigerant identifier • Charging scale • Safety boots • Overall • Gloves • Goggles • Compressor valve key	102

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Reciprocating compressors **Theories:** The student should explain: • Repair concept • Liquids **Circumstantial knowledge** **Detailed knowledge about:** • Different refrigerant application • Refrigerant properties • Safe handling of refrigerants and tools		
		(b) Repairing electrical circuits	**Brainstorm:** Guide the students to define and their electrical circuits application **Demonstration:**	• Select tools and equipment • Perform diagnostic trouble shooting • Repair electric circuits • Test run • Clean workplace	Demonstrate the ability of identify fault of electrical circuits and repair electrical circuits in liquid cooler conforms to	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to:	The following tools, equipment and safety gear are to be available: • Electro mechanical tool kit • Digital or analog multimeter • Solder gun • Insulation tape	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Demonstrate to the students how to and to handle to repair electrical circuits ls and equipment **Practical work:** Organise the students into manageable groups to repair electrical circuits in working area	• Store tools and equipment	technical specifications	• Identify electrical circuit fault • Measure electrical quantity **Principles:** The student should explain the principles of: • Electric floor in the circuit **Theories:** The student should explain: • Repair concept • Liquid cooler • Electric circuits **Circumstantial knowledge** **Detailed knowledge** **about** • Electrical circuits • Safe handling of electricity when perfuming repair	• Cable lugs • Cable tie • Crimping tool • Electrical gloves • Safety boots • Overall	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
		(c) Replacing evaporator coils	**Brainstorm:** Guide the students to define evaporator coil and their application **Demonstration:** Demonstrate to the students how to replace evaporator coils and to handle tools and equipment **Practical work:** Organise the students into manageable groups to replace evaporator coils in liquid coolers	• Select tools and equipment • Perform diagnostic trouble shooting of evaporator coils • Replace evaporator coil • Charge refrigerant • Test run • Clean workplace • Store tools and equipment	Demonstrate the ability of identify fault of evaporator coils and replace evaporator coils in liquid cooler conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Control refrigerant being charged • Perform leak detection • Join copper tubing **Principles:** The student should explain the principles of: • Basic refrigerant cooling cycle **Theories:** The student should explain: • Replace concept • Liquids	The following tools, equipment and safety gear are to be available: • Electro mechanical tool kit • Oxy-acetylene welding set • Gauge manifold • Vacuum pump • Refrigerant leak detector • Spring bender • Tube cutter • Tape measure • Swaging tool • Scriber • Safety boots • Overall • Gloves	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						Circumstantial knowledge **Detailed knowledge about:** • Different copper tube application • Refrigerant properties • Piping circuits • Safe handling of refrigerants and tools		
		(d) Replacing circulation pump	**Brainstorm:** Guide the students to define circulation pump and their application **Demonstration:** Demonstrate to the students how to replace circulation pump and to handle tools and equipment	• Select tools and equipment • Perform diagnostic trouble shooting on circulation pump • Prepare materials for replacing circulation pump • Replace circulation pump • Test run • Clean workplace • Store tools and equipment	Demonstrate the ability of identify fault of circulation pump and replace circulation pump in liquid cooler conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Measure pressure produced by circulation pump • Test for leak detection	The following tools, equipment and safety gear are to be available: • Electro mechanical tool kit • Oxy-acetylene welding set • Gauge • Leak detector • Safety boots • Overall • Gloves	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Practical work: Organise the students into manageable groups to replace circulation pump in liquid cooler			**Principles:** The student should explain the principles of: • Circulation pump **Theories:** The student should explain: • Replace concept • Liquids **Circumstantial knowledge** **Detailed knowledge** **about:** • Different replacement of circulation pump • Safe handling of circulation pump and working tools		

Form Three

Table 5: *Detailed Contents for Form Three*

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
1.0 Maintaining refrigeration systems	1.1 servicing commercial refrigerators	(a) Servicing electrical circuit	**Brainstorm:** Guide the students to define electrical circuit and their application **Demonstration:** Demonstrate to the students how to Service electrical circuit p and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Service electrical circuit in commercial refrigeration	• Select tools and equipment • Carry out trouble shooting • Identify the faulty circuit	A record of values of pressure and electrical quantities conform to specified ratings	**Knowledge evidence: Detailed knowledge of:** **Method used:** The student should explain how to: • Clean different electric circuit units of the system **Principles:** The student should explain the principles of: • Basic principles of electricity and electronic circuits **Theories:** The student should explain: • Basic heat transfer modes • Storage requirements of commodities • Commercial systems and assembly	The following tools, equipment and safety gear are to be available: • Compressed air supply • Air blower • Bristle brush • Power supply • Multimeter • Clamp meter • Capacitor analyzer • Burn-out filter (portable) • Charging and testing plant • Pinch of tool • Electric soldering iron • Megger • Noise meter • Digital/analog multimeter	45

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						Circumstantial knowledge **Detailed knowledge about:** • Safe handling of working tools • Safe handling of measuring instruments • Environmental regulations on refrigerants		
		(b) Servicing compressor	**Brainstorm:** Guide the students to define Service compressor and their application **Demonstration:** Demonstrate to the students how to Service compressor and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Service compressor in	• Select tools and equipment • Carry out trouble shooting • Measure refrigerant pressure and electric quantities • Charge the system with fresh refrigerant • Replace electric fuses	A record of values of pressure and electrical quantities conform to specified ratings	**Knowledge evidence:** **Detailed knowledge of**: Method used: The student should explain how to: Clean different units of the system • Carry out leakage tests • Charge the system with fresh refrigerant Principles: The students should explain the principles of:	The following tools, equipment and safety gear are to be available: • Compressed air supply • Air blower • Bristle brush • Power supply • Manifold gauge • Multimeter • Clamp meter • Capacitor analyzer • Burn-out filter (portable) • Charging and testing plant	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			commercial refrigeration	• Clean the compressor units of the system • Clean the workplace and tools • Store tools and equipment		(c) Vapor compression refrigeration cycle Theories: The student should explain: • Super heating and sub-cooling • Environmental requirement on refrigerant disposal • Difference between absorption and compression refrigeration cycle • Gas laws • Basic heat transfer modes • Storage requirements of commodities • Commercial systems and assembly **Circumstantial knowledge** **Detailed knowledge about:**	• Pinch of tool • Leak detectors • Electric soldering iron • Megger • Noise meter • Digital/analog multimeter • Washing fluid container • Washing plant • Electro-mechanical toolbox • Vibration meter • Wattmeter • Pressure gauge manifold • Oxy-acetylene welding set • Fluorescent leakage detector set	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Safe handling of working tools • Safe handling of measuring instruments • Environmental regulations on refrigerants		
		(c) Servicing condenser	**Brainstorm:** Guide the students to define Service condenser and their application **Demonstration:** Demonstrate to the students how to Service condenser and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Service condenser in commercial refrigeration	• Select tools and equipment • Carry out trouble shooting • Measure refrigerant pressure and electric quantities • Charge the system with fresh refrigerant • Replace electric fuses • Replace condenser units of the system	A record of values of pressure and electrical quantities conform to specified ratings	**Knowledge evidence: Detailed knowledge of:** **Method used:** The student should explain how to: • Clean condenser units of the system • Carry out leakage tests • Charge the system with fresh refrigerant **Principles:** The student should explain the principles of: (d) Vapor compression refrigeration cycle	The following tools, equipment and safety gear are to be available: • Compressed air supply • Air blower • Bristle brush • Power supply • Manifold gauge • Multimeter • Clamp meter • Capacitor analyzer • Burn-out filter (portable) • Charging and testing plant • Pinch of tool • Leak detectors • Electric soldering iron	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				• Clean condenser units of the system • Clean the workplace and tools • Store tools and equipment		**Theories:** The student should explain: • Super heating and sub-cooling • Environmental requirement on refrigerant disposal • Difference between absorption and compression refrigeration cycle • Gas laws • Basic heat transfer modes • Commercial systems and assembly **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools • Safe handling of measuring instruments	• Megger • Noise meter • Digital/analog multimeter • Washing fluid container • Washing plant • Electro-mechanical toolbox • Vibration meter • Wattmeter • Pressure gauge manifold • Oxy-acetylene welding set • Fluorescent leakage detector set	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Environmental regulations on refrigerants		
		(d) Servicing electronic card	Guide the students to define electronic card and their application **Demonstration:** Demonstrate to the students how to Service electronic card and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Service electronic card in commercial refrigeration	• Select tools and equipment • Carry out trouble shooting • Replace electric fuses • Make electric circuitry • Clean the workplace and tools • Store tools and equipment	A record of values of pressure and electrical quantities conform to specified ratings	**Knowledge evidence: Detailed knowledge of:** **Method used:** The student should explain how to: • Clean different units of the system • Carry out leakage tests • Charge the system with fresh refrigerant **Principles:** The student should explain the principles of: (e) Vapor compression refrigeration cycle (f) Basic principles of electricity and electronic circuits	The following tools, equipment and safety gear are to be available: • Air blower • Bristle brush • Power supply • Multimeter • Clamp meter • Capacitor analyzer • Burn-out filter (portable) • Pinch of tool • Electric soldering iron • Megger • Noise meter • Digital/analog multimeter • Electro-mechanical toolbox • Vibration meter • Wattmeter • manifold • welding set	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						Theories: The student should explain: • Basic heat transfer modes **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools • Safe handling of measuring instruments • Environmental regulations on refrigerants		
		(e) Performing leak detection	Guide the students to define leak detection and their application **Demonstration:** Demonstrate to the students how to Performing leak detection and to handle tools and equipment **Practical work:**	• Select tools and equipment • Carry out trouble shooting • Measure refrigerant pressure and electric quantities • Charge the system with	A record of values of pressure and electrical quantities conform to specified ratings	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Clean different units of the system • Carry out leakage tests • Charge the system with fresh refrigerant	The following tools, equipment and safety gear are to be available: • Compressed air supply • Air blower • Bristle brush • Power supply • Manifold gauge • Multimeter • Clamp meter • Capacitor analyzer	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Organise the students into manageable groups to Performing leak detection in commercial refrigeration	fresh refrigerant • Replace electric fuses • Replace different units of the system • Clean different units of the system • Make electric circuitry • Clean the workplace and tools • Store tools and equipment		**Principles:** The student should explain the principles of: (g) Vapor compression refrigeration cycle (h) Basic principles of electricity and electronic circuits **Theories:** The student should explain: • Super heating and sub-cooling • Environmental requirement on refrigerant disposal • Difference between absorption and compression refrigeration cycle • Gas laws • Basic heat transfer modes	• Burn-out filter (portable) • Charging and testing plant • Pinch of tool • Leak detectors • Electric soldering iron • Megger • Noise meter • Digital/analog multimeter • Washing fluid container • Washing plant • Electro-mechanical toolbox • Vibration meter • Wattmeter • Pressure gauge manifold • Oxy-acetylene welding set • Fluorescent leakage detector set	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Storage requirements of commodities • Commercial systems and assembly **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools • Safe handling of measuring instruments • Environmental regulations on		
	1.2 Servicing ice makers	(a) Servicing condenser	Guide the students to define condenser and their application **Demonstration:** Demonstrate to the students how to Service condenser and to handle tools and equipment **Practical work:**	• Select tools and equipment • Diagnostic trouble shooting • Measure refrigerant pressure in the system • Charge the system with	A record of values of pressure and electrical quantities conform to specified ratings	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Purge an auto air conditioning system • Charge refrigerant in the system	The following tools, equipment and safety gear are to be available: • Vacuum pump • Automobile air conditioning tool kit • Pressure gauge manifold • Power supply • Portable charging station	35

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Organise the students into manageable groups to Service condenser in ice maker	fresh refrigerant • Replace electrical fuses • Replace condenser units of the system • Measure electric quantities • Clean tools and workplace • Store tools and equipment		• Perform fluorescent dye leakage test • Test magnetic clutch engagement **Principles:** The student should explain the principles of: (i) Electromagnetism (j) Vapor compression refrigeration cycle (k) Connecting electrical circuits in parallel, series and combination **Theories:** The student should explain: • Types of refrigerants • Gas laws • State of matter **Circumstantial knowledge** **Detailed knowledge about:**	• Computerized air conditioning service station • Leak detector • Eye protection goggles	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Safe handling of working tools • Safe handling of measuring instruments • Environmental regulations of refrigerants		
		(a) Servicing evaporator	Guide the students to define evaporator and their application **Demonstration:** Demonstrate to the students how to Service evaporator and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Service evaporator in ice makers	• Select tools and equipment • Diagnostic trouble shooting • Measure refrigerant pressure in the system • Charge the system with fresh refrigerant • Replace electrical fuses • Replace fan belt • Adjust fan belt tension	A record of values of pressure and electrical quantities conform to specified ratings	**Knowledge evidence: Detailed knowledge of:** **Method used:** The student should explain how to: • Purge an auto air conditioning system • Charge refrigerant in the system • Perform fluorescent dye leakage test • Test magnetic clutch engagement **Principles:** The student should explain the principles of: (b) Electromagnetism	The following tools, equipment and safety gear are to be available: • Vacuum pump • Automobile air conditioning tool kit • Pressure gauge manifold • Power supply • Belt tension gauge • Portable charging station • Computerized air conditioning service station • Leak detector • Eye protection goggles	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				• Replace different units of the system • Measure electric quantities • Clean tools and workplace • Store tools and equipment		(c) Vapor compression refrigeration cycle (d) Connecting electrical circuits in parallel, series and combination **Theories:** The student should explain: • Types of refrigerants • Gas laws • State of matter **Circumstantial knowledge** **Detailed knowledge about:** • Auto electric circuitry • Safe handling of working tools • Safe handling of measuring instruments • Environmental regulations of refrigerants		
		(c) Servicing refrigerant tubing	Guide the students to define refrigerant tubing	• Select tools and equipment	A record of values of pressure and	**Knowledge evidence:** **Detailed knowledge of:**	The following tools, equipment and	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			and their application **Demonstration:** Demonstrate to the students how to Service refrigerant tubing and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Service refrigerant tubing in ice makers	• Diagnostic trouble shooting • Measure refrigerant pressure in the system • Charge the system with fresh refrigerant • Clean tools and workplace • Store tools and equipment	electrical quantities conform to specified ratings	**Method used:** The student should explain how to: • Purge an auto air conditioning system • Charge refrigerant in the system • Perform fluorescent dye leakage test **Principles:** The student should explain the principles of: **Theories:** The student should explain: • Types of refrigerants • Gas laws • State of matter **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools • Safe handling of measuring instruments	safety gear are to be available: • Vacuum pump • Automobile air conditioning tool kit • Pressure gauge manifold • Power supply • Portable charging station • Computerized air conditioning service station • Leak detector • Eye protection goggles	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Environmental regulations of refrigerants		
		(d) Servicing compressor	Guide the students to define compressor and their application **Demonstration:** Demonstrate to the students how to Service compressor and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Service compressor in ice makers	• Select tools and equipment • Diagnostic trouble shooting • Measure refrigerant pressure in the system • Charge the system with fresh refrigerant • Replace electrical fuses • Replace fan belt • Adjust fan belt tension • Replace different units of the system • Measure electric quantities	A record of values of pressure and electrical quantities conform to specified ratings	**Knowledge evidence: Detailed knowledge of:** **Method used:** The student should explain how to: • Purge an auto air conditioning system • Charge refrigerant in the system • Perform fluorescent dye leakage test • Test magnetic clutch engagement **Principles:** The student should explain the principles of: (e) Electromagnetism (f) Vapor compression refrigeration cycle (g) Connecting electrical circuits	The following tools, equipment and safety gear are to be available: • Vacuum pump • Automobile air conditioning tool kit • Pressure gauge manifold • Power supply • Belt tension gauge • Portable charging station • Computerized air conditioning service station • Leak detector • Eye protection goggles	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				• Clean tools and workplace • Store tools and equipment		in parallel, series and combination **Theories:** The student should explain: • Types of refrigerants • Gas laws • State of matter **Circumstantial knowledge** **Detailed knowledge about:** • Auto electric circuitry • Safe handling of working tools • Safe handling of measuring instruments • Environmental regulations of refrigerants		
		(e) Servicing electric circuitry	Guide the students to define electric circuitry and their application **Demonstration:** Demonstrate to the students how to Service	• Select tools and equipment • Diagnostic trouble shooting • Replace electrical fuses	A record of values of pressure and electrical quantities conform to specified ratings	**Knowledge evidence: Detailed knowledge of:** **Method used:** The student should explain how to: • Perform fluorescent dye leakage test	The following tools, equipment and safety gear are to be available: • Automobile air conditioning tool kit • Power supply	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			electric circuitry and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Service electric circuitry in ice makers	• Replace different units of the system • Measure electric quantities • Clean tools and workplace • Store tools and equipment		• Test magnetic clutch engagement **Principles:** The student should explain the principles of: (h) Electromagnetism (i) Connecting electrical circuits in parallel, series and combination **Theories:** The student should explain: • Electric circuitry **Circumstantial knowledge** **Detailed knowledge about:** • Auto electric circuitry • Safe handling of working tools • Safe handling of measuring instruments	• Eye protection goggles	
	1.3 Servicing absorption system	(a) Servicing gas control devices	Guide the students to define control devices and their application	• Select tools and equipment	A record of values of charged refrigerant conforms to	**Knowledge evidence:** **Detailed knowledge of:**	The following tools, equipment and safety gear are to be available:	45

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
	refrigerators		**Demonstration:** Demonstrate to the students how Service gas control devices and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Service gas control devices	• Detect refrigerant leakage • Service burning/heating equipment • Handle explosive gases • Perform soldering and brazing • Clean workplace and tools • Store tools and equipment	specified rating	**Method used:** The student should explain how to: • Detect a leaking system • Service an absorption refrigerator **Principles:** The student should explain the principles of: (j) Absorption system (k) Heat transfer **Theories:** The student should explain: • Super heating and sub-cooling • Environmental requirement on refrigerant disposal • Difference between absorption and compression refrigeration cycle • Refrigerant properties	• Refrigerant leakage tester (ammonia) • Electro mechanic toolkit • Wire brush • Oxy-acetylene welding act set	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						Circumstantial knowledge **Detailed knowledge about:** • Safe handling of explosive gases • Environmental regulation on refrigerants		
		(b) Servicing gas connections	Guide the students on how to service gas connections and their application **Demonstration:** Demonstrate to the students on how Service gas connections and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Service gas connections	• Select tools and equipment • Detect refrigerant leakage • Service burning/heating equipment • Handle explosive gases • Perform soldering and brazing • Clean workplace and tools • Store tools and equipment	A record of values of charged refrigerant conforms to specified rating	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Detect a leaking system • Service an absorption refrigerator **Principles:** The student should explain the principles of: (c) Absorption system (d) Heat transfer **Theories:** The student should explain: • Super heating and sub-cooling	The following tools, equipment and safety gear are to be available: • Refrigerant leakage tester (ammonia) • Electro mechanic toolkit • Wire brush • Oxy-acetylene welding act set	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Environmental requirement on refrigerant disposal • Difference between absorption and compression refrigeration cycle • Refrigerant properties **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of explosive gases • Environmental regulation on refrigerants		
		(c) Servicing gas burners	Guide the students on how to service gas burners and their application **Demonstration:** Demonstrate to the students how Service gas burner and to	• Select tools and equipment • Detect refrigerant leakage • Service burning/heating equipment	A record of values of charged refrigerant conforms to specified rating	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Detect a leaking system	The following tools, equipment and safety gear are to be available: • Refrigerant leakage tester (ammonia) • Electro mechanic toolkit • Wire brush	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			handle tools and equipment **Practical work:** Organise the students into manageable groups to Service gas burner	• Handle explosive gases • Perform soldering and brazing • Clean workplace and tools • Store tools and equipment		• Service an absorption refrigerator **Principles:** The student should explain the principles of: (d) Absorption system (e) Heat transfer **Theories:** The student should explain: • Super heating and sub-cooling • Environmental requirement on refrigerant disposal • Difference between absorption and compression refrigeration cycle • Refrigerant properties **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of explosive gases	• Oxy-acetylene welding act set	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Environmental regulation on refrigerants		
		(d) Installing absorption refrigerator	Guide the students to define absorption refrigerator and their application **Demonstration:** Demonstrate to the students on how to install absorption refrigerator and to handle tools and equipment **Practical work:** Organise the students into manageable groups to install absorption refrigerator	• Select tools and equipment • Detect refrigerant leakage • Service burning/heating equipment • Handle explosive gases • Perform soldering and brazing • Clean workplace and tools • Store tools and equipment	A record of values of charged refrigerant conforms to specified rating	**Knowledge evidence: Detailed knowledge of:** **Method used:** The students should explain how to: • Detect a leaking system • Service an absorption refrigerator **Principles:** The student should explain the principles of: (f) Absorption system (g) Heat transfer **Theories:** The student should explain: • Super heating and sub-cooling • Environmental requirement on refrigerant disposal • Difference between absorption and	The following tools, equipment and safety gear are to be available: • Refrigerant leakage tester (ammonia) • Electro mechanic toolkit • Wire brush • Oxy-acetylene welding act set	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						compression refrigeration cycle • Refrigerant properties **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of explosive gases • Environmental regulation on refrigerants		
	1.4 Repairing commercial refrigerators	(a) Repairing evaporator	Guide the students to define evaporator and their application **Demonstration:** Demonstrate to the students on how to repair evaporator and to handle tools and equipment **Practical work:** Organise the students into manageable groups to repair evaporator	• Select tools and equipment • Perform diagnostic troubleshooting • Perform sheet metal works • Perform brazing • Perform pump down of refrigerant • Charge refrigerant	A record of repairs carried out conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Perform brazing • Charge refrigerant • Determines super heating and sub-cooling • Fast cool products **Principles:** The student should explain the principles of:	The following tools, equipment and safety gear are to be available: • Safety boots • Safety goggles • Overall/overcoat • Revolving wire brush • Bristle brush • Wire brush • Electro-mechanical toolbox • Gauge manifold • Refrigerant leak detector	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				into the system • Carry out plumbing works • Carry out repairs on pumps • Carry out repairs on compressors • Clean workplace and tools • Store tools and equipment		• Heat transfer • Matter **Theories:** The student should explain: • Primary and secondary refrigeration cycles • Freezing points of liquid mixtures for secondary and primary refrigerants • Metering of refrigerants • Heat conduction • Sub cooling and super heating conditions **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools • Safe handling of measuring instruments • Safe handling of electrical controls	• Pipe wrench • Oxy-acetylene welding set	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						and other components • Safe handling of refrigerant when discharging or charging the system • Dismantling and assembling procedures		
		(b) Repairing control equipment	Guide the students to define control equipment and their application **Demonstration:** Demonstrate to the students on how to repair control equipment and to handle tools and equipment **Practical work:** Organise the students into manageable groups to repair control equipment	**The student should be able to:** • Select tools and equipment • Perform diagnostic troubleshooting • Perform sheet metal works • Perform brazing • Perform pump down of refrigerant • Charge refrigerant into the system	A record of repairs carried out conforms to technical specifications	**Knowledge evidence: Detailed knowledge of:** **Method used:** The student should explain how to: • Perform brazing • Charge refrigerant • Determine super heating and sub cooling • Fast cool products **Principles:** The student should explain the principles of: • Heat transfer • Matter **Theories:** The student should explain:	The following tools, equipment and safety gear are to be available: • Safety boots • Safety goggles • Overall/overcoat • Revolving wire brush • Bristle brush • Wire brush • Electro-mechanical toolbox • Gauge manifold • Refrigerant leak detector • Pipe wrench • Oxy-acetylene welding set	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				• Carry out plumbing works • Carry out repairs on pumps • Carry out repairs on compressors • Clean workplace and tools • Store tools and equipment		• Primary and secondary refrigeration cycles • Freezing points of liquid mixtures for secondary and primary refrigerants • Metering of refrigerants • Heat conduction • Sub cooling and super heating conditions **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools • Safe handling of measuring instruments • Safe handling of electrical controls and other components • Safe handling of refrigerant when discharging or		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						charging the system • Dismantling and assembling procedures		
		(c) Repairing electrical circuit	Guide the students to define electrical circuit and their application **Demonstration:** Demonstrate to the students how to repair electrical circuit equipment and to handle tools and equipment **Practical work:** Organise the students into manageable groups to repair electrical circuit	• Select tools and equipment • Perform diagnostic troubleshooting • Perform brazing • Clean workplace and tools • Store tools and equipment	A record of repairs carried out conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Repair default circuit **Principles:** The student should explain the principles of: • Electric circuit operation **Theories:** The student should explain: • Electric circuit connection **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools • Safe handling of measuring instruments	The following tools, equipment and safety gear are to be available: • Safety boots • Safety goggles • Overall/overcoat • Revolving wire brush • Bristle brush • Wire brush • Electro-mechanical toolbox • Gauge manifold • Refrigerant leak detector • Pipe wrench • Oxy-acetylene welding set	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Safe handling of electrical controls and other components • Dismantling and assembling procedures		
		(d) Repairing or Replace compressor	Guide the students to define compressor and their application **Demonstration:** Demonstrate to the students on how to repair or Replace compressor and to handle tools and equipment **Practical work:** Organise the students into manageable groups to repair or replace compressor	• Select tools and equipment • Perform diagnostic troubleshooting • Perform sheet metal works • Perform brazing • Perform pump down of refrigerant • Charge refrigerant into the system • Carry out plumbing works • Carry out repairs on pumps	A record of repairs carried out conforms to technical specifications	**Knowledge evidence: Detailed knowledge of:** **Method used:** The student should explain how to: • Perform brazing • Charge refrigerant • Determine super heating and sub cooling • Fast cool products **Principles:** The student should explain the principles of: • Heat transfer • Matter **Theories:** The student should explain: • Primary and secondary	The following tools, equipment and safety gear are to be available: • Safety boots • Safety goggles • Overall/overcoat • Revolving wire brush • Bristle brush • Wire brush • Electro-mechanical toolbox • Gauge manifold • Refrigerant leak detector • Pipe wrench • Oxy-acetylene welding set	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				• Carry out repairs on compressors • Clean workplace and tools • Store tools and equipment		refrigeration cycles • Freezing points of liquid mixtures for secondary and primary refrigerants • Metering of refrigerants • Heat conduction • Sub cooling and super heating conditions **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools • Safe handling of measuring instruments • Safe handling of electrical controls and other components • Safe handling of refrigerant when discharging or charging the system		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Dismantling and assembling procedures		
		(e) Replacing default electronic card	**Brainstorm:** Guide the students to define Replace default electronic card and their application **Demonstration:** Demonstrate to the students on how to Replace default electronic card and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Replace default electronic card	• Select tools and equipment • Perform diagnostic troubleshooting • Carry out plumbing works • Clean workplace and tools • Store tools and equipment	A record of repairs carried out conforms to technical specifications	**Knowledge evidence: Detailed knowledge of:** **Method used:** The student should explain how to: • Repair electric circuit **Principles:** The student should explain the principles of: • Heat transfer • Matter **Theories:** The student should explain: • Primary and secondary refrigeration cycles • Freezing points of liquid mixtures for secondary and primary refrigerants • Metering of refrigerants • Heat conduction	The following tools, equipment and safety gear are to be available: • Safety boots • Safety goggles • Overall/overcoat • Revolving wire brush • Bristle brush • Wire brush • Electro-mechanical toolbox • Gauge manifold • Refrigerant leak detector • Pipe wrench • Oxy-acetylene welding set	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Sub cooling and super heating conditions **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools • Safe handling of measuring instruments • Safe handling of electrical controls and other components • Safe handling of refrigerant when discharging or charging the system • Dismantling and assembling procedures		
	1.5 Repairing ice makers	(a) Replacing compressor and add oil	**Brainstorm:** Guide the students to define Replace compressor and add oil and their application	• Measure electrical temperature and pressure quantities	A record of charged refrigerants, temperatures and freezing time and electrical	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Measure weight	The following tools, equipment and safety gear are to be available: • Oxyacetylene welding set	93

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Demonstration: Demonstrate to the students on how to Replace compressor and add oil and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Replace compressor and add oil	• Identify type of refrigerator used • Determine correct quantities of refrigerants • Charge the system with refrigerants • Perform brazing • Connect electric circuits • Clean tools, equipment and workplace • Store tools and equipment	quantities confirm to operating technical specifications	• Measure temperature and time • Make different concentration of secondary refrigerant **Principles:** The student should explain the principles of: • Ice making • Freezing point variation **Theories:** The student should explain: • Primary and secondary refrigeration cycle • Types of secondary refrigerants • Application of secondary refrigerant **Circumstantial knowledge** **Detailed knowledge about:**	• Electro-mechanical tools loot • Vacuum pump • Manifold gauge • Pinch off tool • Multimeter • Dial type thermometer • Hard bush • Safety goggles • Leak detector • Safety loots • Overall • Water pail	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Safe handling of different refrigerants • Safe handling of equipment • Environmental regulations		
		(b) Replacing condenser and evaporator	**Brainstorm:** Guide the students to define Replace condenser and evaporator and their application **Demonstration:** Demonstrate to the students how to Replace condenser and evaporator and add oil and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Replace condenser and evaporator	• Measure electrical temperature and pressure quantities • Identify type of refrigerator used • Determine correct quantities of refrigerants • Charge the system with refrigerants • Perform brazing • Connect electric circuits • Clean tools, equipment	A record of charged refrigerants, temperatures and freezing time and electrical quantities confirm to operating technical specifications	**Knowledge evidence: Detailed knowledge of:** **Method used:** The student should explain how to: • Measure weight • Measure temperature and time • Make different concentration of secondary refrigerant **Principles:** The student should explain the principles of: • Ice making • Freezing point variation **Theories:** The student should explain:	The following tools, equipment and safety gear are to be available: • Oxyacetylene welding set • Electro-mechanical tools loot • Vacuum pump • Manifold gauge • Pinch off tool • Multimeter • Dial type thermometer • Hard bush • Safety goggles • Leak detector • Safety loots • Overall • Water pail	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				and workplace • Store tools and equipment		• Primary and secondary refrigeration cycle • Types of secondary refrigerants • Application of secondary refrigerant **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of different refrigerants • Safe handling of equipment • Environmental regulations		
		(c) Replacing grills and container	**Brainstorm:** Guide the students to define Replace grills and container their application **Demonstration:** Demonstrate to the students how	• Identify type of refrigerator used • Perform brazing • Clean tools, equipment and workplace	A record of charged refrigerants, temperatures and freezing time and electrical quantities	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Measure weight	The following tools, equipment and safety gear are to be available: • Oxyacetylene welding set • Electro-mechanical tools loot	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			to Replace grills and container and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Replace grills and container	• Store tools and equipment	confirm to operating technical specifications	• Measure temperature and time **Principles:** The student should explain the principles of: • Ice making • Freezing point variation **Theories:** The student should explain: • Primary and secondary refrigeration cycle • Types of secondary refrigerants • Application of secondary refrigerant **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of different refrigerants • Safe handling of equipment	• Vacuum pump • Manifold gauge • Pinch off tool • Multimeter • Dial type thermometer • Hard bush • Safety goggles • Leak detector • Safety loots • Overall • Water pail	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Environmental regulations		
		(d) Performing wiring circuit	**Brainstorm:** Guide the students to define Performing wiring circuit and their application **Demonstration:** Demonstrate to the students on how to Performing wiring circuit and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Performing wiring circuit	**The student should be able to:** • Measure electrical temperature and pressure quantities • Perform brazing • Connect electric circuits • Clean tools, equipment and workplace • Store tools and equipment	A record of charged refrigerants, temperatures and freezing time and electrical quantities confirm to operating technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Make wiring circuit **Principles:** The student should explain the principles of: • Wiring circuit **Theories:** The student should explain: • Primary and secondary wiring circuit **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of different refrigerants • Safe handling of equipment • Environmental regulations	The following tools, equipment and safety gear are to be available: • Oxyacetylene welding set • Electro-mechanical tools loot • Vacuum pump • Manifold gauge • Pinch off tool • Multimeter • Dial type thermometer • Hard bush • Safety goggles • Leak detector • Safety loots • Overall • Water pail	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
		(e) Repairing piping circuit	**Brainstorm:** Guide the students to define piping circuit and their application **Demonstration:** Demonstrate to the students on how to Repair piping circuit and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Repair piping circuit	• Measure electrical temperature and pressure quantities • Identify type of refrigerator used • Determine correct quantities of refrigerants • Charge the system with refrigerants • Perform brazing • Connect electric circuits • Clean tools, equipment and workplace • Store tools and equipment	A record of charged refrigerants, temperatures and freezing time and electrical quantities confirm to operating technical specifications	**Knowledge evidence: Detailed knowledge of:** **Method used:** The student should explain how to: • Measure weight • Measure temperature and time • Make different concentration of secondary refrigerant **Principles:** The student should explain the principles of: • Ice making • Freezing point variation **Theories:** The student should explain: • Primary and secondary refrigeration cycle • Types of secondary refrigerants	The following tools, equipment and safety gear are to be available: • Oxyacetylene welding set • Electro-mechanical tools loot • Vacuum pump • Manifold gauge • Pinch off tool • Multimeter • Dial type thermometer • Hard bush • Safety goggles • Leak detector • Safety loots • Overall • Water pail	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Application of secondary refrigerant **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of different refrigerants • Safe handling of equipment • Environmental regulations		
	1.6 Repairing absorption system of refrigerators	(a) Repairing gas control devices	**Brainstorm:** Guide the students to define gas control devices and their application **Demonstration:** Demonstrate to the students on how repair gas control devices circuit and to handle tools and equipment **Practical work:** Organise the students into	• Select tools and equipment • Detect refrigerant leakage • Repair burning/heating equipment • Handle explosive gases • Perform soldering and brazing	A record of values of charged refrigerant conforms to specified rating	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Detect a leaking system • Service an absorption refrigerator **Principles:** The student should explain the principles of: (f) Absorption system	The following tools, equipment and safety gear are to be available: • Refrigerant leakage tester (ammonia) • Electro mechanic toolkit • Wire brush • Oxy-acetylene welding set	60

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			manageable groups to repair gas control devices	• Clean workplace and tools • Store tools and equipment		(g) Heat transfer **Theories:** The student should explain: • Super heating and sub-cooling • Environmental requirement on refrigerant disposal • Difference between absorption and compression refrigeration cycle • Refrigerant properties **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of explosive gases • Environmental regulations on refrigerants		
		(b) Repairing gas connections	**Brainstorm:** Guide the students to define gas connection	• Select tools and equipment	A record of values of charged refrigerant conforms to	**Knowledge evidence:** **Detailed knowledge of:**	The following tools, equipment and safety gear are to be available:	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			and their application **Demonstration:** Demonstrate to the students on how repair gas connection and to handle tools and equipment **Practical work:** Organise the students into manageable groups to gas connection	• Detect refrigerant leakage • Repair burning/heating equipment • Handle explosive gases • Perform soldering and brazing • Clean workplace and tools • Store tools and equipment	specified rating	**Method used:** The student should explain how to: • Detect a leaking system • Service an absorption refrigerator **Principles:** The student should explain the principles of: (c) Absorption system (d) Heat transfer **Theories:** The student should explain: • Super heating and sub-cooling • Environmental requirement on refrigerant disposal • Difference between absorption and compression refrigeration cycle • Refrigerant properties	• Refrigerant leakage tester (ammonia) • Electro mechanic toolkit • Wire brush • Oxy-acetylene welding set	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						Circumstantial knowledge **Detailed knowledge about:** • Safe handling of explosive gases • Environmental regulations on refrigerants		
		(c) Repairing gas burners	**Brainstorm:** Guide the students to define gas burners and their application **Demonstration:** Demonstrate to the students on how repair gas burners and to handle tools and equipment **Practical work:** Organise the students into manageable groups to repair gas burners	• Select tools and equipment • Detect refrigerant leakage • Repair burning/heating equipment • Handle explosive gases • Perform soldering and brazing • Clean workplace and tools • Store tools and equipment	A record of values of charged refrigerant conforms to specified rating	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Detect a leaking system • Service an absorption refrigerator **Principles:** The student should explain the principles of: (d) Absorption system (e) Heat transfer **Theories:** The student should explain: • Super heating and sub-cooling	The following tools, equipment and safety gear are to be available: • Refrigerant leakage tester (ammonia) • Electro mechanic toolkit • Wire brush Oxy-acetylene welding set	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Environmental requirement on refrigerant disposal • Difference between absorption and compression refrigeration cycle • Refrigerant properties **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of explosive gases • Environmental regulations on refrigerants		
		(d) Installing absorption system of refrigerator	**Brainstorm:** Guide the students to define absorption system of refrigerator and their application **Demonstration:** Demonstrate to the students on	• Select tools and equipment • Detect refrigerant leakage • Repair burning/heating equipment	A record of values of charged refrigerant conforms to specified rating	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Detect a leaking system	The following tools, equipment and safety gear are to be available: • Refrigerant leakage tester (ammonia) • Electro mechanic toolkit • Wire brush	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			how install absorption system of refrigerator and to handle tools and equipment **Practical work:** Organise the students into manageable groups to install absorption system of refrigerator	• Handle explosive gases • Perform soldering and brazing • Clean workplace and tools • Store tools and equipment		• Service an absorption refrigerator **Principles:** The student should explain the principles of: (f) Absorption system (g) Heat transfer **Theories:** The student should explain: • Super heating and sub-cooling • Environmental requirement on refrigerant disposal • Difference between absorption and compression refrigeration cycle • Refrigerant properties **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of explosive gases	Oxy-acetylene welding set	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Environmental regulations on refrigerants		
2.0 Maintaining air conditioning systems	2.1 Servicing self-contained air conditioners	(a) Servicing delivery pipes	**Brainstorm:** Guide the students to understand service delivery Pipes and their application **Demonstration:** Demonstrate to the students on how service delivery pipes and to handle tools and equipment **Practical work:** Organise the students into manageable groups to service delivery pipes	• Select proper tools and equipment • Detect refrigerant leakage • Mount and dismount a unit • Measure electric quantities • Charge refrigerant • Seal the system • Clean the workplace and tools • Store the working tools and equipment	A record of charged refrigerant conforms to technical specifications	**Knowledge evidence: Detailed knowledge of:** **Method used:** The student should explain how to: • Determine a leaking system • Determine performance • Determine type and amount of refrigerant used **Principles:** The student should explain the principles of: (h) Compression and absorption refrigeration systems (i) Non fusion welding (j) Heat transfer **Theories:** The student should explain:	The following tools, equipment and safety gear are to be available: • Electro mechanical toolbox • Oxy-acetylene welding set • Pail/water container • Bristle brush • Digital/analog multimeter • Refrigerant leakage detector • Power supply • Safety boots • Overall or overcoat • Safety goggles • Hard brush • Nose mask	66

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Super heat and sub cooling of refrigerant • Environmental requirement on refrigerant disposal • State of matter **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of oxy-acetylene welding set • Safe handling of refrigerants • Environment regulations on refrigerant		
		(b) Servicing condenser	**Brainstorm:** Guide the students to understand condenser and their application **Demonstration:** Demonstrate to the students on how service	• Select proper tools and equipment • Detect refrigerant leakage • Mount and dismount a unit	A record of charged refrigerant conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Determine a leaking system • Determine performance	The following tools, equipment and safety gear are to be available: • Electro mechanical toolbox • Oxy-acetylene welding set	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			condenser and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Service condenser	• Measure electric quantities • Charge refrigerant • Seal the system • Clean the workplace and tools • Store the working tools and equipment		• Determine type and amount of refrigerant used **Principles:** The student should explain the principles of: (k) Compression and absorption refrigeration systems (l) Non fusion welding (m) Heat transfer **Theories:** The student should explain: • Super heat and sub cooling of refrigerant • Environmental requirement on refrigerant disposal • State of matter **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of oxy-acetylene welding set	• Pail/water container • Bristle brush • Digital/analog multimeter • Refrigerant leakage detector • Power supply • Safety boots • Overall or overcoat • Safety goggles • Hard brush • Nose mask	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Safe handling of refrigerants • Environment regulations on refrigerant		
		(c) Servicing evaporator	**Brainstorm:** Guide the students to define evaporator and their application **Demonstration:** Demonstrate to the students on how service evaporator and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Service evaporator	• Select proper tools and equipment • Detect refrigerant leakage • Mount and dismount a unit • Measure electric quantities • Charge refrigerant • Seal the system • Clean the workplace and tools • Store the working tools and equipment	A record of charged refrigerant conforms to technical specifications	**Knowledge evidence: Detailed knowledge of:** **Method used:** The student should explain how to: • Determine a leaking system • Determine performance • Determine type and amount of refrigerant used **Principles:** The student should explain the principles of: (d) Compression and absorption refrigeration systems (e) Non fusion welding (f) Heat transfer	The following tools, equipment and safety gear are to be available: • Electro mechanical toolbox • Oxy-acetylene welding set • Pail/water container • Bristle brush • Digital/analog multimeter • Refrigerant leakage detector • Power supply • Safety boots • Overall or overcoat • Safety goggles • Hard brush • Nose mask	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						Theories: The student should explain: • Super heat and sub cooling of refrigerant • Environmental requirement on refrigerant disposal • State of matter **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of oxy-acetylene welding set • Safe handling of refrigerants • Environment regulations on refrigerant		
		(d) Refilling refrigerant	**Brainstorm:** Guide the students to define refrigerant and their application **Demonstration:** Demonstrate to the students on	• Select proper tools and equipment • Detect refrigerant leakage	A record of charged refrigerant conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Determine a leaking system	The following tools, equipment and safety gear are to be available: • Electro mechanical toolbox	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			how refill refrigerant and to handle tools and equipment **Practical work:** Organise the students into manageable groups to refill refrigerant	• Mount and dismount a unit • Measure electric quantities • Charge refrigerant • Seal the system • Clean the workplace and tools • Store the working tools and equipment		• Determine performance • Determine type and amount of refrigerant used **Principles:** The student should explain the principles of: (g) Compression and absorption refrigeration systems (h) Non fusion welding (i) Heat transfer **Theories:** The student should explain: • Super heat and sub cooling of refrigerant • Environmental requirement on refrigerant disposal • State of matter **Circumstantial knowledge** **Detailed knowledge about:**	• Oxy-acetylene welding set • Pail/water container • Bristle brush • Digital/analog multimeter • Refrigerant leakage detector • Power supply • Safety boots • Overall or overcoat • Safety goggles • Hard brush • Nose mask	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Safe handling of oxy-acetylene welding set • Safe handling of refrigerants • Environment regulations on refrigerant		
		(e) Servicing electric circuit	**Brainstorm:** Guide the students to define electric circuit and their application **Demonstration:** Demonstrate to the students on how service electric circuit and to handle tools and equipment **Practical work:** Organise the students into manageable groups to service electric circuit	• Select proper tools and equipment • Detect refrigerant leakage • Mount and dismount a unit • Measure electric quantities • Charge refrigerant • Seal the system • Clean the workplace and tools • Store the working tools	A record of charged refrigerant conforms to technical specifications	**Knowledge evidence: Detailed knowledge of:** **Method used:** The student should explain how to: • Determine a leaking system • Determine performance • Determine type and amount of refrigerant used **Principles:** The student should explain the principles of: (j) Compression and absorption refrigeration systems	The following tools, equipment and safety gear are to be available: • Electro mechanical toolbox • Oxy-acetylene welding set • Pail/water container • Bristle brush • Digital/analog multimeter • Refrigerant leakage detector • Power supply • Safety boots • Overall or overcoat • Safety goggles • Hard brush	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				and equipment		(k) Non fusion welding (l) Heat transfer **Theories:** The student should explain: • Super heat and sub cooling of refrigerant • Environmental requirement on refrigerant disposal • State of matter **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of oxy-acetylene welding set • Safe handling of refrigerants • Environment regulations on refrigerant	• Nose mask	
	2.2 Servicing split unit air conditioners	(a) Servicing condensing unit	**Brainstorm:** Guide the students to define condensing unit	• Select tools, equipment and materials	Serviced spilt unit operates according to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain	The following tools, equipment and safety gear are to be available:	60

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			and their application **Demonstration:** Demonstrate to the students on how service condensing unit and to handle tools and equipment **Practical work:** Organise the students into manageable groups to service condensing unit	• Disconnect electric supply circuit • Service the condensing unit • Check electric for starter circuit • Perform pump down operation • Service indoor unit • Check leaks on joints of refrigerant pipes • Service drainage system • Test run the system • Test amperage • Observe safety regulations • Clean workplace,		how to attend different type of split units **Principles:** The student should explain the principles of operators and air flow in a conditioned space **Theories:** The student should explain: • Type of maintenance service • Types split units • Pump-down operation **Circumstantial knowledge** **Detailed knowledge about:** • Safe working and handling of unit • Safe handling of tools and equipment • Safe handling of indoor units	• Oxy-acetylene plant • Blower • Ladder • Extension cable • Trolley • Electro-mechanical tool kits • Safety boots • Safety goggles • Multimeter • Clamp-on-meter • Megger • Leak detector • Brush • Fins comb	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				tools and safety gears • Store tools				
		(b) Servicing evaporator	**Brainstorm:** Guide the students to define evaporator and their application **Demonstration:** Demonstrate to the students on how service evaporator and to handle tools and equipment **Practical work:** Organise the students into manageable groups to service evaporator	• Select tools, equipment and materials • Disconnect electric supply circuit • Service the condensing unit • Check electric for starter circuit • Perform pump down operation • Service indoor unit • Check leaks on joints of refrigerant pipes • Service drainage system • Test run the system	Serviced spilt unit operates according to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to attend different type of split units **Principles:** The student should explain the principles of operators and air flow in a conditioned space **Theories:** The student should explain: • Type of maintenance service • Types split units • Pump-down operation **Circumstantial knowledge** **Detailed knowledge about:**	The following tools, equipment and safety gear are to be available: • Oxy-acetylene plant • Blower • Ladder • Extension cable • Trolley • Electro-mechanical tool kits • Safety boots • Safety goggles • Multimeter • Clamp-on-meter • Megger • Leak detector • Brush • Fins comb	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				• Test amperage • Observe safety regulations • Clean workplace, tools and safety gears • Store tools		• Safe working and handling of unit • Safe handling of tools and equipment • Safe handling of indoor units		
		(c) Servicing electric circuitry	**Brainstorm:** Guide the students to define electric circuitry and their application **Demonstration:** Demonstrate to the students on how service electric circuitry and to handle tools and equipment **Practical work:** Organise the students into manageable groups to service electric circuitry	• Select tools, equipment and materials • Disconnect electric supply circuit • Service the condensing unit • Check electric for starter circuit • Perform pump down operation • Service indoor unit • Check leaks on joints of refrigerant pipes	Serviced spilt unit operates according to technical specifications	**Knowledge evidence: Detailed knowledge of:** **Method used:** The student should explain how to attend different type of split units **Principles:** The student should explain the principles of operators and air flow in a conditioned space **Theories:** The student should explain: • Type of maintenance service • Types split units • Pump-down operation	The following tools, equipment and safety gear are to be available: • Oxy-acetylene plant • Blower • Ladder • Extension cable • Trolley • Electro-mechanical tool kits • Safety boots • Safety goggles • Multimeter • Clamp-on-meter • Megger • Leak detector • Brush • Fins comb	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				• Service drainage system • Test run the system • Test amperage • Observe safety regulations • Clean workplace, tools and safety gears • Store tools		**Circumstantial knowledge** **Detailed knowledge about:** • Safe working and handling of unit • Safe handling of tools and equipment • Safe handling of indoor units		
		(d) Servicing piping circuits	**Brainstorm:** Guide the students to define pipes circuit and their application **Demonstration:** Demonstrate to the students on how service piping circuits and to handle tools and equipment **Practical work:**	• Select tools, equipment and materials • Disconnect electric supply circuit • Service the condensing unit • Check electric for starter circuit • Perform pump down operation	Serviced spilt unit operates according to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to attend different type of split units **Principles:** The student should explain the principles of operators and air flow in a conditioned space **Theories:** The student should explain:	The following tools, equipment and safety gear are to be available: • Oxy-acetylene plant • Blower • Ladder • Extension cable • Trolley • Electro-mechanical tool kits • Safety boots • Safety goggles	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Organise the students into manageable groups to service piping circuits	• Service indoor unit • Check leaks on joints of refrigerant pipes • Service drainage system • Test run the system • Test amperage • Observe safety regulations • Clean workplace, tools and safety gears • Store tools		• Type of maintenance service • Types split units • Pump-down operation **Circumstantial knowledge** **Detailed knowledge about:** • Safe working and handling of unit • Safe handling of tools and equipment • Safe handling of indoor units	• Multimeter • Clamp-on-meter • Megger • Leak detector • Brush • Fins comb	
		(d) Troubleshooting the system	**Brainstorm:** Guide the students to define Troubleshoot the system and their application **Demonstration:** Demonstrate to the students on	• Select tools, equipment and materials • Disconnect electric supply circuit • Check electric for starter circuit	Serviced spilt unit operates according to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to attend different type of split units	The following tools, equipment and safety gear are to be available: • Oxy-acetylene plant • Blower • Ladder • Extension cable	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			how to troubleshoot the system and to handle tools and equipment **Practical work:** Organise the students into manageable groups to troubleshoot the system	• Service indoor unit • Test run the system • Test amperage • Observe safety regulations • Clean workplace, tools and safety gears • Store tools		**Principles:** The student should explain the principles of operators and air flow in a conditioned space **Theories:** The student should explain: • Type of maintenance service • Types split units • Pump-down operation **Circumstantial knowledge** **Detailed knowledge about:** • Safe working and handling of unit • Safe handling of tools and equipment • Safe handling of indoor units	• Trolley • Electro-mechanical tool kits • Safety boots • Safety goggles • Multimeter • Clamp-on-meter • Megger • Leak detector • Brush • Fins comb	
	2.3 Servicing car air conditioners	(a) Servicing compressor	**Brainstorm:** Guide the students to service	• Select tools and equipment	A record of values of pressure and electrical quantities	**Knowledge evidence:** **Detailed knowledge of:**	The following tools, equipment and safety gear are to be available: • Vacuum pump	53

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			compressor and their application **Demonstration:** Demonstrate to the students on how to service compressor and to handle tools and equipment **Practical work:** Organise the students into manageable groups to service compressor	• Diagnostic trouble shooting • Measure refrigerant pressure in the system • Charge the system with fresh refrigerant • Replace electrical fuses • Replace fan belt • Adjust fan belt tension • Replace different units of the system • Measure electric quantities • Clean tools and workplace • Store tools and equipment	conform to specified ratings	**Method used:** The student should explain how to: • Purge an auto air conditioning system • Charge refrigerant in the system • Perform fluorescent dye leakage test • Test magnetic clutch engagement **Principles:** The student should explain the principles of: (e) Electromagnetism (f) Vapor compression refrigeration cycle (g) Connecting electrical circuits in parallel, series and combination **Theories:** The student should explain:	• Automobile air conditioning tool kit • Pressure gauge manifold • Power supply • Belt tension gauge • Portable charging station • Computerized air conditioning service station • Leak detector • Eye protection goggles	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Types of refrigerants • Gas laws • State of matter **Circumstantial knowledge** **Detailed knowledge about:** • Auto electric circuitry • Safe handling of working tools • Safe handling of measuring instruments • Environmental regulations of refrigerants		
		(b) Servicing evaporator	**Brainstorm:** Guide the students to service evaporator and their application **Demonstration:** Demonstrate to the students on how to service evaporator and to handle tools and equipment	• Select tools and equipment • Diagnostic trouble shooting • Measure refrigerant pressure in the system • Charge the system with	A record of values of pressure and electrical quantities conform to specified ratings	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Purge an auto air conditioning system • Charge refrigerant in the system	The following tools, equipment and safety gear are to be available: • Vacuum pump • Automobile air conditioning tool kit • Pressure gauge manifold • Power supply • Belt tension gauge	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Practical work: Organise the students into manageable groups to service evaporator	fresh refrigerant • Replace electrical fuses • Replace fan belt • Adjust fan belt tension • Replace different units of the system • Measure electric quantities • Clean tools and workplace • Store tools and equipment		• Perform fluorescent dye leakage test • Test magnetic clutch engagement **Principles:** The student should explain the principles of: (c) Electromagnetism (d) Vapor compression refrigeration cycle (e) Connecting electrical circuits in parallel, series and combination **Theories:** The student should explain: • Types of refrigerants • Gas laws • State of matter **Circumstantial knowledge** **Detailed knowledge about:**	• Portable charging station • Computerized air conditioning service station • Leak detector • Eye protection goggles	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Auto electric circuitry • Safe handling of working tools • Safe handling of measuring instruments Environmental regulations of refrigerants		
		(c) Servicing pipe circuits	**Brainstorm:** Guide the students to service pipe circuits and their application **Demonstration:** Demonstrate to the students on how to service pipe circuit and to handle tools and equipment **Practical work:** Organise the students into manageable groups to service pipe circuit	• Select tools and equipment • Diagnostic trouble shooting • Measure refrigerant pressure in the system • Charge the system with fresh refrigerant • Replace electrical fuses • Replace different units of the system	A record of values of pressure and electrical quantities conform to specified ratings	**Knowledge evidence: Detailed knowledge of:** **Method used:** The student should explain how to: • Purge an auto air conditioning system • Charge refrigerant in the system • Perform fluorescent dye leakage test • Test magnetic clutch engagement **Principles:** The student should explain the principles of:	The following tools, equipment and safety gear are to be available: • Vacuum pump • Automobile air conditioning tool kit • Pressure gauge manifold • Power supply • Belt tension gauge • Portable charging station • Computerized air conditioning service station • Leak detector • Eye protection goggles	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				• Measure electric quantities • Clean tools and workplace • Store tools and equipment		• Electromagnetism • Vapor compression refrigeration cycle • Connecting electrical circuits in parallel, series and combination **Theories:** The student should explain: • Types of refrigerants • Gas laws • State of matter **Circumstantial knowledge** **Detailed knowledge about:** • Auto electric circuitry • Safe handling of working tools • Safe handling of measuring instruments		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Environmental regulations of refrigerants		
		(d) Troubleshooting the system	**Brainstorm:** Guide the students to troubleshoot the system and their application **Demonstration:** Demonstrate to the students on how to troubleshoot the system and to handle tools and equipment **Practical work:** Organise the students into manageable groups to troubleshoot the system	• Select tools and equipment • Diagnostic trouble shooting • Measure refrigerant pressure in the system • Charge the system with fresh refrigerant • Replace electrical fuses • Replace fan belt • Adjust fan belt tension • Replace different units of the system • Measure electric quantities	A record of values of pressure and electrical quantities conform to specified ratings	**Knowledge evidence: Detailed knowledge of:** **Method used:** The student should explain how to: • Purge an auto air conditioning system • Charge refrigerant in the system • Perform fluorescent dye leakage test • Test magnetic clutch engagement **Principles:** The student should explain the principles of: • Electromagnetism • Vapor compression refrigeration cycle	The following tools, equipment and safety gear are to be available: • Vacuum pump • Automobile air conditioning tool kit • Pressure gauge manifold • Power supply • Belt tension gauge • Portable charging station • Computerized air conditioning service station • Leak detector • Eye protection goggles	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				• Clean tools and workplace • Store tools and equipment		• Connecting electrical circuits in parallel, series and combination **Theories:** The student should explain: • Types of refrigerants • Gas laws • State of matter **Circumstantial knowledge** **Detailed knowledge about:** • Auto electric circuitry • Safe handling of working tools • Safe handling of measuring instruments Environmental regulations of refrigerants		
		(e) Servicing wiring system of Car AC	**Brainstorm:** Guide the students to define wiring system of Car AC system	• Select tools and equipment	A record of values of pressure and electrical quantities	**Knowledge evidence: Detailed knowledge of:**	The following tools, equipment and safety gear are to be available: • Vacuum pump	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			and their application **Demonstration:** Demonstrate to the students on how service wiring system of Car AC and to handle tools and equipment **Practical work:** Organise the students into manageable groups to service wiring system of Car AC	• Diagnostic trouble shooting • Measure refrigerant pressure in the system • Charge the system with fresh refrigerant • Replace electrical fuses • Replace fan belt • Adjust fan belt tension • Replace different units of the system • Measure electric quantities • Clean tools and workplace • Store tools and equipment	conform to specified ratings	**Method used:** The student should explain how to: • Purge an auto air conditioning system • Charge refrigerant in the system • Perform fluorescent dye leakage test • Test magnetic clutch engagement **Principles:** The student should explain the principles of: • Electromagnetism • Vapor compression refrigeration cycle • Connecting electrical circuits in parallel, series and combination	• Automobile air conditioning tool kit • Pressure gauge manifold • Power supply • Belt tension gauge • Portable charging station • Computerized air conditioning service station • Leak detector • Eye protection goggles	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						Theories: The student should explain: • Types of refrigerants • Gas laws • State of matter **Circumstantial knowledge** **Detailed knowledge about:** • Auto electric circuitry • Safe handling of working tools • Safe handling of measuring instruments • Environmental regulations of refrigerants		
	2.4 Repairing self-contained air conditioners	(a) Repairing evaporator	**Brainstorm:** Guide the students to define evaporator and their application **Demonstration:** Demonstrate to the students on how repair evaporator and to	• Select proper tools and equipment • Purge the system • Charge the unit with fresh refrigerant	A record of amount of charged refrigerant conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Charge refrigerant into a system • Detect refrigerant leaks in a system	The following tools, equipment and safety gear are to be available: • Tool kit • Oxy-acetylene welding set • Digital and analog multimeter	75

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			handle tools and equipment **Practical work:** Organise the students into manageable groups to repair evaporator	• Measure pressure quantities • Detect refrigerant leakage • Perform soldering and brazing • Measure electrical quantities • Clean tools and workplace • Store tools		• Seal the system after charging **Principles:** The student should explain the principles of: • Charging refrigerant • Leakage detection • Non fusion welding • Working principles of different types of compressors **Theories:** The student should explain: • Basic Refrigeration cycle • Super heating • Classification of refrigerants **Circumstantial knowledge** **Detailed knowledge about:** • Environmental regulation on	• Refrigerant leakage detector • Power supply • Vacuum pump • Pinch off tool • Digital thermometer • Overalls • Safety boots • Safety goggles	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						disposal of oils and refrigerant • Safe handling of welding equipment • Work safety and health regulations		
		(b) Replacing compressor	**Brainstorm:** Guide the students to define compressor and their application **Demonstration:** Demonstrate to the students on how to replace compressor and to handle tools and equipment **Practical work:** Organise the students into manageable groups to replace compressor	• Select proper tools and equipment • Purge the system • Charge the unit with fresh refrigerant • Measure pressure quantities • Detect refrigerant leakage • Perform soldering and brazing • Measure electrical quantities • Clean tools and workplace	A record of amount of charged refrigerant conforms to technical specifications	**Knowledge evidence: Detailed knowledge of:** **Method used:** The student should explain how to: • Charge refrigerant into a system • Detect refrigerant leaks in a system • Seal the system after charging **Principles:** The student should explain the principles of: (c) Charging refrigerant (d) Leakage detection (e) Non fusion welding (f) Working principles of	The following tools, equipment and safety gear are to be available: • Tool kit • Oxy-acetylene welding set • Digital and analog multimeter • Refrigerant leakage detector • Power supply • Vacuum pump • Pinch off tool • Digital thermometer • Overalls • Safety boots • Safety goggles	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				• Store tools		different types of compressors **Theories:** The student should explain: • Basic Refrigeration cycle • Super heating • Classification of refrigerants **Circumstantial knowledge** **Detailed knowledge about:** • Environmental regulation on disposal of oils and refrigerant • Safe handling of welding equipment • Work safety and health regulations		
		(c) Repairing condensing unit	**Brainstorm:** Guide the students to define condensing unit and their application **Demonstration:**	• Select proper tools and equipment • Purge the system • Charge the unit with	A record of amount of charged refrigerant conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to:	The following tools, equipment and safety gear are to be available: • Tool kit	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Demonstrate to the students on how to repair condensing unit and to handle tools and equipment **Practical work:** Organise the students into manageable groups to repair condensing unit	fresh refrigerant • Measure pressure quantities • Detect refrigerant leakage • Perform soldering and brazing • Measure electrical quantities • Clean tools and workplace • Store tools		• Charge refrigerant into a system • Detect refrigerant leaks in a system • Seal the system after charging **Principles:** The student should explain the principles of: (d) Charging refrigerant (e) Leakage detection (f) Non fusion welding (g) Working principles of different types of compressors **Theories:** The student should explain: • Basic Refrigeration cycle • Super heating • Classification of refrigerants	• Oxy-acetylene welding set • Digital and analog multimeter • Refrigerant leakage detector • Power supply • Vacuum pump • Pinch off tool • Digital thermometer • Overalls • Safety boots • Safety goggles	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						Circumstantial knowledge **Detailed knowledge about:** • Environmental regulation on disposal of oils and refrigerant • Safe handling of welding equipment • Work safety and health regulations		
		(d) Refilling refrigerant	**Brainstorm:** Guide the students to define refrigerant and their application **Demonstration:** Demonstrate to the students on how to refill refrigerant and to handle tools and equipment **Practical work:** Organise the students into manageable groups to refill refrigerant	• Select proper tools and equipment • Purge the system • Charge the unit with fresh refrigerant • Measure pressure quantities • Detect refrigerant leakage • Measure electrical quantities	A record of amount of charged refrigerant conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Charge refrigerant into a system • Detect refrigerant leaks in a system • Seal the system after charging **Principles:** The student should explain the principles of: (h) Charging refrigerant	The following tools, equipment and safety gear are to be available: • Tool kit • Oxy-acetylene welding set • Digital and analog multimeter • Refrigerant leakage detector • Power supply • Vacuum pump • Pinch off tool • Digital thermometer • Overalls	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				• Clean tools and workplace • Store tools		(i) Leakage detection (j) Non fusion welding (k) Working principles of different types of compressors **Theories:** The student should explain: • Basic Refrigeration cycle • Super heating • Classification of refrigerants **Circumstantial knowledge** **Detailed knowledge about:** • Environmental regulation on disposal of oils and refrigerant • Safe handling of welding equipment • Work safety and health regulations	• Safety boots Safety goggles	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
	2.5 Repairing split unit air conditioners	(a) Repairing the pipe circuit	**Brainstorm:** Guide the students to define repairing the pipe circuit and their application **Demonstration:** Demonstrate to the students on how to repair the pipe circuit and to handle tools and equipment **Practical work:** Organise the students into manageable groups to repair the pipe circuit	• Select tools, equipment and material • Perform troubleshooting • Repair/replace condensing unit • Repair evaporator unit • Replace electric components and electronic cards • Repair/replace refrigerant tubing • Replace compressor • Recharge refrigerant • Re-install units in place • Clean tools, equipment and workplace	The repaired split unit air conditioner conforms to operational and technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Carry out troubleshooting • Re-installing evaporators • Charging refrigerant **Principles:** The student should explain the principles of heat transfer **Theories:** The student should explain state of mater with reference with refrigerant **Circumstantial knowledge** **Detailed knowledge about:** • Installation methods • Environmental regulations	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Electric mechanical toolbox • Vacuum pump • Manifold gauge • Multimeter • Lock detector • Ladder • Trolley • Safety boots • Overall	83

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				• Store tools and equipment				
		(b) Replacing compressor and add oil	**Brainstorm:** Guide the students to define compressor and add oil and their application **Demonstration:** Demonstrate to the students on how to replace compressor and add oil and to handle tools and equipment **Practical work:** Organise the students into manageable groups to replacing compressor and add oil	• Select tools, equipment and material • Perform troubleshooting • Replace electric components and electronic cards • Repair/replace refrigerant tubing • Replace compressor • Recharge refrigerant • Re-install units in place • Clean tools, equipment and workplace • Store tools and equipment	The repaired split unit air conditioner conforms to operational and technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Carry out troubleshooting • Re-installing evaporators • Charging refrigerant **Principles:** The student should explain the principles of heat transfer **Theories:** The student should explain state of mater with reference with refrigerant **Circumstantial knowledge** **Detailed knowledge about:** • Installation methods	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Electric mechanical toolbox • Vacuum pump • Manifold gauge • Multimeter • Lock detector • Ladder • Trolley • Safety boots • Overall	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Environmental regulations		
		(c) Performing pump-down of refrigerant	**Brainstorm:** Guide the students to define pump-down of refrigerant and their application **Demonstration:** Demonstrate to the students on how to perform pump-down of refrigerant and to handle tools and equipment **Practical work:** Organise the students into manageable groups to perform pump-down of refrigerant	• Select tools, equipment and material • Perform troubleshooting • Repair/replace refrigerant tubing • Replace compressor • Recharge refrigerant • Re-install units in place • Clean tools, equipment and workplace • Store tools and equipment	The repaired split unit air conditioner conforms to operational and technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Carry out troubleshooting • Charging refrigerant • Pump down refrigerant **Principles:** The student should explain the principles of heat transfer **Theories:** The student should explain state of mater with reference with refrigerant **Circumstantial knowledge** **Detailed knowledge about:** • Installation methods	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Electric mechanical toolbox • Vacuum pump • Manifold gauge • Multimeter • Lock detector • Ladder • Trolley • Safety boots • Overall	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Environmental regulations		
		(d) Replacing indoor unit	**Brainstorm:** Guide the students to define indoor unit and their application **Demonstration:** Demonstrate to the students on how to replace indoor unit and to handle tools and equipment **Practical work:** Organise the students into manageable groups to replace indoor unit	• Select tools, equipment and material • Perform troubleshooting • Repair/replace indoor unit • Repair evaporator unit • Replace electric components and electronic cards • Clean tools, equipment and workplace • Store tools and equipment	The repaired split unit air conditioner conforms to operational and technical specifications	**Knowledge evidence: Detailed knowledge of:** **Method used:** The student should explain how to: • Carry out troubleshooting • Re-installing evaporators • Charging refrigerant **Principles:** The student should explain the principles of heat transfer **Theories:** The student should explain state of mater with reference with refrigerant **Circumstantial knowledge** **Detailed knowledge about:** • Installation methods • Environmental regulations	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Electric mechanical toolbox • Vacuum pump • Manifold gauge • Multimeter • Lock detector • Ladder • Trolley • Safety boots • Overall	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
		(e) Charging with refrigerant	**Brainstorm:** Guide the students to understand the way on how to charge with refrigerant and their application **Demonstration:** Demonstrate to the students on how to Charge with refrigerant and to handle tools and equipment **Practical work:** Organise the students into manageable groups to charge with refrigerant	• Select tools, equipment and material • Perform troubleshooting • Clean tools, equipment and workplace • Store tools and equipment	The repaired split unit air conditioner conforms to operational and technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Carry out troubleshooting • Re-installing evaporators • Charging refrigerant **Principles:** The student should explain the principles of heat transfer **Theories:** The student should explain state of mater with reference with refrigerant **Circumstantial knowledge** **Detailed knowledge about:** • Installation methods • Environmental regulations	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Electric mechanical toolbox • Vacuum pump • Manifold gauge • Multimeter • Lock detector • Ladder • Trolley • Safety boots • Overall	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
	2.6 Repairing car air conditioners	(a) Replacing receiver drier	**Brainstorm:** Guide the students to define receiver drier and their application **Demonstration:** Demonstrate to the students on how to replace receiver drier and to handle tools and equipment **Practical work:** Organise the students into manageable groups to replace receiver drier	• Select tools and equipment • Diagnostic trouble shooting • Measure refrigerant pressure in the system • Charge the system with fresh refrigerant • Replace electrical fuses • Replace receiver drier • Clean tools and workplace • Store tools and equipment	A record of values of pressure and electrical quantities conform to specified ratings	**Knowledge evidence: Detailed knowledge of:** **Method used:** The student should explain how to: • Replace receiver drier • Charge refrigerant in the system • Perform fluorescent dye leakage test **Principles:** The student should explain the principles of: (f) Electromagnetism (g) Vapor compression refrigeration cycle (h) Connecting electrical circuits in parallel, series and combination **Theories:** The student should explain:	The following tools, equipment and safety gear are to be available: • Vacuum pump • Automobile air conditioning tool kit • Pressure gauge manifold • Power supply • Belt tension gauge • Portable charging station • Computerized air conditioning service station • Leak detector • Eye protection goggles	57

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Types of refrigerants • Gas laws • State of matter **Circumstantial knowledge** **Detailed knowledge about:** • Auto electric circuitry • Safe handling of working tools • Safe handling of measuring instruments • Environmental regulations of refrigerants		
		(b) Replacing compressor and add oil	**Brainstorm:** Guide the students to define compressor and add oil and their application **Demonstration:** Demonstrate to the students on how to replace compressor and add oil and to	• Select tools and equipment • Diagnostic trouble shooting • Measure refrigerant pressure in the system • Charge the system with	A record of values of pressure and electrical quantities conform to specified ratings	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Replace compressor • Add oil in the compressor • Charge refrigerant in the system	The following tools, equipment and safety gear are to be available: • Vacuum pump • Automobile air conditioning tool kit • Pressure gauge manifold • Power supply • Belt tension gauge	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			handle tools and equipment **Practical work:** Organise the students into manageable groups to replace compressor and add oil	fresh refrigerant • Clean tools and workplace • Store tools and equipment		• Perform fluorescent dye leakage test **Principles:** The student should explain the principles of: (c) Vapor compression refrigeration cycle (d) Connecting electrical circuits in parallel, series and combination **Theories:** The student should explain: • Types of refrigerants • Gas laws • State of matter • Types of compressors **Circumstantial knowledge** **Detailed knowledge about:** • Auto electric circuitry	• Portable charging station • Computerized air conditioning service station • Leak detector • Eye protection goggles	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Safe handling of working tools • Safe handling of measuring instruments • Environmental regulations of refrigerants		
		(c) Replacing TEV and evaporator	**Brainstorm:** Guide the students to define TEV and evaporator and add oil and their application **Demonstration:** Demonstrate to the students on how to replace TEV and evaporator and to handle tools and equipment **Practical work:** Organise the students into manageable groups to replace TEV and evaporator	• Select tools and equipment • Diagnostic trouble shooting • Measure refrigerant pressure in the system • Charge the system with fresh refrigerant • Replace electrical fuses • Replace evaporator • Clean tools and workplace	A record of values of pressure and electrical quantities conform to specified ratings	**Knowledge evidence: Detailed knowledge of:** **Method used:** The student should explain how to: • Replace TET and evaporator • Charge refrigerant in the system • Perform fluorescent dye leakage test **Principles:** The student should explain the principles of: (d) Electromagnetism (e) Vapor compression refrigeration cycle	The following tools, equipment and safety gear are to be available: • Vacuum pump • Automobile air conditioning tool kit • Pressure gauge manifold • Power supply • Belt tension gauge • Portable charging station • Computerized air conditioning service station • Leak detector • Eye protection goggles	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				• Store tools and equipment		(f) Connecting electrical circuits in parallel, series and combination **Theories:** The student should explain: • Types of refrigerants • Gas laws • State of matter **Circumstantial knowledge** **Detailed knowledge about:** • Auto electric circuitry • Safe handling of working tools • Safe handling of measuring instruments Environmental regulations of refrigerants		
		(d) Replacing condenser and pipe circuit	**Brainstorm:** Guide the students to define condenser and their application	• Select tools and equipment	A record of values of pressure and electrical quantities	**Knowledge evidence: Detailed knowledge of:**	The following tools, equipment and safety gear are to be available: • Vacuum pump	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Demonstration: Demonstrate to the students on how to Replace condenser and to handle tools and equipment **Practical work:** Organise the students into manageable groups to replace condenser	• Diagnostic trouble shooting • Measure refrigerant pressure in the system • Charge the system with fresh refrigerant • Replace electrical fuses • Replace condenser • Clean tools and workplace • Store tools and equipment	conform to specified ratings	**Method used:** The student should explain how to: • Replace receiver drier • Charge refrigerant in the system • Perform fluorescent dye leakage test **Principles:** The student should explain the principles of: (g) Electromagnetism (h) Vapor compression refrigeration cycle (i) Connecting electrical circuits in parallel, series and combination **Theories:** The student should explain: • Types of refrigerants • Gas laws	• Automobile air conditioning tool kit • Pressure gauge manifold • Power supply • Belt tension gauge • Portable charging station • Computerized air conditioning service station • Leak detector • Eye protection goggles	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• State of matter **Circumstantial knowledge** **Detailed knowledge about:** • Auto electric circuitry • Safe handling of working tools • Safe handling of measuring instruments • Environmental regulations of refrigerants		
		(e) Charging with refrigerant		• Select tools and equipment • Diagnostic trouble shooting • Measure refrigerant pressure in the system • Charge the system with fresh refrigerant	A record of values of pressure and electrical quantities conform to specified ratings	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Replace receiver drier • Charge refrigerant in the system • Perform fluorescent dye leakage test	The following tools, equipment and safety gear are to be available: • Vacuum pump • Automobile air conditioning tool kit • Pressure gauge manifold • Power supply • Belt tension gauge • Portable charging station	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				• Clean tools and workplace • Store tools and equipment		**Principles:** The student should explain the principles of: (j) Electromagnetism (k) Vapor compression refrigeration cycle (l) Connecting electrical circuits in parallel, series and combination **Theories:** The student should explain: • Types of refrigerants • Gas laws • State of matter **Circumstantial knowledge** **Detailed knowledge about:** • Auto electric circuitry • Safe handling of working tools	• Computerized air conditioning service station • Leak detector • Eye protection goggles	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Safe handling of measuring instruments • Environmental regulations of refrigerants		
3.0 Installing air conditioning systems	3.1 installing self-contained air conditioners	(a) Installing window type	**Brainstorm:** Guide the students to define window type air condition and their application **Demonstration:** Demonstrate to the students on how to install window type and to handle tools and equipment **Practical work:** Organise the students into manageable groups to install window type	• Read and interpret installation drawings • Select tools and equipment • Select and prepare mounting place • Perform inspection for damages • Mount the units in place • Install electrical supply circuits • Test run the equipment • Produce documentation in	Installed unit operate according to technical specifications	**Knowledge evidence: Detailed knowledge of:** **Method used:** The student should explain how to: • Select different locations to fit units • Prepare installation site • Determine air properties **Principles:** The student should explain the principles of operation and air flow in a conditioned space **Theories:** The student should explain: • Heat load estimate • Psychrometric – chart	The following tools, equipment and safety gear are to be available: • Pressure gauge manifold • Oxy-acetylene welding set • • Wattmeter • Volt-ohm milliammeter (VOM) • Digital multimeter • Spirit level • Laser beam spirit level • Hand power tools (drilling machine, grinder) • Lifting tackle • Megger • Noise meter	59

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				accordance with work site procedures • Clean the workplace and tools • Store tools and equipment		• Air and air properties • Dos and don'ts on site selection **Circumstantial knowledge** **Detailed knowledge about:** • Safe working and handling of unit • Safe handling of tools and equipment • Safe handling the water condensate	• Electronic leak detector • Pinch off tool • Ladder • Electro-mechanical toolbox • Measuring tape • Trolley	
		(b) Installing console cabinet type	**Brainstorm:** Guide the students to define console cabinet type and their application **Demonstration:** Demonstrate to the students on how to install console cabinet type and to handle tools and equipment **Practical work:**	• Read and interpret installation drawings • Select tools and equipment • Select and prepare mounting place • Perform inspection for damages	Installed unit operate according to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Select different locations to fit units • Prepare installation site • Determine air properties **Principles:** The student should explain	The following tools, equipment and safety gear are to be available: • Pressure gauge manifold • Oxy-acetylene welding set • Wattmeter • Volt-ohm milliammeter (VOM) • Digital multimeter • Spirit level	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Organise the students into manageable groups to install console cabinet type	• Mount the units in place • Install electrical supply circuits • Test run the equipment • Produce documentation in accordance with work site procedures • Clean the workplace and tools • Store tools and equipment		the principles of operation and air flow in a conditioned space **Theories:** The student should explain: • Heat load estimate • Psychrometric – chart • Air and air properties • Dos and don'ts on site selection **Circumstantial knowledge** **Detailed knowledge about:** • Safe working and handling of unit • Safe handling of tools and equipment • Safe handling the water condensate	• Laser beam spirit level • Hand power tools (drilling machine, grinder) • Lifting tackle • Megger • Noise meter • Electronic leak detector • Pinch off tool • Ladder • Electro-mechanical toolbox • Measuring tape Trolley	
	3.2 Installing split unit air conditioners	(a) Installing condensing unit on slab		• Read and interpret installation drawings	A record of values of pressure, temperature and electrical quantities	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to:	The following tools, equipment and safety gear are to be available: • Spirit level	96

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				• Select tools and equipment • Perform diagnostic trouble shooting • Perform modifications to suit site conditions • Prepare foundation • Grout and fix foundation bolts • Position major components in accordance with drawings, design specifications and instructions • Run refrigerant piping, tubing and	conforming to the specified ratings	• Perform levelling of equipment • Prepare installation site • Install the various components • Perform test run • Fabricate copper tubing • Procedurally install or erect machinery **Principles:** The student should explain the principles of: (c) Making an alignment (d) Temperature controls (e) Leveling a machine (f) Test running equipment **Theories:** The student should explain: • Different preservation temperatures for different items	• Laser beam spirit level • Hand power tools (drilling machine, grinder) • Lifting tackle • Pipe cutters • Pipe expanders (swaging tools) • Flaring tool • Pinch off tool • Electro-mechanical toolbox • Measuring tape	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				condensate drain • Ensure ancillary components are installed in accordance with drawings, design specifications and instruction • Produce documentation in accordance with work site procedures (commissioning) • Clean the workplace and tools • Store tools and equipment		• Use of installation drawings • Importance of control systems • Verification of acceptable performances of equipment • Machinery erection procedures • Dos and Don'ts on site selection **Circumstantial knowledge** **Detailed knowledge about:** • Installation codes of practice • Documented safety procedures and safety plans for personal and work site safety • Safe handling of tools, measuring instruments and materials		
		(b) Installing condensing unit	**Brainstorm:**	• Read and interpret	A record of values of	**Knowledge evidence:**	The following tools, equipment and	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
		on hanged brackets	Guide the students to define condensing unit on hanged brackets and their application **Demonstration:** Demonstrate to the students on how to install condensing unit on hanged brackets and to handle tools and equipment **Practical work:** Organise the students into manageable groups to install condensing unit on hanged brackets	installation drawings • Select tools and equipment • Perform diagnostic trouble shooting • Perform modifications to suit site conditions • Prepare foundation • Grout and fix foundation bolts • Position major components in accordance with drawings, design specifications and instructions • Run refrigerant piping, tubing	pressure, temperature and electrical quantities conforming to the specified ratings	**Detailed knowledge of:** **Method used:** The student should explain how to: • Perform levelling of equipment • Prepare installation site • Install the various components • Perform test run • Fabricate copper tubing • Procedurally install or erect machinery **Principles:** The student should explain the principles of: (c) Making an alignment (d) Temperature controls (e) Leveling a machine (f) Test running equipment **Theories:** The student should explain:	safety gear are to be available: • Spirit level • Laser beam spirit level • Hand power tools (drilling machine, grinder) • Lifting tackle • Pipe cutters • Pipe expanders (swaging tools) • Flaring tool • Pinch off tool • Electro-mechanical toolbox • Measuring tape	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				and condensate drain • Ensure ancillary components are installed in accordance with drawings, design specifications and instruction • Produce documentation in accordance with work site procedures (commissioning) • Clean the workplace and tools • Store tools and equipment		• Different preservation temperatures for different items • Use of installation drawings • Importance of control systems • Verification of acceptable performances of equipment • Machinery erection procedures • Dos and Don'ts on site selection **Circumstantial knowledge** **Detailed knowledge about:** • Installation codes of practice • Documented safety procedures and safety plans for personal and work site safety • Safe handling of tools, measuring		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						instruments and materials		
		(c) Installing wall mounted indoor unit	**Brainstorm:** Guide the students to define wall mounted indoor unit and their application **Demonstration:** Demonstrate to the students on how to install wall mounted indoor unit and to handle tools and equipment **Practical work:** Organise the students into manageable groups to install wall mounted indoor unit	• Read and interpret installation drawings • Select tools and equipment • Perform diagnostic trouble shooting • Perform modifications to suit site conditions • Prepare foundation • Grout and fix foundation bolts • Position major components in accordance with drawings, design specifications	A record of values of pressure, temperature and electrical quantities conforming to the specified ratings	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Perform levelling of equipment • Prepare installation site • Install the various components • Perform test run • Fabricate copper tubing • Procedurally install or erect machinery **Principles:** The student should explain the principles of: (d) Making an alignment (e) Temperature controls (f) Levelling a machine (g) Test running equipment	The following tools, equipment and safety gear are to be available: • Spirit level • Laser beam spirit level • Hand power tools (drilling machine, grinder) • Lifting tackle • Pipe cutters • Pipe expanders (swaging tools) • Flaring tool • Pinch off tool • Electro-mechanical toolbox Measuring tape	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				and instructions • Run refrigerant piping, tubing and condensate drain • Ensure ancillary components are installed in accordance with drawings, design specifications and instruction • Produce documentation in accordance with work site procedures (commissioning) • Clean the workplace and tools		**Theories:** The student should explain: • Different preservation temperatures for different items • Use of installation drawings • Importance of control systems • Verification of acceptable performances of equipment • Machinery erection procedures • Dos and Don'ts on site selection **Circumstantial knowledge** **Detailed knowledge about:** • Installation codes of practice • Documented safety procedures and safety plans for personal and work site safety		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				• Store tools and equipment		• Safe handling of tools, measuring instruments and materials		
		(d) Installing cassette type indoor unit	**Brainstorm:** Guide the students to define cassette type indoor unit and their application **Demonstration:** Demonstrate to the students on how to install cassette type indoor unit and to handle tools and equipment **Practical work:** Organise the students into manageable groups to install cassette type indoor unit	• Read and interpret installation drawings • Select tools and equipment • Perform diagnostic trouble shooting • Perform modifications to suit site conditions • Prepare foundation • Grout and fix foundation bolts • Position major components in accordance with drawings, design	A record of values of pressure, temperature and electrical quantities conforming to the specified ratings	**Knowledge evidence: Detailed knowledge of:** **Method used:** The student should explain how to: • Perform levelling of equipment • Prepare installation site • Install the various components • Perform test run • Fabricate copper tubing • Procedurally install or erect machinery **Principles:** The student should explain the principles of: (h) Making an alignment (i) Temperature controls (j) Levelling a machine	The following tools, equipment and safety gear are to be available: • Spirit level • Laser beam spirit level • Hand power tools (drilling machine, grinder) • Lifting tackle • Pipe cutters • Pipe expanders (swaging tools) • Flaring tool • Pinch off tool • Electro-mechanical toolboxMeasuring tape	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				specifications and instructions • Run refrigerant piping, tubing and condensate drain • Ensure ancillary components are installed in accordance with drawings, design specifications and instruction • Produce documentation in accordance with work site procedures (commissioning) • Clean the workplace and tools		(k) Test running equipment **Theories:** The student should explain: • Different preservation temperatures for different items • Use of installation drawings • Importance of control systems • Verification of acceptable performances of equipment • Machinery erection procedures • Dos and Don'ts on site selection **Circumstantial knowledge** **Detailed knowledge about:** • Installation codes of practice • Documented safety procedures and safety plans		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				• Store tools and equipment		for personal and work site safety • Safe handling of tools, measuring instruments and materials		
		(e)Installing floor type indoor unit	**Brainstorm:** Guide the students to define floor type indoor unit and their application **Demonstration:** Demonstrate to the students on how to install floor type indoor unit and to handle tools and equipment **Practical work:** Organise the students into manageable groups to install floor type indoor unit	• Read and interpret installation drawings • Select tools and equipment • Perform diagnostic trouble shooting • Perform modifications to suit site conditions • Prepare foundation • Grout and fix foundation bolts • Position major components in accordance with	A record of values of pressure, temperature and electrical quantities conforming to the specified ratings	**Knowledge evidence: Detailed knowledge of:** **Method used:** The student should explain how to: • Perform levelling of equipment • Prepare installation site • Install the various components • Perform test run • Fabricate copper tubing • Procedurally install or erect machinery **Principles:** The student should explain the principles of: (l) Making an alignment (m) Temperature controls	The following tools, equipment and safety gear are to be available: • Spirit level • Laser beam spirit level • Hand power tools (drilling machine, grinder) • Lifting tackle • Pipe cutters • Pipe expanders (swaging tools) • Flaring tool • Pinch off tool • Electro-mechanical toolbox • Measuring tape	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				drawings, design specifications and instructions • Run refrigerant piping, tubing and condensate drain • Ensure ancillary components are installed in accordance with drawings, design specifications and instruction • Produce documentation in accordance with work site procedures (commissioning)		(n) Levelling a machine (o) Test running equipment **Theories:** The student should explain: • Different preservation temperatures for different items • Use of installation drawings • Importance of control systems • Verification of acceptable performances of equipment • Machinery erection procedures • Dos and Don'ts on site selection **Circumstantial knowledge** **Detailed knowledge about:** • Installation codes of practice		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				• Clean the workplace and tools • Store tools and equipment		• Documented safety procedures and safety plans for personal and work site safety • Safe handling of tools, measuring instruments and materials		
		(f) Installing piping circuit	**Brainstorm:** Guide the students to define piping circuit and their application **Demonstration:** Demonstrate to the students on how to install piping circuit and to handle tools and equipment **Practical work:** Organise the students into manageable groups to install piping circuit	• Read and interpret installation drawings • Select tools and equipment • Perform modifications to suit site conditions • Position major components in accordance with drawings, design specifications and instructions	A record of values of pressure, temperature and electrical quantities conforming to the specified ratings	**Knowledge evidence: Detailed knowledge of:** **Method used:** The student should explain how to: • Perform levelling of equipment • Prepare installation site • Install the various components • Perform test run • Fabricate copper tubing • Procedurally install or erect machinery **Principles:** The student should explain the principles of:	This element can be achieved at a workplace or training institution The following tools, equipment and safety gear are to be available: • Pressure gauge manifold • Oxy-acetylene welding set • Wattmeter • Volt-ohm milliammeter (VOM) • Digital multimeter • Spirit level • Laser beam spirit level	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				• Run refrigerant piping, tubing and condensate drain • Ensure ancillary components are installed in accordance with drawings, design specifications and instruction • Test run the equipment • Produce documentation in accordance with work site procedures (commissioning) • Clean the workplace and tools		(p) Making an alignment (q) Temperature controls (r) Levelling a machine (s) Test running equipment **Theories:** The student should explain: • Different preservation temperatures for different items • Use of installation drawings • Importance of control systems • Verification of acceptable performances of equipment • Machinery erection procedures • Dos and Don'ts on site selection	• Hand power tools (drilling machine, grinder) • Lifting tackle • Megger • Noise meter • Oil pump • Pipe cutters • Pipe expanders (swaging tools) • Leak detector • Flaring tool • Electronic leak detector • Pinch off tool • Charging cylinder • Capacitor analyzer • Air flow meter • Electro-mechanical toolbox • Measuring tape	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				• Store tools and equipment		**Circumstantial knowledge** **Detailed knowledge about:** • Installation codes of practice • Documented safety procedures and safety plans for personal and work site safety • Safe handling of tools, measuring instruments and materials		
		(g) Installing supply circuit	**Brainstorm:** Guide the students to define supply circuit and their application **Demonstration:** Demonstrate to the students on how to install supply circuit and to handle tools and equipment	• Read and interpret installation drawings • Select tools and equipment • Perform diagnostic trouble shooting • Position major components in accordance with	A record of values of pressure, temperature and electrical quantities conforming to the specified ratings	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Prepare installation site • Install the various components • Perform test run • Procedurally install or erect machinery	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Wattmeter • Volt-ohm milliammeter (VOM) • Digital multimeter • Hand power tools (drilling machine, grinder)	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Practical work: Organise the students into manageable groups to install supply circuit	drawings, design specifications and instructions • Ensure ancillary components are installed in accordance with drawings, design specifications and instruction • Test run the equipment • Produce documentation in accordance with work site procedures (commissioning) • Clean the workplace and tools		**Principles:** The student should explain the principles of: (t) Making an alignment (u) Test running equipment **Theories:** The student should explain: • Different preservation temperatures for different items • Use of installation drawings • Importance of control systems • Verification of acceptable performances of equipment • Machinery erection procedures • Dos and Don'ts on site selection **Circumstantial knowledge** **Detailed knowledge about:**	• Megger • Electronic leak detector • Capacitor analyzer • Air flow meter Electro-mechanical toolbox • Measuring tape	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				• Store tools and equipment		• Installation codes of practice • Documented safety procedures and safety plans for personal and work site safety • Safe handling of tools, measuring instruments and materials		
	3.3 Installing cassette type air conditioners	(a) Installing wall mounted indoor unit	**Brainstorm:** Guide the students to define wall mounted indoor unit and their application **Demonstration:** Demonstrate to the students on how to install wall mounted indoor unit and to handle tools and equipment **Practical work:** Organise the students into manageable groups to install wall mounted indoor unit	• Read and interpret installation drawings • Select tools and equipment • Perform diagnostic trouble shooting • Perform modifications to suit site conditions • Prepare foundation • Grout and fix foundation bolts	A record of values of pressure, temperature and electrical quantities conforming to the specified ratings	**Knowledge evidence: Detailed knowledge of:** **Method used:** The student should explain how to: • Perform levelling of equipment • Prepare installation site • Install the various components • Perform test run • Fabricate copper tubing • Procedurally install or erect machinery	The following tools, equipment and safety gear are to be available: • Pressure gauge manifold • Oxy-acetylene welding set • • Wattmeter • Volt-ohm milliammeter (VOM) • Digital multimeter • Spirit level • Laser beam spirit level • Hand power tools (drilling	60

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				• Position major components in accordance with drawings, design specifications and instructions • Run refrigerant piping, tubing and condensate drain • Ensure ancillary components are installed in accordance with drawings, design specifications and instruction • Test run the equipment • Produce documentation in		**Principles:** The student should explain the principles of: (v) Making an alignment (w) Temperature controls (x) Levelling a machine (y) Test running equipment **Theories:** The student should explain: • Different preservation temperatures for different items • Use of installation drawings • Importance of control systems • Verification of acceptable performances of an equipment • Machinery erection procedures • Do and Don'ts on site selection	machine, grinder) • Lifting tackle • Megger • Noise meter • Oil pump • Pipe cutters • Pipe expanders (swaging tools) • Leak detector • Flaring tool • Electronic leak detector • Pinch off tool • Charging cylinder • Capacitor analyzer • Air flow meter • Electro-mechanical toolbox • Measuring tape	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				accordance with work site procedures (commissioning) • Clean the workplace and tools • Store tools and equipment		**Circumstantial knowledge** **Detailed knowledge about:** • Installation codes of practice • Documented safety procedures and safety plans for personal and work site safety • Safe handling of tools, measuring instruments and materials		
		(b) Installing ceiling type/cassette indoor unit	**Brainstorm:** Guide the students to define ceiling type/cassette indoor unit and their application **Demonstration:** Demonstrate to the students on how to install ceiling type/cassette indoor unit and to handle tools and equipment	• Read and interpret installation drawings • Select tools and equipment • Perform diagnostic trouble shooting • Perform modifications to suit site conditions	A record of values of pressure, temperature and electrical quantities conforming to the specified ratings	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Perform levelling of equipment • Prepare installation site • Install the various components • Perform test run • Fabricate copper tubing	The following tools, equipment and safety gear are to be available: • Pressure gauge manifold • Oxy-acetylene welding set • Wattmeter • Volt-ohm milliammeter (VOM) • Digital multimeter • Spirit level	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Practical work: Organise the students into manageable groups to install ceiling type/cassette indoor unit	• Prepare foundation • Grout and fix foundation bolts • Position major components in accordance with drawings, design specifications and instructions • Run refrigerant piping, tubing and condensate drain • Ensure ancillary components are installed in accordance with drawings, design specifications and instruction		• Procedurally install or erect machinery **Principles:** The student should explain the principles of: (z) Making an alignment (aa) Temperature controls (bb) Levelling a machine (cc) Test running equipment **Theories:** The student should explain: • Different preservation temperatures for different items • Use of installation drawings • Importance of control systems • Verification of acceptable performances of an equipment	• Laser beam spirit level • Hand power tools (drilling machine, grinder) • Lifting tackle • Megger • Noise meter • Oil pump • Pipe cutters • Pipe expanders (swaging tools) • Leak detector • Flaring tool • Electronic leak detector • Pinch off tool • Charging cylinder • Capacitor analyzer • Air flow meter • Electro-mechanical toolbox • Measuring tape	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				• Test run the equipment • Produce documentation in accordance with work site procedures (commissioning) • Clean the workplace and tools • Store tools and equipment		• Machinery erection procedures • Do and Don'ts on site selection **Circumstantial knowledge** **Detailed knowledge about:** • Installation codes of practice • Documented safety procedures and safety plans for personal and work site safety • Safe handling of tools, measuring instruments and materials		
4.0 Building advance refrigeration system control circuits	4.1 Installing control of AC machines	(a) Installing a DOL starter in cooperating remote control	**Brainstorm:** Guide the students to define a DOL starter in cooperating remote control and their application **Demonstration:**	• Interpret control diagram • Identify types and ratings of machine control • Mark the location for installing the	The machines control installed and functions as per technical manufacturer's manual specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Install single phase machine control	The following tools, equipment and safety gear are to be available: • Set of screw drivers • Analogue and digital multimeter	92

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			Demonstrate to the students on how to install a DOL starter in cooperating remote control and to handle tools and equipment **Practical work:** Organise the students into manageable groups to install a DOL starter in cooperating remote control	machine control systems • Install the machine control • Terminate cables • Test the machine control • Clean the workplace • Store tools, equipment and safety gears		• Install three phase machine control (dd) **Principles:** The student should explain the principles of operating machine control **Theories:** The student should explain: • Types of machine control • Major parts of machine control • Power rating of machine control • Application and importance of machine control **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of machine controls • First aid	• Set of open-ended spanners • Work bench • Safety boots • Safety goggles • Leather and plastic gloves • Overalls • Diagonal cutting plier • Combination plier • Wooden boards	
		(b) Installing DOL starter by using jogging method	**Brainstorm:** Guide the students to define	• Interpret control diagram	The machines control installed and	**Knowledge Evidence:**	The following tools, equipment and	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			a DOL starter by using jogging method and their application **Demonstration:** Demonstrate to the students on how to install DOL starter by using jogging method and to handle tools and equipment **Practical work:** Organise the students into manageable groups to install DOL starter by using jogging method	• Identify types and ratings of machine control • Mark the location for installing the machine control systems • Install the machine control • Terminate cables • Test the machine control • Clean the work place • Store tools, equipment and safety gears	functions as per technical manufacturer's manual specifications	**Detailed knowledge of:** **Method used:** The student should explain how to: • Install single phase machine control • Install three phase machine control (c) **Principles:** The student should explain the principles of operating machine control **Theories:** The student should explain: • Types of machine control • Major parts of machine control • Power rating of machine control • Application and importance of machine control **Circumstantial knowledge:**	safety gear are to be available: • Set of screw drivers • Analogue and digital multimeter • Set of open-ended spanners • Work bench • Safety boots • Safety goggles • Leather and plastic gloves • Overalls • Diagonal cutting plier • Combination plier Wooden boards	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						Detailed knowledge about: • Safe handling of machine controls • First aid		
		(c) Installing forward reverse starter	**Brainstorm:** Guide the students to define forward reverse starter and their application **Demonstration:** Demonstrate to the students on how to install forward reverse starter and to handle tools and equipment **Practical work:** Organise the students into manageable groups to install forward reverse starter	• Interpret control diagram • Identify types and ratings of machine control • Mark the location for installing the machine control systems • Install the machine control • Terminate cables • Test the machine control • Clean the workplace • Store tools, equipment	The machines control installed and functions as per technical manufacturer's manual specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Install single phase machine control • Install three phase machine control (d) **Principles:** The student should explain the principles of operating machine control **Theories:** The student should explain: • Types of machine control • Major parts of machine control	The following tools, equipment and safety gear are to be available: • Set of screw drivers • Analogue and digital multimeter • Set of open-ended spanners • Work bench • Safety boots • Safety goggles • Leather and plastic gloves • Overalls • Diagonal cutting plier • Combination plier • Wooden boards	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				and safety gears		• Power rating of machine control • Application and importance of machine control **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of machine controls • First aid		
		(d) Installing manual star-delta starter	**Brainstorm:** Guide the students to define manual star-delta starter and their application **Demonstration:** Demonstrate to the students on how to install manual star-delta starter and to handle tools and equipment **Practical work:** Organise the students into manageable groups to install	• Interpret control diagram • Identify types and ratings of machine control • Mark the location for installing the machine control systems • Install the machine control • Terminate cables	The machines control installed and functions as per technical manufacturer's manual specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Install single phase machine control • Install three phase machine control (e) **Principles:** The student should explain the principles of operating	The following tools, equipment and safety gear are to be available: • Set of screw drivers • Analogue and digital multimeter • Set of open-ended spanners • Work bench • Safety boots • Safety goggles • Leather and plastic gloves • Overalls • Diagonal cutting plier	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			manual star-delta starter	• Test the machine control • Clean the workplace • Store tools, equipment and safety gears		machine control **Theories:** The student should explain: • Types of machine control • Major parts of machine control • Power rating of machine control • Application and importance of machine control **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of machine controls • First aid	• Combination plier • Wooden boards	
		(e) Installing automatic star-delta starter	**Brainstorm:** Guide the students to define automatic star-delta starter and their application **Demonstration:** Demonstrate to the students on how to install automatic star-	• Interpret control diagram • Identify types and ratings of machine control • Mark the location for installing the machine	The machines control installed and functions as per technical manufacturer's manual specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The element should explain how to: • Install single phase machine control	The following tools, equipment and safety gear are to be available: • Set of screw drivers • Analogue and digital multimeter • Set of open-ended spanners	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			delta starter and to handle tools and equipment **Practical work:** Organise the students into manageable groups to install automatic star-delta starter	control systems • Install the machine control • Terminate cables • Test the machine control • Clean the workplace • Store tools, equipment and safety gears		• Install three phase machine control (f) **Principles:** The student should explain the principles of operating machine control **Theories:** The student should explain: • Types of machine control • Major parts of machine control • Power rating of machine control • Application and importance of machine control **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of machine controls • First aid	• Work bench • Safety boots • Safety goggles • Leather and plastic gloves • Overalls • Diagonal cutting plier • Combination plier • Wooden boards	
		(f) Installing electrical safety devices	**Brainstorm:** Guide the students to define	• Interpret control diagram	The machines control installed and	**Knowledge Evidence:**	The following tools, equipment and	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			electrical safety devices and their application **Demonstration:** Demonstrate to the students on how to install electrical safety devices and to handle tools and equipment **Practical work:** Organise the students into manageable groups to install electrical safety devices	• Identify types and ratings of machine control • Mark the location for installing the machine control systems • Install the machine control • Terminate cables • Test the machine control • Clean the workplace • Store tools, equipment and safety gears	functions as per technical manufacturer's manual specifications	**Detailed knowledge of:** **Method used:** The student should explain how to: • Install single phase machine control • Install three phase machine control (g) **Principles:** The student should explain the principles of operating machine control **Theories:** The student should explain: • Types of machine control • Major parts of machine control • Power rating of machine control • Application and importance of machine control **Circumstantial knowledge:**	safety gear are to be available: • Set of screw drivers • Analogue and digital multimeter • Set of open-ended spanners • Work bench • Safety boots • Safety goggles • Leather and plastic gloves • Overalls • Diagonal cutting plier • Combination plier • Wooden boards	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						Detailed knowledge about: • Safe handling of machine controls • First aid		
	4.2 Installing compression system refrigerant control circuits	(a) Building controls based on temperature change	**Brainstorm:** Guide the students to define controls based on temperature change and their application **Demonstration:** Demonstrate to the students on how to build controls based on temperature change and to handle tools and equipment **Practical work:** Organise the students into manageable groups to build controls based on temperature change	**The student should be able to:** • Select tools, equipment and safety gears • Interpret working drawing • Test function of control components • Mount refrigerant controls at appropriate locations of the system • Charge system with refrigerant • Clean tools, equipment	Refrigerant controls are installed as per technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain different ways of installing refrigerant controls **Principles:** The student should explain the principle of: (h) Controls based on temperature changes (i) Controls based on pressure changes (j) Controls based on volume or quantity changes **Theories:** The student should explain:	The following tools, equipment and safety gear are to be available: • Electro mechanical toolbox • Manifold gauge • Clamp-on-meter • Thermometer • Wooden installation board • Vacuum pump • Safety goggles • Safety boots • Overall • Refrigerant leakage detector	39

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
				and workplace • Store tools and equipment		• Gas laws • Super heating and sub-cooling process • Flash gas and heating refrigerant operations • Equalizer operations **Circumstantial knowledge:** **Detailed knowledge about:** • Plumbing work • Environmental regulation • Refrigerant safety regulations		
		(b) Building controls based on pressure change	**Brainstorm:** Guide the students to define controls based on pressure change and their application **Demonstration:** Demonstrate to the students on how to build controls based on	• Select tools, equipment and safety gears • Interpret working drawing • Test function of control components • Mount refrigerant	Refrigerant controls are installed as per technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain different ways of installing refrigerant controls **Principles:** The student should explain the principle of:	The following tools, equipment and safety gear are to be available: • Electro mechanical toolbox • Manifold gauge • Clamp-on-meter • Thermometer	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
			pressure change and to handle tools and equipment **Practical work:** Organise the students into manageable groups to build controls based on pressure change	controls at appropriate locations of the system • Charge system with refrigerant • Clean tools, equipment and workplace • Store tools and equipment		(c) Controls based on temperature changes (d) Controls based on pressure changes (e) Controls based on volume or quantity changes **Theories:** The student should explain: • Gas laws • Super heating and sub-cooling process • Flash gas and heating refrigerant operations • Equalizer operations **Circumstantial knowledge:** **Detailed knowledge about:** • Plumbing work • Environmental regulation • Refrigerant safety regulations	• Wooden installation board • Vacuum pump • Safety goggles • Safety boots • Overall • Refrigerant leakage detector	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
		(c) Building controls based on volume or quantity changes	**Brainstorm:** Guide the students to define controls based on volume or quantity changes and their application **Demonstration:** Demonstrate to the students on how to build controls based on volume or quantity changes and to handle tools and equipment **Practical work:** Organise the students into manageable groups to build controls based on volume or quantity changes	• Select tools, equipment and safety gears • Interpret working drawing • Test function of control components • Mount refrigerant controls at appropriate locations of the system • Charge system with refrigerant • Clean tools, equipment and workplace • Store tools and equipment	Refrigerant controls are installed as per technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain different ways of installing refrigerant controls **Principles:** The student should explain the principle of: (d) Controls based on temperature changes (e) Controls based on pressure changes (f) Controls based on volume or quantity changes **Theories:** The student should explain: • Gas laws • Super heating and sub-cooling process • Flash gas and heating refrigerant operations	The following tools, equipment and safety gear are to be available: • Electro mechanical toolbox • Manifold gauge • Clamp-on-meter • Thermometer • Wooden installation board • Vacuum pump • Safety goggles • Safety boots • Overall • Refrigerant leakage detector	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/ Services Assessment	Knowledge assessment		
						• Equalizer operations **Circumstantial knowledge:** **Detailed knowledge about:** • Plumbing work • Environmental regulation • Refrigerant safety regulations		

Form Four

Table 6: *Detailed Contents for Form Four*

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
1.0 Designing domestic refrigeration system	1.1 Designing and make domestic refrigerator	(a) Designing and draw a refrigerator schematic diagram	**Brainstorm:** Guide the students to design and draw a refrigerator schematic diagram and their application **Demonstration:** Demonstrate to the students on how to design and draw a refrigerator schematic diagram and to handle tools and equipment **Practical work:** Organise the students into manageable groups to design and draw a refrigerator schematic diagram	• Make design diagram • Make schematic diagram • Select materials, tools and equipment	Designed and drawn refrigerator schematic diagram confirms to technical specifications Specifications and aesthetic appearance	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: Design and make schematic drawing of the refrigerator **Principles:** The student should explain the principles of: • Designing a refrigerator **Theories:** The student should explain: • P-h chart/diagrams • Material science • Refrigeration cycles	The following tools, equipment and safety gears should be available: • Drawing instruments • Computer (Drilled Design) Auto-card software • Handouts	105

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						Circumstantial knowledge: **Detailed knowledge about:** • Safe handling o working tools and equipment • Aesthetical appearance • Environmental impacts		
		(c) Making evaporator coil	**Brainstorm:** Guide the students to make evaporator coil and their application **Demonstration:** Demonstrate to the students on how to make evaporator coil and to handle tools and equipment **Practical work:** Organise the students into manageable groups	• Make evaporator sketch • Select materials, tools and equipment • Pipe the evaporator coil • Perform spray painting • Apply safety measures • Clean workplace tools and equipment	Designed refrigerator as per to technical Specifications and aesthetic appearance	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: Make evaporator coil • Apply safety precautions • Detect refrigerant leakage	The following tools, equipment and safety gear are to be available: • Electro – mechanical tool kit • Oxy-acetylene plant • Shearing machine • Bending machine • Multimeter • Drilling machine • Pop rivet gun • Soldering gun • Gloves • Safety goggles	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			to make evaporator coil	• Store tools and equipment • Commission the system performance		**Principles:** The student should explain the principles of: • Designing a Evaporator coil **Theories:** The student should explain: • P-h chart/diagrams • Material science • Refrigeration cycles **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of working tools and equipment • Aesthetical appearance • Environmental impacts	• Hand grinder • Heavy duty clamps • Drawing instruments • Computer (Drilled Design) Auto-card software • Handouts • Manifold gauge • Vacuum pump • Clamp – on meter • Air compressor • Tape measure • Leak detector	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
		(d) Constructing refrigerant pipe circuit	**Brainstorm:** Guide the students to define refrigerant pipe circuit and their application **Demonstration:** Demonstrate to the students on how to construct refrigerant pipe circuit and to handle tools and equipment **Practical work:** Organise the students into manageable groups to construct refrigerant pipe circuit	• Select materials, tools and equipment • Make panels to required specifications • Assemble panels to form refrigerator walls • Make refrigerator door with gasket • Mount main components of the refrigeration piping circuit • Pipe the refrigeration circuit • Install wiring circuit • Perform spray painting	Designed refrigerator as per technical Specifications and aesthetic appearance	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Pipe the different types refrigeration circuits • Determine charge • Apply safety precautions **Principles:** The student should explain the principles of: • Refrigeration cycle • Designing a refrigerator **Theories:** The student should explain: • calculations • System components capacity • P-h chart/diagrams	The following tools, equipment and safety gear are to be available: • Electro – mechanical tool kit • Oxy-acetylene plant • Shearing machine • Bending machine • Multimeter • Drilling machine • Pop rivet gun • Soldering gun • Gloves • Safety goggles • Hand grinder • Heavy duty clamps • Drawing instruments • Computer (Drilled Design) Auto-card software • Handouts • Manifold gauge • Vacuum pump	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Evaluate and charge with refrigerant • Apply safety measures • Clean workplace tools and equipment • Store tools and equipment • Commission the system performance		• Material science • Refrigeration cycles **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of working tools and equipment • Aesthetical appearance • Environmental impacts	• Clamp – on meter • Air compressor • Tape measure • Leak detector	
		(e) Installing electrical wiring circuit	**Brainstorm:** Guide the students to define electrical wiring circuit and their application **Demonstration:** Demonstrate to the students on how install electrical wiring circuit and to handle tools and equipment	• Select materials, tools and equipment • Make panels to required specifications • Install wiring circuit • Apply safety measures • Clean workplace	Designed refrigerator as per technical Specifications and aesthetic appearance	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Pipe the different types refrigeration circuits • Determine charge	The following tools, equipment and safety gear are to be available: • Electro – mechanical tool kit • Oxy-acetylene plant • Shearing machine • Bending machine • Multimeter	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Practical work: Organise the students into manageable groups to install electrical wiring circuit	tools and equipment • Store tools and equipment • Commission the system performance		**Principles:** The student should explain the principles of: • Ohms law **Theories:** The student should explain: • Electrical quantity **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of working tools and equipment • Aesthetical appearance • Environmental impacts	• Drilling machine • Pop rivet gun • Soldering gun • Gloves • Safety goggles • Hand grinder • Heavy duty clamps • Drawing instruments • Computer (Drilled Design) Auto-card software • Handouts • Manifold gauge • Vacuum pump • Clamp – on meter • Air compressor • Tape measure • Leak detector	
		(f) Charging and commission the system	**Brainstorm:** Guide the students to define charge and commission	• Select materials, tools and equipment	Designed refrigerator as per technical	**Knowledge Evidence:** **Detailed knowledge of:**	The following tools, equipment and safety gear are to be available:	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			the system and their application **Demonstration:** Demonstrate to the students on how charge and commission the system and to handle tools and equipment **Practical work:** Organise the students into manageable groups to charge and commission the system	• Evaluate and charge with refrigerant • Apply safety measures • Clean workplace tools and equipment • Store tools and equipment • Commission the system performance	Specifications and aesthetic appearance	**Method used:** The student should explain how to: • Detect refrigerant leakage and commission **Principles:** The student should explain the principles of: • Refrigeration cycle • Designing a refrigerator • Heat transfer **Theories:** The student should explain: • System components capacity • Material science • Refrigeration cycles **Circumstantial knowledge:**	• Electro – mechanical tool kit • Oxy-acetylene plant • Shearing machine • Bending machine • Multimeter • Gloves • Safety goggles • Hand grinder • Heavy duty clamps • Drawing instruments • Computer (Drilled Design) Auto-card software • Handouts • Manifold gauge • Vacuum pump • Clamp – on meter • Air compressor • Tape measure • Leak detector	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						Detailed knowledge about: • Safe handling of working tools and equipment • Aesthetical appearance • Environmental impacts		
		(g) Making clutter in Refrigerator	**Brainstorm:** Guide the students to define clutter in Refrigerator and their application **Demonstration:** Demonstrate to the students on how make clutter in Refrigerator and to handle tools and equipment **Practical work:** Organise the students into manageable groups	• Select materials, tools and equipment • Check the lack of storage • Observe over-purchasing • Check overcrowding • Clean workplace tools and equipment • Store tools and equipment	Designed refrigerator as per technical Specifications and aesthetic appearance	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: Make and assemble panels for minimum • Pipe the different types refrigeration circuits • Determine charge • Apply safety precautions • Detect	The following tools, equipment and safety gear are to be available: • Electro – mechanical tool kit • Oxy-acetylene plant • Shearing machine • Bending machine • Multimeter • Drilling machine • Pop rivet gun • Soldering gun • Gloves • Safety goggles	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			to make Clutter in Refrigerator			refrigerant leakage **Principles:** The student should explain the principles of: • Pressure and Temperature controls • Refrigeration cycle • Designing a refrigerator • Heat transfer **Theories:** The student should explain: • Heat load calculations • System components capacity • P-h chart/diagrams • Material science • Refrigeration cycles **Circumstantial knowledge:** **Detailed knowledge**	• Hand grinder • Heavy duty clamps • Drawing instruments • Computer (Drilled Design) Auto-card software • Handouts • Manifold gauge • Vacuum pump • Clamp – on meter • Air compressor • Tape measure • Leak detector	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						about: • Safe handling of working tools and equipment • Aesthetical appearance • Environmental impacts		
	1.2 Designing and make domestic freezers	(a) Designing and draw working drawing of chest-freezer	**Brainstorm:** Guide the students to define drawing of chest-freezer **Demonstration:** Demonstrate to the students on how design and draw working drawing of chest-freezer and to handle tools and equipment **Practical work:** Organise the students into manageable groups design and draw	**The student should be able to:** • Select materials, tools and equipment • Draw mechanical working drawing (Detail and Assembly) • Draw electrical wiring circuit diagrams • Prepare freezer body	Designed and made freezer conform to technical specifications and aesthetic appearance	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Design and manufacture different types of freezers • Apply safety measures **Principles:** The student should explain the principles of: (h) Design parameters **Theories:** The student should explain:	The following tools, equipment and safety gear are to be available: • Computer with CAD software • Tape measure • Set square • Drawing board	113

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			working drawing of chest-freezer	to required specifications • Apply safety measures • Commission the performance • Clean the workplace, tools and equipment • Store tools, equipment and machine		• Steps of drawing and assembly • Materials science **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of tools, equipment and machines • Environmental regulations		
		(b) Making freezer body	**Brainstorm:** Guide the students to define freezer body **Demonstration:** Demonstrate to the students on how make freezer body and to handle tools and equipment **Practical work:**	**The student should be able to:** • Select materials, tools and equipment • Draw mechanical working drawing (Detail and Assembly) • Draw electrical	Designed and made freezer conform to technical specifications and aesthetic appearance	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Design and manufacture different types of freezers • Apply safety measures **Principles:** The student should explain the principles of:	The following tools, equipment and safety gear are to be available: • Oxy-acetylene plant • Electro-mechanical tool kit • Shearing machine • Vacuum pump • Bending machine • Drilling machine • Computer with CAD software	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Organise the students into manageable groups make freezer body	wiring circuit diagrams • Prepare freezer body to required specifications • Mount the refrigerating components • Pipe the freezer components • Mount electrical and perform wiring of the circuit • Fabricate door with gaskets • Fit the door to freezer body • Perform finishing to aesthetic appearance • Perform spray painting		(i) Heat transfer and exchange (j) Design parameters **Theories:** The student should explain: • Steps to estimate refrigerating capacity of a unit • Materials science **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of tools, equipment and machines • Environmental regulations	• Pop rivet gun • Soldering gun • Resistance welding machine • Tape measure • Thermometer • Spray painting compressor • Safety gears facilities	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Apply safety measures • Commission the performance • Clean the workplace, tools and equipment • Store tools, equipment and machine				
		(c)Making evaporator coil	**Brainstorm:** Guide the students to define evaporator **Demonstration:** Demonstrate to the students on how make evaporator and to handle tools and equipment **Practical work:** Organise the students into	**The student should be able to:** • Select materials, tools and equipment • Draw mechanical working drawing (Detail and Assembly) • Draw electrical wiring circuit diagrams	Designed and made freezer conform to technical specifications and aesthetic appearance	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Design and manufacture different types of freezers • Apply safety measures **Principles:** The student should explain the principles of: (k) Heat transfer and exchange	The following tools, equipment and safety gear are to be available: • Oxy-acetylene plant • Electro-mechanical tool kit • Shearing machine • Bending machine • Drilling machine • Pop rivet gun • Soldering gun • Resistance welding machine • Tape measure	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			manageable groups make evaporator	• Prepare evaporator coil to required specifications • Mount the refrigerating components • Fabricate evaporator coil • Perform finishing to aesthetic appearance • Perform spray painting • Apply safety measures • Commission the performance • Clean the workplace, tools and equipment • Store tools, equipment and machine		(l) Design parameters **Theories:** The student should explain: • Steps to make evaporator coil • Materials science **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of tools, equipment and machines • Environmental regulations	• Thermometer • Spray painting compressor • Safety gears facilities	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
		(d) Constructing refrigerant pipe circuit	**Brainstorm:** Guide the students to define refrigerant pipe circuit **Demonstration:** Demonstrate to the students on how construct refrigerant pipe circuit and to handle tools and equipment **Practical work:** Organise the students into manageable groups construct refrigerant pipe circuit	**The student should be able to:** • Select materials, tools and equipment • Draw mechanical working drawing (Detail and Assembly) • Pipe the refrigerating components • Mount electrical and perform wiring of the circuit • Perform finishing to aesthetic appearance • Perform spray painting • Apply safety measures	Designed and made freezer conform to technical specifications and aesthetic appearance	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Construct refrigerant pipe circuit • Apply safety measures **Principles:** The student should explain the principles of: (m) Heat transfer and exchange (n) Design parameters **Theories:** The student should explain: • Steps to estimate refrigerating capacity of a unit • Materials science **Circumstantial knowledge:** **Detailed knowledge about:**	The following tools, equipment and safety gear are to be available: • Oxy-acetylene plant • Electro-mechanical tool kit • Shearing machine • Bending machine • Drilling machine • Pop rivet gun • Soldering gun • Resistance welding machine • Tape measure • Thermometer • Spray painting compressor • Safety gears facilities	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Commission the performance • Clean the workplace, tools and equipment • Store tools, equipment and machine		• Safe handling of tools, equipment and machines • Environmental regulations		
		(e) Installing electrical wiring circuit	**Brainstorm:** Guide the students to define electrical wiring circuit **Demonstration:** Demonstrate to the students on how install electrical wiring circuit and to handle tools and equipment **Practical work:** Organise the students into manageable groups	**The student should be able to:** • Select materials, tools and equipment • Draw mechanical working drawing (Detail and Assembly) • Draw electrical wiring circuit diagrams • Prepare freezer body	Designed and made freezer conform to technical specifications and aesthetic appearance	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Design and manufacture different types of freezers • Apply safety measures **Principles:** The student should explain the principles of: (o) Heat transfer and exchange (p) Design parameters	The following tools, equipment and safety gear are to be available: • Oxy-acetylene plant • Electro-mechanical tool kit • Shearing machine • Vacuum pump • Manifold gauge • Megger • Leak detector • Bending machine • Drilling machine • Multimeter • Computer with CAD software	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			install electrical wiring circuit	to required specifications • Mount the refrigerating components • Pipe the refrigerating components • Mount electrical and perform wiring of the circuit • Fabricate door with gaskets • Fit the door to refrigerator body • Perform finishing to aesthetic appearance • Perform spray painting • Charge the systems with refrigerant (R134a)		**Theories:** The student should explain: • Steps to estimate refrigerating capacity of a unit • Materials science **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of tools, equipment and machines • Environmental regulations	• Pop rivet gun • Soldering gun • Resistance welding machine • Tape measure • Thermometer • Spray painting compressor • Safety gears facilities	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Apply safety measures • Commission the performance • Clean the workplace, tools and equipment • Store tools, equipment and machine				
		(f) Charging with refrigerant and commission the system	**Brainstorm:** Guide the students to define refrigerant and commission the system **Demonstration:** Demonstrate to the students on how charge with refrigerant and commission the system and to handle tools and equipment	**The student should be able to:** • Select materials, tools and equipment • Mount the refrigerating components • Pipe the refrigerating components • Mount electrical and perform	Designed and made freezer conform to technical specifications and aesthetic appearance	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Select the appropriate refrigerant to charge the freezers • Charge the Freezer **Principles:** The student should explain the principles of: (q) Heat transfer and exchange (r) Design parameters	The following tools, equipment and safety gear are to be available: • Electro-mechanical tool kit • Vacuum pump • Manifold gauge • Megger • Leak detector • Multimeter • Resistance welding machine • Tape measure • Thermometer	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Practical work: Organise the students into manageable groups charge with refrigerant and commission the system	wiring of the circuit • Perform finishing to aesthetic appearance • Charge the systems with refrigerant (R134a) • Apply safety measures • Commission the performance • Clean the workplace, tools and equipment • Store tools, equipment and machine		**Theories:** The student should explain: • Steps to estimate refrigerating capacity of a unit • Materials science **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of tools, equipment and machines • Environmental regulations	• Safety gears facilities	
	1.3 Designing and make ice maker machine	(a) Designing and draw schematic diagrams	**Brainstorm:** Guide the students to define ice maker **Demonstration:** Demonstrate to the students on how design and draw	**The student should be able to:** • Identify materials, tools and equipment required	Designed and made ice maker conform to technical and aesthetic specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Plan work	The following tools, equipment and safety gear are to be available: • Computer with CAD • Tape measure • Set square • Drawing board	120

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			schematic diagrams and to handle tools and equipment **Practical work:** Organise the students into manageable groups design and draw schematic diagrams and commission the system	• Draw a mechanical working drawing • Draw electrical wiring circuit diagram • Prepare body structure of the ice making system • Apply safety gears appropriately • Clean workplace, tools and equipment • Store tools and equipment • Commission the machine		• Measure electrical to pressure quantities • Determine system character • Make different types of ice making units • Form ice **Principles:** The student should explain the principles of: (s) Heat transfer and exchange (t) System operating characteristics (u) Design parameters **Theories:** The student should explain: • Principle of drawing **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of working tools and equipment machines • Plumbing • Environmental Regulations		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
		(b) Making an ice maker body	**Brainstorm:** Guide the students to define ice maker **Demonstration:** Demonstrate to the students on how make an ice maker and to handle tools and equipment **Practical work:** Organise the students into manageable groups make an ice maker	**The student should be able to:** • Identify materials, tools and equipment required • Draw a mechanical working drawing • Draw electrical wiring circuit diagram • Prepare body structure of the ice making system • Assemble parts to form the machine • Mount the mechanical refrigeration components • Perform wiring circuits for	Designed and made ice maker conform to technical and aesthetic specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Plan work • Measure electrical to pressure quantities • Determine system character • Make different types of ice making units • Form ice **Principles:** The student should explain the principles of: (c) Heat transfer and exchange (d) System operating characteristics (e) Design parameters **Theories:** The student should explain: • Components functions • Refrigeration cycle • Refrigerants properties	The following tools, equipment and safety gear are to be available: • Oxy-acetylene plant • Bending machine • Shearing machine • Drilling machine/equipment • Electro-mechanical tool kit • Pop rivet gun • Soldering gun • Bench with Bench vice • Resistance welding machine • Safety gears facilities • Plumbing tools • Computer with CAD • Vacuum pump • Tape measure • Pipe benders	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				Primary and Secondary circuits • Perform plumbing • Evacuate and charge with refrigerant • Perform spray painting • Apply safety gears appropriately • Clean workplace, tools and equipment • Store tools and equipment • Commission the machine		• Heat load estimation **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of working tools and equipment machines • Plumbing • Environmental Regulations		
		(c) Making evaporator coil	**Brainstorm:** Guide the students to define evaporator coil **Demonstration:**	**The student should be able to:** • Identify materials, tools and equipment required	Designed and made ice maker conform to technical and aesthetic specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Plan work	The following tools, equipment and safety gear are to be available: • Oxy-acetylene plant • Bending machine • Shearing machine	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Demonstrate to the students on how make evaporator coil and to handle tools and equipment **Practical work:** Organise the students into manageable groups make evaporator coil	• Draw a mechanical working drawing • Draw electrical wiring circuit diagram • Prepare body structure of the ice making system • Assemble parts to form the machine • Mount the mechanical refrigeration components • Perform wiring circuits for Primary and Secondary circuits • Perform plumbing • Evacuate and charge with refrigerant		• Measure electrical to pressure quantities • Determine system character • Make different types of ice making units • Form ice **Principles:** The student should explain the principles of: (d) Heat transfer and exchange (e) System operating characteristics (f) Design parameters **Theories:** The student should explain: • Components functions • Refrigeration cycle • Refrigerants properties • Heat load estimation **Circumstantial knowledge:** **Detailed knowledge about:**	• Drilling machine/equipment • Electro-mechanical tool kit • Pop rivet gun • Soldering gun • Bench with Bench vice • Resistance welding machine • Safety gears facilities • Plumbing tools • Computer with CAD • Vacuum pump • Tape measure • Pipe benders	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Perform spray painting • Apply safety gears appropriately • Clean workplace, tools and equipment • Store tools and equipment • Commission the machine		• Safe handling of working tools and equipment machines • Plumbing • Environmental Regulations		
		(d) Making icing system	**Brainstorm:** Guide the students to define icing system **Demonstration:** Demonstrate to the students on how make icing system and to handle tools and equipment **Practical work:** Organise the students into	• Identify materials, tools and equipment required • Draw a mechanical working drawing • Draw electrical wiring circuit diagram • Prepare body structure of the ice	Designed and made ice maker conform to technical and aesthetic specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Plan work • Measure electrical to pressure quantities • Determine system character • Make different types of ice making units • Form ice	The following tools, equipment and safety gear are to be available: • Oxy-acetylene plant • Bending machine • Shearing machine • Drilling machine/equipment • Electro-mechanical tool kit • Pop rivet gun • Soldering gun	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			manageable groups make icing system	making system • Assemble parts to form the machine • Mount the mechanical refrigeration components • Perform wiring circuits for Primary and Secondary circuits • Perform plumbing • Evacuate and charge with refrigerant • Perform spray painting • Apply safety gears appropriately • Clean workplace, tools and equipment		**Principles:** The student should explain the principles of: (g) Heat transfer and exchange (h) System operating characteristics (i) Design parameters **Theories:** The student should explain: • Components functions • Refrigeration cycle • Refrigerants properties • Heat load estimation **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of working tools and equipment machines • Plumbing • Environmental Regulations	• Bench with Bench vice • Multimeter • Resistance welding machine • Safety gears facilities • Spray painting compressor • Plumbing tools • Computer with CAD • Vacuum pump • Manifold gauge • Tape measure • Clamp-on meter • Megger • Pipe benders	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Store tools and equipment • Commission the machine				
		(e) Constructing refrigerant pipe circuit	**Brainstorm:** Guide the students to define refrigerant pipe circuit **Demonstration:** Demonstrate to the students on how construct refrigerant pipe circuit and to handle tools and equipment **Practical work:** Organise the students into manageable groups construct refrigerant pipe circuit	• Identify materials, tools and equipment required • Draw a mechanical working drawing • Prepare body structure of the ice making system • Assemble parts to form the machine • Mount the mechanical refrigeration components • Perform wiring circuits for Primary and	Designed and made ice maker conform to technical and aesthetic specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Plan work • Measure electrical to pressure quantities • Determine system character • Make different types of ice making units • Form ice **Principles:** The student should explain the principles of: (j) Heat transfer and exchange (k) System operating characteristics (l) Design parameters	The following tools, equipment and safety gear are to be available: • Oxy-acetylene plant • Bending machine • Shearing machine • Drilling machine/equipment • Electro-mechanical tool kit • Pop rivet gun • Soldering gun • Bench with Bench vice • Resistance welding machine • Safety gears facilities • Spray painting compressor • Plumbing tools	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				Secondary circuits • Perform plumbing • Evacuate and charge with refrigerant • Perform spray painting • Apply safety gears appropriately • Clean workplace, tools and equipment • Store tools and equipment • Commission the machine		**Theories:** The student should explain: • Components functions • Refrigeration pipe circuit • Refrigerants properties • Heat load estimation **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of working tools and equipment machines • Plumbing • Environmental Regulations	• Computer with CAD • Vacuum pump • Manifold gauge • Tape measure • Pipe benders	
		(f) Installing electrical wiring circuits	**Brainstorm:** Guide the students to define electrical wiring circuits **Demonstration:**	• Identify materials, tools and equipment required • Draw electrical	Designed and made ice maker conform to technical and aesthetic specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Plan work	The following tools, equipment and safety gear are to be available: • Oxy-acetylene plant • Bending machine • Shearing machine	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Demonstrate to the students on how Install electrical wiring circuits and to handle tools and equipment **Practical work:** Organise the students into manageable groups Install electrical wiring circuits	wiring circuit diagram • Prepare body structure of the ice making system • Assemble parts to form the machine • Mount the mechanical refrigeration components • Perform wiring circuits for Primary and Secondary circuits • Perform plumbing • Apply safety gears appropriately • Clean workplace, tools and equipment		• Measure electrical to pressure quantities • Determine system character • Make different types of ice making units • Form ice **Principles:** The student should explain the principles of: (m) Heat transfer and exchange (n) System operating characteristics (o) Design parameters **Theories:** The student should explain: • Components functions • Refrigeration cycle • Refrigerants properties • Heat load estimation **Circumstantial knowledge:** **Detailed knowledge about:**	• Drilling machine/equipment • Electro-mechanical tool kit • Pop rivet gun • Soldering gun • Bench with Bench vice • Multimeter • Resistance welding machine • Safety gears facilities • Tape measure • Clamp-on meter • Megger • Pipe benders	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Store tools and equipment • Commission the machine		• Safe handling of working tools and equipment machines • Plumbing • Environmental Regulations		
		(g) Charging and commission the system	**Brainstorm:** Guide the students to define Charge and commission the system **Demonstration:** Demonstrate to the students on how Charge and commission the system and to handle tools and equipment **Practical work:** Organise the students into manageable groups Charge and commission the system	• Identify materials, tools and equipment required • Evacuate and charge with refrigerant • Apply safety gears appropriately • Clean workplace, tools and equipment • Store tools and equipment • Commission the machine	Designed and made ice maker conform to technical and aesthetic specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Plan work • Measure electrical to pressure quantities • Determine system character • Make different types of ice making units • Form ice **Principles:** The student should explain the principles of: (p) Heat transfer and exchange (q) System operating characteristics	The following tools, equipment and safety gear are to be available: • Safety gears facilities • Spray painting compressor • Plumbing tools • Computer with CAD • Vacuum pump • Manifold gauge • Tape measure	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						(r) Design parameters **Theories:** The student should explain: • Components functions • Refrigeration cycle • Refrigerants properties • Heat load estimation **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of working tools and equipment machines • Plumbing • Environmental Regulations		
	1.4 Designing and construct small cold room	(a) Designing and draw working drawing of small cold room	**Brainstorm:** Guide the students to define Design and draw working drawing of small cold room	• Select proper tools and materials • Produce working sketches	A set of working documents prepared conforms to set standards	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to:	The following tools, equipment and safety gear are to be available: • Measuring tapes • Drawing board • T-square	107

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Demonstration: Demonstrate to the students on how Design and draw working drawing of small cold room and to handle tools and equipment **Practical work:** Organise the students into manageable groups Design and draw working drawing of small cold room	• Produce working drawings • Take measurement of existing structure • Choose required components • conditions • Clean workplace and tools • Store tools and equipment		• Size a cold room • Calculate refrigeration load **Principles:** The student should explain the principles of: (s) Cooling of different types of refrigerants (t) Primary and secondary refrigeration (u) Heat transfer **Theories:** The student should explain: • Psychrometric diagrams • Pressure enthalpy diagrams • Pressure temperature charts • Gas laws • Working of flow control equipment **Circumstantial knowledge:** **Detailed knowledge about:**	• Pencils, eraser and sharpener • Set squares and protractors	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						• Working parameters of different refrigerants • Electrical controls applied in refrigeration systems • Mechanical and electrical installation requirement • Building safety regulations • Environmental regulations on greenhouse gases • Imperial and SI units • Mathematical calculation		
		(b) Making cold room body	**Brainstorm:** Guide the students to define Make cold room body **Demonstration:** Demonstrate to the students on how Make cold room body and to handle tools and equipment	• Select proper tools and materials • Produce working sketches • Produce working drawings • Take measurement of existing structure	A set of working documents prepared conforms to set standards	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Size a cold room • Calculate refrigeration load **Principles:** The student should explain the principles of:	The following tools, equipment and safety gear are to be available: • Measuring tapes • Drawing board • T-square • Pencils, eraser and sharpener • Set squares and protractors	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Practical work: Organise the students into manageable groups Make cold room body	• Choose required components • Determine refrigerant load • Clean workplace and tools • Store tools and equipment		• Cooling of different types of refrigerants • Primary and secondary refrigeration • Heat transfer **Theories:** The student should explain: • Psychrometric diagrams • Pressure enthalpy diagrams • Pressure temperature charts • Gas laws • Working of flow control equipment **Circumstantial knowledge:** **Detailed knowledge about:** • Working parameters of different refrigerants • Electrical controls applied in refrigeration systems		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						• Mechanical and electrical installation requirement • Building safety regulations • Environmental regulations on greenhouse gases • Imperial and SI units • Mathematical calculation		
		(c) Installing evaporator unit	**Brainstorm:** Guide the students to define Install evaporator unit **Demonstration:** Demonstrate to the students on how Install evaporator unit and to handle tools and equipment **Practical work:** Organise the students into manageable groups	• Select proper tools and materials • Produce working sketches • Produce working drawings • Take measurement of existing structure • Choose required components • Determine refrigerant load	A set of working documents prepared conforms to set standards	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Size a cold room • Calculate refrigeration load **Principles:** The student should explain the principles of: • Cooling of different types of refrigerants • Primary and secondary refrigeration • Heat transfer	The following tools, equipment and safety gear are to be available: • Measuring tapes • Drawing board • T-square • Pencils, eraser and sharpener • Set squares and protractors	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Install evaporator unit	• Clean workplace and tools • Store tools and equipment		**Theories:** The student should explain: • Psychrometric diagrams • Pressure enthalpy diagrams • Pressure temperature charts • Gas laws • Working of flow control equipment **Circumstantial knowledge:** **Detailed knowledge about:** • Working parameters of different refrigerants • Electrical controls applied in refrigeration systems • Mechanical and electrical installation requirement • Building safety regulations • Environmental regulations on greenhouse gases		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						• Imperial and SI units • Mathematical calculation		
		(d) Constructing refrigerant pipe circuit	**Brainstorm:** Guide the students to define Construct refrigerant pipe circuit **Demonstration:** Demonstrate to the students on how Construct refrigerant pipe circuit and to handle tools and equipment **Practical work:** Organise the students into manageable groups Construct refrigerant pipe circuit	• Select proper tools and materials • Produce working sketches • Produce working drawings • Take measurement of existing structure • Choose required components • Select refrigerant pipe size • Clean workplace and tools • Store tools and equipment	A set of working documents prepared conforms to set standards	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Size a cold room • Calculate refrigeration load **Principles:** The student should explain the principles of: • Cooling of different types of refrigerants • Primary and secondary refrigeration • Heat transfer **Theories:** The student should explain: • Psychrometric diagrams • Pressure enthalpy diagrams	The following tools, equipment and safety gear are to be available: • Measuring tapes • Drawing board • T-square • Pencils, eraser and sharpener • Set squares and protractors	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						• Pressure temperature charts • Gas laws • Working of flow control equipment **Circumstantial knowledge:** **Detailed knowledge about:** • Working parameters of different refrigerants • Electrical controls applied in refrigeration systems • Mechanical and electrical installation requirement • Building safety regulations • Environmental regulations on greenhouse gases • Imperial and SI units • Mathematical calculation		
		(f) Installing electrical	**Brainstorm:** Guide the students to define Install	• Select proper tools and materials	A set of working documents prepared	**Knowledge Evidence:** **Detailed knowledge of:**	The following tools, equipment and safety gear are to be available:	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
		wiring circuit	electrical wiring circuit **Demonstration:** Demonstrate to the students on how Install electrical wiring circuit and to handle tools and equipment **Practical work:** Organise the students into manageable groups Install electrical wiring circuit	• Produce working sketches • Produce working drawings • Take measurement of existing structure • Choose required components • Select refrigerant pipe size • Clean workplace and tools • Store tools and equipment	conforms to set standards	**Method used:** The student should explain how to: • Size a cold room • Calculate refrigeration load **Principles:** The student should explain the principles of: • Cooling of different types of refrigerants • Primary and secondary refrigeration • Heat transfer **Theories:** The students should explain: • Psychrometric diagrams • Pressure enthalpy diagrams • Pressure temperature charts • Gas laws • Working of flow control equipment	• Measuring tapes • Psychrometric charts • Pressure enthalpy chart for different refrigerants • Drawing board • T-square • Pencils, eraser and sharpener • Set squares and protractors	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						Circumstantial knowledge: **Detailed knowledge about:** • Working parameters of different refrigerants • Electrical controls applied in refrigeration systems • Mechanical and electrical installation requirement • Building safety regulations • Environmental regulations on greenhouse gases • Imperial and SI units • Mathematical calculation		
		(f) Charging with refrigerant and commission the system	**Brainstorm:** Guide the students to define Charge with refrigerant and commission the system **Demonstration:**	• Select proper tools and materials • Produce working drawings • Take measurement	A set of working documents prepared conforms to set standards	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Commission the system	The following tools, equipment and safety gear are to be available: • Measuring tapes • Psychrometric charts	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Demonstrate to the students on how Charge with refrigerant and commission the system and to handle tools and equipment **Practical work:** Organise the students into manageable groups Charge with refrigerant and commission the system	of existing structure • Choose required components • Determine refrigerant load • Choose correct refrigerant type to meet operating conditions • Clean workplace and tools • Store tools and equipment		• Calculate refrigeration load **Principles:** The student should explain the principles of: • Cooling of different types of refrigerants • Primary and secondary refrigeration • Heat transfer **Theories:** The student should explain: • Psychrometric diagrams • Pressure enthalpy diagrams • Pressure temperature charts • Gas laws • Working of flow control equipment **Circumstantial knowledge:** **Detailed knowledge about:**	• Pressure enthalpy chart for different refrigerants • Drawing board • T-square • Pencils, eraser and sharpener • Set squares and protractors	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						• Working parameters of different refrigerants • Electrical controls applied in refrigeration systems • Mechanical and electrical installation requirement • Building safety regulations • Environmental regulations on greenhouse gases • Imperial and SI units • Mathematical calculation		
	1.5 Designing and make liquid coolers	(a)Designing and draw schematic diagram	**Brainstorm:** Guide the students to define Design and draw schematic diagram **Demonstration:** Demonstrate to the students on how Design and draw schematic diagram and to handle tools and equipment	**The students should be able to:** • Select materials, tools and equipment • Draw detailed drawing and assembly drawings • Draw electrical	Designed and made liquid coolers conform to the technical specifications and aesthetic appearance	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Make different kind of coolers • Apply safety measures	The following tools, equipment and safety gear are to be available: • Computer with CAD software • Measuring tapes • Psychrometric charts • Pressure enthalpy chart for different refrigerants • Drawing board • T-square	90

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Practical work: Organise the students into manageable groups Design and draw schematic diagram	wiring circuits • Clean workplace, tools and equipment • Store tools and equipment • Commission the system performance		**Principles:** The student should explain the principles of: • Heat transfer and exchange • Design characteristics/parameters **Theories:** The student should explain: • The functional of components • Refrigeration cycle • Heat load estimation/calculations **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of tools, equipment and machines • Environmental regulations	• Pencils, eraser and sharpener • Set squares and protractors	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
		(b) Making juice cooler body	**Brainstorm:** Guide the students to define Making juice cooler body **Demonstration:** Demonstrate to the students on how Making juice cooler body and to handle tools and equipment **Practical work:** Organise the students into manageable groups Making juice cooler body	**The students should be able to:** • Select materials, tools and equipment • Draw detailed drawing and assembly drawings • Draw electrical wiring circuits • Prepare the system main body structures of the liquid coolers • Mount the refrigerating compound in the case • Make a refrigerating cabinet body and cooling coil	Designed and made liquid coolers conform to the technical specifications and aesthetic appearance	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Make different kind of coolers • Apply safety measures **Principles:** The student should explain the principles of: (c) Heat transfer and exchange (d) Design characteristics/parameters **Theories:** The student should explain: • The functional of components • Refrigeration cycle • Heat load estimation/calculations **Circumstantial knowledge:**	The following tools, equipment and safety gear are to be available: • Oxy-acetylene plant • Electro-mechanical tool kit • Shearing machine • Vacuum pump • Manifold gauge • Megger • Clamp on meter • Leak detector • Bending machine • Drilling machine • Multimeter • Computer with CAD software • Pop rivet gun • Soldering gun • Tape measure • Thermometer • Resistance welding machine • Spray painting compressor • Safety gears facilities	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Perform wiring circuits for both heating and cooling • Perform spray painting • Charge with refrigerant R134a • Apply safety gears • Clean workplace, tools and equipment • Store tools and equipment • Commission the system performance		**Detailed knowledge about:** • Safe handling of tools, equipment and machines • Environmental regulations		
		(b) Installing refrigerant pipe circuit	**Brainstorm:** Guide the students to define Install refrigerant pipe	**The students should be able to:** • Select materials,	Designed and made liquid coolers conform to the technical specifications and	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to:	The following tools, equipment and safety gear are to be available: • Oxy-acetylene plant	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			circuit **Demonstration:** Demonstrate to the students on how Install refrigerant pipe circuit and to handle tools and equipment **Practical work:** Organise the students into manageable groups Install refrigerant pipe circuit	tools and equipment • Draw detailed drawing and assembly drawings • Draw electrical wiring circuits • Prepare the system main body structures of the liquid coolers • Mount the refrigerating compound in the case • Make a refrigerating cabinet body and cooling coil • Perform wiring circuits for both heating and cooling	aesthetic appearance	• Make different kind of coolers • Apply safety measures **Principles:** The student should explain the principles of: (c) Heat transfer and exchange (d) Design characteristics/parameters **Theories:** The student should explain: • The functional of components • Refrigeration cycle • Heat load estimation/calculations **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of tools, equipment and machines	• Electro-mechanical tool kit • Shearing machine • Bending machine • Drilling machine • Pop rivet gun • Soldering gun • Tape measure • Resistance welding machine • Spray painting compressor • Safety gears facilities	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Perform spray painting • Apply safety gears • Clean workplace, tools and equipment • Store tools and equipment • Commission the system performance		• Environmental regulations		
		(c) Installing electrical wiring circuits	**Brainstorm:** Guide the students to define Install electrical wiring circuits **Demonstration:** Demonstrate to the students on how Install electrical wiring circuits and to handle tools and equipment	**The students should be able to:** • Select materials, tools and equipment • Draw detailed drawing and assembly drawings • Draw electrical	Designed and made liquid coolers conform to the technical specifications and aesthetic appearance	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Make different kind of coolers • Apply safety measures **Principles:** The student should explain the principles of:	The following tools, equipment and safety gear are to be available: • Oxy-acetylene plant • Electro-mechanical tool kit • Shearing machine • Bending machine • Drilling machine • Computer with CAD software	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Practical work: Organise the students into manageable groups Install electrical wiring circuits	wiring circuits • Prepare the system main body structures of the liquid coolers • Perform wiring circuits for both heating and cooling • Apply safety gears • Clean workplace, tools and equipment • Store tools and equipment • Commission the system performance		(d) Heat transfer and exchange (e) Design characteristics/parameters **Theories:** The student should explain: • The functional of components • Refrigeration cycle • Heat load estimation/calculations **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of tools, equipment and machines • Environmental regulations	• Pop rivet gun • Soldering gun • Tape measure • Thermometer • Resistance welding machine • Spray painting compressor • Safety gears facilities	
		(d) Charging and commission the system	**Brainstorm:** Guide the students to define Charge and commission	**The students should be able to:**	Designed and made liquid coolers conform to the technical specifications and	**Knowledge Evidence:** **Detailed knowledge of:**	The following tools, equipment and safety gear are to be available:	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			the system **Demonstration:** Demonstrate to the students on how Charge and commission the system and to handle tools and equipment **Practical work:** Organise the students into manageable groups Charge and commission the system	• Select materials, tools and equipment • Apply safety gears • Clean workplace, tools and equipment • Store tools and equipment • Commission the system performance	aesthetic appearance	**Method used:** The student should explain how to: • Make different kind of coolers • Apply safety measures to ensure performance **Principles:** The student should explain the principles of: (f) Heat transfer and exchange (g) Design characteristics/parameters **Theories:** The student should explain: • The functional of components • Refrigeration cycle • Heat load estimation/calculations **Circumstantial knowledge:** **Detailed knowledge about:**	• Oxy-acetylene plant • Electro-mechanical tool kit • Shearing machine • Vacuum pump • Manifold gauge • Megger • Clamp on meter • Leak detector • Bending machine • Drilling machine • Multimeter • Computer with CAD software • Pop rivet gun • Soldering gun • Tape measure • Thermometer • Resistance welding machine • Spray painting compressor • Safety gears facilities	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						• Safe handling of tools, equipment and machines • Environmental regulations		
2.0 Maintaining industrial air conditioning and refrigeration systems	2.1 Servicing cold rooms	(a) Servicing cooling cabinet	**Brainstorm:** Guide the students to define cooling cabinet and their application **Demonstration:** Demonstrate to the students on how to service cooling cabinet and to handle tools and equipment **Practical work:** Organise the students into manageable groups to service cooling cabinet in cold room	• Select tools and equipment • Perform diagnostic trouble shooting • Check drive system • Clean evaporator • Inspect door sealing • Insulate refrigerant tubing • Determine refrigerant level • Perform pump down • Clean workplace and tools	Demonstrate the ability of identify fault of cooling cabinet and service cooling cabinet in cold rooms conforms to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Interpret pressure and temperature relationship • Connect electrical circuits **Principles:** The student should explain the principles of: (h) Heat transfer (i) Evaporation condensers **Theories:** The student should explain: • Super heat • Sub-cooling	The following tools, equipment and safety gear are to be available: • Electro mechanical tool kit • Oxy-acetylene welding set • Bristle brush • New waste cotton • Pressure cleaner • Refrigerant leakage detector • Power supply • Water container • Cold room warm garments • Gauge manifold • Digital thermometer • Pressure cleaner • Analog/digital multimeter	12

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				Store tools and equipment		• Compression refrigeration cycle **Circumstantial knowledge:** **Detailed knowledge about:** Service cooling cabinet Safe handling of working tools	• Gloves • Eye protection gears • Safety boot overall	
		(b) Servicing compressor	**Brainstorm:** Guide the students to define compressor and their application **Demonstration:** Demonstrate to the students on how to Service compressor and to handle tools and equipment **Practical work:** Organise the students into manageable groups	• Select tools and equipment • Perform diagnostic trouble shooting • Check drive system • Check oil level in the engine and compressor • Insulate refrigerant tubing	Demonstrate the ability of identify fault of compressor and Service compressor in cold rooms conforms to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Measure electrical and pressure quantities • Interpret pressure and temperature relationship • Connect electrical circuits • Charge the system with refrigerant	The following tools, equipment and safety gear are to be available: • Electro mechanical tool kit • Oxy-acetylene welding set • Bristle brush • Refrigerant leakage detector • Power supply • Water container • Cold room warm garments • Gauge manifold	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			to Service compressor in cold room	• Determine refrigerant level • Perform pump down • Charge refrigerant • Clean workplace and tools Store tools and equipment		**Principles:** The student should explain the principles of: (j) Heat transfer (k) Evaporation condensers **Theories:** The student should explain: • Super heat • Sub-cooling • Compression refrigeration cycle **Circumstantial knowledge:** **Detailed knowledge about:** Safe handling of working tools	• Digital thermometer • Analog/digital multimeter • Gloves • Eye protection gears • Safety boot • overall	
		(c) Servicing cooling tower	**Brainstorm:** Guide the students to define cooling tower and their application **Demonstration:** Demonstrate to the students on how to	• Select tools and equipment • Perform diagnostic trouble shooting • Check drive system	Demonstrate the ability of identify fault of cooling tower and Service cooling tower in cold rooms conforms to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Measure electrical and pressure quantities	The following tools, equipment and safety gear are to be available: • Electro mechanical tool kit • Oxy-acetylene welding set • Bristle brush	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Service cooling tower and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Service cooling tower in cold room	• Perform service in electrical and mechanical part • Clean tank and add treated water • Clean condensing unit • Determine water level • Clean workplace and tools Store tools and equipment		• Interpret pressure and temperature relationship • Connect electrical circuits • Charge the system with refrigerant **Principles:** The student should explain the principles of: (l) Heat transfer (m) Evaporation condensers **Theories:** The student should explain: • Super heat • Sub-cooling • Compression refrigeration cycle **Circumstantial knowledge:** **Detailed knowledge about:** • Plumbing • Operating internal combustion engines • Sheet metal work • Fitter mechanic work	• Refrigerant leakage detector • Power supply • Water container • Cold room warm garments • Gauge manifold • Digital thermometer • Pressure cleaner • Gloves • Eye protection gears • Safety boot • overall	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
		(d) Servicing electrical system	**Brainstorm:** Guide the students to define electrical system and their application **Demonstration:** Demonstrate to the students on how to Service electrical system and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Service electrical system in cold room	• Select tools and equipment • Perform diagnostic trouble shooting • Perform electrical checks • Clean workplace and tools Store tools and equipment	Demonstrate the ability of identify fault of electrical system and service electrical system in cold rooms conforms to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Measure electrical quantities • Interpret pressure and temperature relationship • Connect electrical circuits • Charge the system with refrigerant **Principles:** The student should explain the principles of: • Service electrical system (n) Heat transfer (o) Evaporation condensers **Theories:** The student should explain: **Circumstantial knowledge:**	This element can be achieved at a workplace or training institution The following tools, equipment and safety gear are to be available: • Electro mechanical tool kit • Oxy-acetylene welding set • Bristle brush • Refrigerant leakage detector • Power supply • Eye protection gears • Water container • Cold room warm garments • Gauge manifold • Digital thermometer • Analog/digital multimeter • Gloves (electrical)	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						Detailed knowledge about: • Plumbing • Operating internal combustion engines • Sheet metal work • Fitter mechanic work	• Eye protection gears • Safety boot overall	
		(e) Servicing refrigerant pipes	**Brainstorm:** Guide the students to define refrigerant pipes and their application **Demonstration:** Demonstrate to the students on how to Service refrigerant pipes and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Service	• Select tools and equipment • Perform diagnostic trouble shooting • Check drive system • Insulate refrigerant tubing • Determine refrigerant level • Perform pump down • Clean workplace and tools	Demonstrate the ability of identify fault of refrigeration pipes and Service refrigerant pipes in cold rooms conforms to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Interpret pressure and temperature relationship **Principles:** The student should explain the principles of: (p) Heat transfer (q) Service refrigerant piping circuit **Theories:** The student should explain: • Super heat	This element can be achieved at a workplace or training institution The following tools, equipment and safety gear are to be available: • Electro mechanical tool kit • Oxy-acetylene welding set • Bristle brush • Refrigerant leakage detector • Power supply • Water container • Cold room warm garments • New waste cotton	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			refrigerant pipes in cold room	Store tools and equipment		• Sub-cooling **Circumstantial knowledge:** **Detailed knowledge about:** • Plumbing • Operating internal combustion engines • Sheet metal work • Fitter mechanic work	• Binding tape • Gauge manifold • Gloves • Eye protection gears • Safety boot • overall	
		(f) Servicing evaporator	**Brainstorm:** Guide the students to define evaporator and their application **Demonstration:** Demonstrate to the students on how to Service evaporator and to handle tools and equipment **Practical work:** Organise the students into manageable groups	• Select tools and equipment • Perform diagnostic trouble shooting • Perform electrical checks • Clean evaporator • Inspect door sealing • Check oil level in the engine and compressor	Demonstrate the ability of identify fault of evaporator and Service evaporator in cold rooms conforms to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Measure pressure quantities • Interpret pressure and temperature relationship **Principles:** The student should explain the principles of: • Heat transfer • Evaporator	The following tools, equipment and safety gear are to be available: • Electro mechanical tool kit • Oxy-acetylene welding set • Bristle brush • Refrigerant leakage detector • Power supply • Eye protection gears • Water container • Cold room warm garments	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			to Service evaporator in cold room	• Clean condensing unit • Insulate refrigerant tubing • Determine refrigerant level • Perform pump down • Charge refrigerant • Clean workplace and tools • Store tools and equipment		**Theories:** The student should explain: • Type of evaporator **Circumstantial knowledge:** **Detailed knowledge about:** Safe handling of evaporator and working tools	• Gauge manifold • Digital thermometer • Pressure cleaner • Gloves • Eye protection gears • Safety boot • overall	
	2.2 Servicing chillers	(a) Servicing water supply system	**Brainstorm:** Guide the students to define water supply system and their application **Demonstration:** Demonstrate to the students on how to Service water supply system and	• Select proper tools and equipment • Perform trouble shooting in a logical sequence • Measure water pressure	Demonstrate the ability of identify fault of Service water supply system and Service water supply system in chiller conforms to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used**: The student should explain how to: • Regulate freezing temperature of secondary refrigerant • Measure weights/volumes	The following tools, equipment and safety gear are to be available: • Electro-mechanical toolbox • Oxy-acetylene welding set • Manifold gauge • Plumbing tools • Hard brush	22

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			to handle tools and equipment **Practical work:** Organise the students into manageable groups to Service water supply system in chillers	temperature quantities • Purge the system • Perform plumbing works • Clean tools equipment and workplace • Store tools		**Principles:** The student should explain principle of: • Heat transfer • Change of state of matter **Theories:** The student should explain: • refrigerant • Super heating • Classification of Primary and secondary refrigerants **Circumstantial knowledge:** **Detailed knowledge of about:** • Safe handling of primary and secondary refrigerants Environmental regulations	• Water pail • Leak detector • Hand gloves • Safety boots • Overall • Safety goggles	
		(b) Servicing	**Brainstorm:** Guide the students to define cooling		Demonstrate the ability of identify fault of cooling tower and Service	**Knowledge Evidence:** **Detailed knowledge of:**	The following tools and equipment:	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
		cooling tower	tower and their application **Demonstration:** Demonstrate to the students on how to Service cooling tower and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Service cooling tower in chillers	• Select proper tools and equipment • Perform trouble shooting in a logical sequence • Identify refrigerants used • Measure water pressure and temperature quantities • Perform plumbing works • Clean tools equipment and workplace • Store tools	cooling tower in chiller conforms to technical specifications	**Method used**: The student should explain how to: • Regulate water floor into cooling tower • Measure amount weights/volumes **Principles:** The student should explain principle of: • Heat transfer • Change of state of matter **Theories:** The student should explain: • Primary and secondary refrigeration cycles • Super heating • Classification of refrigerants **Circumstantial knowledge:** **Detailed knowledge of about:**	• Electro-mechanical toolbox • Oxy-acetylene welding set • Manifold gauge • Plumbing tools • Water pail • Hard brush • Safety goggles • Hand gloves • Leak detector • Safety boots • Overall • Water pail	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						• Safe handling of refrigerants Environmental regulations		
		(c) Servicing fan coil unit	**Brainstorm:** Guide the students to define fan coil unit and their application **Demonstration:** Demonstrate to the students on how to servicing fan coil unit system and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Service fan coil unit in chillers	**The students should be able to:** • Select proper tools and equipment • Perform trouble shooting in a logical sequence • Identify fan coil unit • Measure air floor, electrical and temperature quantities • Clean tools equipment and workplace • Store tools	Demonstrate the ability of identify fault of fan coil unit and Service fan coil unit in chiller conforms to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used**: The student should explain how to: **Principles:** The student should explain principle of: • Heat transfer **Theories:** The student should explain: • Different types of fan coil unit • Classification of refrigerants **Circumstantial knowledge:** **Detailed knowledge of about:** • Safe handling of fan coil unit	The following tools, equipment and safety gear are to be available: • Electro-mechanical toolbox • Oxy-acetylene welding set • Manifold gauge • Plumbing tools • Hard brush • Safety goggles • Hand gloves • Leak detector • Multimeter • Safety boots • Overall • Water pail	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						Environmental regulations		
		(d) Servicing/replacing refrigerant control units	**Brainstorm:** Guide the students to define refrigerant control units and their application **Demonstration:** Demonstrate to the students on how to Service refrigerant control units and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Service refrigerant control units in chillers	**The students should be able to:** • Select proper tools and equipment • Perform trouble shooting in a logical sequence • Identify refrigerants used • Measure pressure quantities • Purge the system • Select refrigerant • Perform brazing • Clean tools equipment and workplace • Store tools	Demonstrate the ability of identify fault of refrigerant control units and Service refrigerant control units in chiller conforms to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used**: The student should explain how to: • Replace refrigerant control unit Measure pressure of refrigerant control unit **Principles:** The student should explain principle of: • Heat transfer • Change of state of matter **Theories:** The student should explain: • Types of refrigerant control unit • Classification of refrigerants **Circumstantial knowledge:**	The following tools, equipment and safety gear are to be available: • Electro-mechanical toolbox • Oxy-acetylene welding set • Leak detector • Manifold gauge • Safety goggles • Hand gloves • Safety boots • Overall	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						Detailed knowledge of about: • Safe handling of refrigerants Environmental regulations		
		(e) Servicing/charging with refrigerant	**Brainstorm:** Guide the students to define Service/Charge with refrigerant and their application **Demonstration:** Demonstrate to the students on how to Service/Charge with refrigerant and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Service/Charge	**The students should be able to:** • Select proper tools and equipment • Perform trouble shooting in a logical sequence • Identify refrigerants used • Measure pressure electrical and temperature quantities • Purge the system • /Refrigerant • Perform brazing	Demonstrate the ability of identify properties of refrigerant and charge refrigerant in chiller conforms to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used**: The student should explain how to: • Identify freezing point of different refrigerant Measure amount of refrigerant gas **Principles:** The student should explain principle of: • Heat transfer • Change of state of matter **Theories:** The student should explain: • Methods of charging • Classification of refrigerants	The following tools, equipment and safety gear are to be available: • Electro-mechanical toolbox • Oxy-acetylene welding set • Manifold gauge • Refrigerant identifies • Recovery unit • Recovery cylinder • Safety goggles • Hand gloves • Leak detector • Safety boots • Overall • Water pail	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			with refrigerant in chillers	• Perform plumbing works • Clean tools equipment and workplace • Store tools		**Circumstantial knowledge:** **Detailed knowledge of about:** • Safe handling of refrigerants Environmental regulations		
	2.3 Servicing central air conditioners	(a) Servicing electrical circuit	**Brainstorm:** Guide the students to define Service electrical circuit and their application **Demonstration:** Demonstrate to the students on how to Service electrical circuit and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Service	• Select tools and equipment • Perform diagnostic trouble shooting • Check control equipment performance • Clean and tight electrical components • Clean workplace and tools • Store tools and equipment	A record of temperature and pressure conform to specified ratings	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Measuring electric quantities • Connect electric circuits • Apply different methods of servicing electrical circuit methods • Identify control symbols **Principles:** The student should explain the principles of:	The following tools, equipment and safety gear are to be available: • Electro mechanical toolbox • Bristle brush • Hand blower • Power supply • Flash light • Inspection lamp • Soft brush • Gloves • Safety boot • Dust mask • overall	23

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			electrical circuit in central air conditioners			(r) Heat exchange (s) Application of various electrical circuit **Theories:** The student should explain: • Various forms of maintenance planning • Function and application of electrical circuits **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of power tools Safety regulations		
		(b) Servicing compressor	**Brainstorm:** Guide the students to define Service compressor and their application **Demonstration:** Demonstrate to the students on how to Service compressor	• Select tools and equipment • Perform diagnostic trouble shooting • Check control equipment performance	A record of temperature and pressure conform to specified ratings	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Measuring electric, pressure and temperature quantities	The following tools, equipment and safety gear are to be available: • Electro mechanical toolbox • Bristle brush • Water container • Hand blower • Pressure cleaner	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Service compressor in central air conditioners	• Clean and adjust mounting rubber • Check oil levels or add oil to required level • Check refrigerant levels and maintain correct level where necessary • Clean workplace and tools • Store tools and equipment		• Connect electric circuits • Apply different leakage detection methods • Identify control symbols **Principles:** The student should explain the principles of: (t) Compressor working (u) Application of various types of air conditioning compressor **Theories:** The student should explain: • Various forms of maintenance planning • Basic heat transfer • Function and application of compressor • Various types of compressors used in central air-cooling system	• Power supply • Refrigerant leak detector • Flash light • Air blower • Inspection lamp • Dust mask • Soft brush • Gloves • Safety boot • overall	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						Circumstantial knowledge: **Detailed knowledge about:** • Safe handling of compressor • Environmental regulations Safety regulations		
		(c) Servicing air handling unit	**Brainstorm:** Guide the students to define Service air handling unit and their application **Demonstration:** Demonstrate to the students on how to Service air handling unit and to handle tools and equipment **Practical work:** Organise the students into manageable groups	• Select tools and equipment • Perform diagnostic trouble shooting • Check control equipment performance • Clean and adjust blower components • Inspect, clean or change air filters • Check air handling unit for function l	A record of temperature and pressure conform to specified ratings	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Measuring air floor in air handling unit • Apply different methods service air handling unit • Identify control symbols **Principles:** The student should explain the principles of: (v) Application of various types of air handling unit	The following tools, equipment and safety gear are to be available: • Electro mechanical toolbox • Bristle brush • Water container • Hand blower • Pressure cleaner • Power supply • Dust mask • Soft brush • Gloves • Safety boot • overall	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			to Service air handling unit in central air conditioners	where necessary • Clean workplace and tools • Store tools and equipment		**Theories:** The student should explain: • Various forms of maintenance planning • Function of air handling unit • Various types of air handling unit as used in central air-cooling system **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of air handling unit • Consider environmental regulations Safety regulations		
		(d) Servicing condenser	**Brainstorm:** Guide the students to define Service condenser and their application **Demonstration:**	• Select tools and equipment • Perform diagnostic trouble shooting	A record of temperature and pressure conform to specified ratings	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to:	The following tools, equipment and safety gear are to be available: • Electro mechanical toolbox • Bristle brush • Water container	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Demonstrate to the students on how to Service condenser and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Service condenser in central air conditioners	• Check control equipment performance • Inspect condenser • Perform service condenser • Check condenser coil and fins and maintain them correctly where necessary • Clean workplace and tools • Store tools and equipment		• Measuring pressure and temperature quantities • Apply different leakage detection methods • Identify condenser function **Principles:** The student should explain the principles of: (w) Heat exchange (x) Application of various types of condensers **Theories:** The student should explain: • Various forms of maintenance planning • Basic heat transfer • Function and application of condenser • Various types of condensers used in central air-cooling system **Circumstantial knowledge:**	• Hand blower • Vacuum cleaner • Compressed air hose • Compressed air supply • Power supply • Dust mask • Refrigerant leak detector • Flash light • Inspection lamp • Dust mask • Soft brush • Gloves • Safety boot • overall	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						Detailed knowledge about: • Safe handling of condenser • Environmental regulations Safety regulations		
		(e) Servicing air duct	**Brainstorm:** Guide the students to define Service air duct and their application **Demonstration:** Demonstrate to the students on how to Service air duct and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Service air duct in central air conditioners	• Select tools and equipment • Perform diagnostic trouble shooting • Check control equipment performance • Inspect air duct components • Seal leaking ducts • Perform insulation of the duct • Check air duct and maintain correct function	A record of temperature and pressure conform to specified ratings	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Measuring air floor rate • Apply different ways of leakage detection methods in air duct • Identify control symbols **Principles:** The student should explain the principles of: • Application of various types of air duct **Theories:** The student should explain:	The following tools, equipment and safety gear are to be available: • Electro mechanical toolbox • Bristle brush • Water container • Hand blower • Pressure cleaner • Compressed air hose • Compressed air supply/ air blower • Power supply • Dust mask • Air leak detector • Inspection lamp • Dust mask • Soft brush	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				where necessary • Clean workplace and tools • Store tools and equipment		• Various forms of maintenance planning • Basic heat transfer • Function and application of air duct • Various types of air duct as used in central air-cooling system **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of air duct • Environmental regulations Safety regulations	• Gloves • Safety boot • overall	
	2.4 Repairing cold rooms	(a) Repairing cooling cabinet	**Brainstorm:** Guide the students to define Repair cooling cabinet and their application **Demonstration:** Demonstrate to the students on how to Repair cooling	• Identify types of cold room • Select tools and equipment • Carryout diagnostic troubleshooting • Perform sheet metal works	A record of repairs carried out conforms to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Select material needed for cooling cabinet	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Electro-mechanical toolbox • Manifold gauge • Hand shear	32

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			cabinet and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Repair cooling cabinet in cold rooms	• Repair body work		• Perform pumping down **Principles:** The student should explain the principles of heat transfer **Theories:** The student should explain: • Super heating and sub-cooling • Heat road calculation **Circumstantial knowledge:** **Detailed knowledge about:** • Consider environmental regulation • Safe handling of working tools	• Ladder • Safety goggles • Safety boots • Overall • Rivet gun • Mallet hammer • Silicon/ gasket maker	
		(b) Repairing compressor	**Brainstorm:** Guide the students to define Repair compressor and their application **Demonstration:**	• Identify types of Cold room • Select tools and equipment • Carryout diagnostic	A record of repairs carried out conforms to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to:	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Demonstrate to the students on how to Repair compressor and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Repair compressor in cold rooms	troubleshooting • Perform pump down / refrigerant recovering • Repair / replace compressor • Change refrigerant		• Perform refrigerant pump down or recovery • Perform brazing **Principles:** The student should explain the principles of heat transfer **Theories:** The student should explain: • Types of compressors used in cold room • Working principle of compressor **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of belt driven equipment • Environmental regulation Safe handling of working	• Electro-mechanical toolbox • Mounting rubber • Manifold gauge • Multimeter • Digital clamp meter • Ladder • Hand puller • Compressor oil • Safety goggles • Safety boots • Overall	
		(c) Repairing cooling tower	**Brainstorm:** Guide the students to define Repair cooling tower and their application	• Identify types of cold room • Select tools and equipment	A record of repairs carried out conforms to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:**	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Demonstration: Demonstrate to the students on how to Repair cooling tower and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Repair cooling tower in cold rooms	• Carryout diagnostic troubleshooting • Understanding the Key Components • Inspect the Tower Exterior • Clean the Basin and Sump • Check the Water Treatment System • Examine Drift Eliminators and Fill Material Check the Fan System • Inspect the Water Distribution System		**Method used:** The student should explain how to: • Perform Repair cooling tower **Principles:** The student should explain the principles related to Repair cooling tower **Theories:** The student should explain: • Advantage of repairing cool tower • Types of cooling tower **Circumstantial knowledge:** **Detailed knowledge about:** • Consider environmental regulation Safe handling of working tools	• Electro-mechanical toolbox • Vacuum pump • Manifold gauge • Multimeter • Digital clamp meter • Safety goggles • Ladder • Safety boots • Overall	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
		(d) Repairing electrical system	**Brainstorm:** Guide the students to define Repair electrical system and their application **Demonstration:** Demonstrate to the students on how to Repair electrical system and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Repair electrical system in cold rooms	• Identify types of cold room • Select tools and equipment • Carryout diagnostic troubleshooting • Gather information • Understand the malfunction • Identify which parameters need to be evaluated • Identify the source of the problem • Correct/repair the component • Verify the repair	A record of repairs carried out conforms to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: Repair electrical system **Principles:** The student should explain the principles of Repair electrical system **Theories:** The student should explain: • Super heating and sub-cooling • Refrigeration cycle **Circumstantial knowledge:** **Detailed knowledge about:** • Consider environmental regulation Safe handling of working tools	The following tools, equipment and safety gear are to be available: • Electro-mechanical toolbox • Multimeter • Phase tester • Insulation tape • Crimping tool • Cable lugs • Digital clamp meter • Safety goggles • Ladder • Safety boots • Overall	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Perform root cause analysis				
		(e) Repairing refrigerant pipes	**Brainstorm:** Guide the students to define Repair refrigerant pipes and their application **Demonstration:** Demonstrate to the students on how to Repair refrigerant pipes and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Repair refrigerant pipes in cold rooms	• Identify types of cold room • Select tools and equipment • Carryout diagnostic troubleshooting • Select type of piping to be used • Repair refrigerant pipes in both low and high side	A record of repairs carried out conforms to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: Repair refrigerant pipes **Principles:** Repair refrigerant pipes **Theories:** The student should explain: • Refrigerant pipe concept • Types of refrigerant pipe in Cold rooms **Circumstantial knowledge:** **Detailed knowledge about:**	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Electro-mechanical toolbox • Vacuum pump • Manifold gauge • Multimeter • Digital clamp meter • Safety goggles • Ladder • Flaring and swaging tool kit • Recovery cylinder • Recovery unit • Allen key set • Weighing scale • Piecing plier • Pinch of tools • Safety boots	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						• Concept environmental regulation Safe handling working tool	• Overall • Gloves	
		(f) Repairing evaporator	**Brainstorm:** Guide the students to define evaporator and their application **Demonstration:** Demonstrate to the students on how to repair evaporator and to handle tools and equipment **Practical work:** Organise the students into manageable groups to repair evaporator in cold rooms	• Identify types of cold room • Select tools and equipment • Carryout diagnostic troubleshooting • Perform pump down • Repair compressor • Repair / replace evaporator unit • Repair / replace condenser unit • Repair body work • Change refrigerant	A record of repairs carried out conforms to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: Repair evaporator **Principles:** The student should explain the principles of Repair evaporator **Theories:** The student should explain: • Types of evaporators used in Cold rooms • Refrigeration cycle **Circumstantial knowledge:** **Detailed knowledge about:** • Food conservation	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Electro-mechanical toolbox • Vacuum pump • Manifold gauge • Digital clamp meter • Safety goggles • Ladder • Safety boots • Overall	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						• Installing belt driven equipment • Environmental regulation		
	2.5 Repairing chillers	(a) Repairing water supply system	**Brainstorm:** Guide the students to define water supply and their application **Demonstration:** Demonstrate to the students on how to repair water supply system and to handle tools and equipment **Practical work:** Organise the students into manageable groups to repair water supply system	• Select proper tools and equipment • Perform diagnostic trouble shooting • Perform plumbing jobs • Repair/ replace faulty small electrical circuit components • Repair/replace different units of the system • Charge system with refrigerant • Clean workplace	A record of temperature and refrigerant charged conform to specify operational rating	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Determine cause of operational malfunctioning of different units of the system • Cool system water **Principles:** The student should explain of: (y) Primary and secondary refrigeration (z) Heat transfer **Theories:** The student should explain: • Storage requirements of different commodities	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Electro – mechanical toolbox • Set of plumbing tools • Vacuum pump • Gauge manifold • Refrigerant leak detector • Bristle brush • Wire brush • Safety goggles • Safety boots • Over all	32

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				tools and equipment • Store tools and equipment		• Water quality requirements for cooling water • Properties of refrigerants **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of working tools • Environmental regulations		
		(b) Repairing water circulation pump	**Brainstorm:** Guide the students to define water circulation pump and their application **Demonstration:** Demonstrate to the students on how to repair water circulation pump and to handle tools and equipment	• Select proper tools and equipment • Perform diagnostic trouble shooting • Perform plumbing jobs • Repair/ replace faulty small electrical	A record of temperature and refrigerant charged conform to specify operational rating	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Determine cause of operational malfunctioning of different units of the system • Cool system water **Principles:** The student should explain of:	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Electro – mechanical toolbox • Set of plumbing tools • Vacuum pump • Gauge manifold • Refrigerant leak detector	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Practical work: Organise the students into manageable groups to repair water circulation pump	circuit components • Repair/replace different units of the system • Charge system with refrigerant • Clean workplace tools and equipment • Store tools and equipment		(aa) Primary and secondary refrigeration (bb) Heat transfer **Theories:** The student should explain: • Storage requirements of different commodities • Water quality requirements for cooling water • Properties of refrigerants **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of working tools • Environmental regulations	• Bristle brush • Wire brush • Safety goggles • Safety boots • Over all	
		(c) Repairing compressor/ condenser unit	**Brainstorm:** Guide the students to define compressor/conden	• Select proper tools and equipment • Perform diagnostic	A record of temperature and refrigerant charged conform	**Knowledge Evidence:** **Detailed knowledge of:**	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			ser unit and their application **Demonstration:** Demonstrate to the students on how to repair compressor/condenser unit and to handle tools and equipment **Practical work:** Organise the students into manageable groups to repair compressor/condenser unit	trouble shooting • Perform plumbing jobs • Repair/ replace faulty small electrical circuit components • Repair/replace different units of the system • Charge system with refrigerant • Clean workplace tools and equipment • Store tools and equipment	to specify operational rating	**Method used:** The student should explain how to: • Determine cause of operational malfunctioning of different units of the system • Cool system water **Principles:** The student should explain of: (cc) Primary and secondary refrigeration (dd) Heat transfer **Theories:** The student should explain: • Storage requirements of different commodities • Water quality requirements for cooling water • Properties of refrigerants **Circumstantial knowledge:**	• Electro – mechanical toolbox • Set of plumbing tools • Vacuum pump • Gauge manifold • Refrigerant leak detector • Bristle brush • Wire brush • Safety goggles • Safety boots • Over all	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						Detailed knowledge about: • Safe handling of working tools • Environmental regulations		
		(d) Replacing refrigerant control units	**Brainstorm:** Guide the students to define refrigerant control units and their application **Demonstration:** Demonstrate to the students on how to replace refrigerant control units and to handle tools and equipment **Practical work:** Organise the students into manageable groups to replace	• Select proper tools and equipment • Perform diagnostic trouble shooting • Perform plumbing jobs • Repair/ replace faulty small electrical circuit components • Repair/replace different units of the system • Charge system with refrigerant	A record of temperature and refrigerant charged conform to specify operational rating	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Determine cause of operational malfunctioning of different units of the system • Cool system water **Principles:** The student should explain of: (ee) Primary and secondary refrigeration (ff) Heat transfer **Theories:** The student should explain:	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Electro – mechanical toolbox • Set of plumbing tools • Vacuum pump • Gauge manifold • Refrigerant leak detector • Bristle brush • Wire brush • Safety goggles • Safety boots • Over all	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			refrigerant control units	• Clean workplace tools and equipment • Store tools and equipment		• Storage requirements of different commodities • Water quality requirements for cooling water • Properties of refrigerants **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of working tools • Environmental regulations		
		(e) Charging with refrigerant	**Brainstorm:** Guide the students to define charge with refrigerant and their application **Demonstration:** Demonstrate to the students on how to charge with	• Select proper tools and equipment • Perform diagnostic trouble shooting • Perform plumbing jobs • Repair/ replace faulty	A record of temperature and refrigerant charged conform to specify operational rating	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Determine cause of operational malfunctioning of different units of the system	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Electro – mechanical toolbox • Set of plumbing tools • Vacuum pump	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			refrigerant and to handle tools and equipment **Practical work:** Organise the students into manageable groups to charge with refrigerant	small electrical circuit components • Repair/replace different units of the system • Charge system with refrigerant • Clean workplace tools and equipment • Store tools and equipment		• Cool system water **Principles:** The student should explain of: (gg) Primary and secondary refrigeration (hh) Heat transfer **Theories:** The student should explain: • Storage requirements of different commodities • Water quality requirements for cooling water • Properties of refrigerants **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of working tools • Environmental regulations	• Gauge manifold • Refrigerant leak detector • Bristle brush • Wire brush • Safety goggles • Safety boots • Over all	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
	2.6 Repairing central cooling systems	(a) Repairing condenser	**Brainstorm:** Guide the students to define condenser and their application **Demonstration:** Demonstrate to the students on how to repair condenser and to handle tools and equipment **Practical work:** Organise the students into manageable groups to repair condenser	• Select tools and equipment for a task • Perform diagnostic troubleshooting • Repair/replace control equipment • Perform pump down • Purge the system of non-condensates • Replace air filters • Repair compressors • Repair water pumps • Repair or replace condenser • Repair or replace evaporator • Repair or replace duct	A record of maintenance and repair works carried out conforms to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Perform pump down • To install new equipment • Apply different leakage detection methods • Perform diagnostic trouble shooting • Charge refrigerant in a system using different methods **Principles:** The student should explain the principles of: • Heat transfer in a heat exchanger • Compression refrigeration cycle • Primary and secondary refrigerants	The following tools, equipment and safety gear are to be available: • Select tools and equipment for a task • Perform diagnostic troubleshooting • Repair/replace control equipment • Perform pump down • Purge the system of non-condensates • Replace air filters • Repair compressors • Repair water pumps • Repair or replace condenser • Repair or replace evaporator • Repair or replace duct and pipe installations	20

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				and pipe installations • Perform sheet metal works • Carry out plumbing works • Perform balancing of air delivery equipment • Perform machine erection • Store tools and equipment • Clean equipment and workplace • Perform riveting work		**Theories:** The student should explain: • Pressure temperature charts for different refrigerants • Super heating as it refers to refrigeration **Circumstantial knowledge:** **Detailed knowledge about:** • Dismantling and assembling procedures • Safe handling of working tools and equipment • Electric circuitry • Pressure and temperature quantities with reference to refrigeration • Safe handling of refrigerants during charging, discharging and storage Environmental regulations on green gases	• Perform sheet metal works • Carry out plumbing works • Perform balancing of air delivery equipment • Perform machine erection • Store tools and equipment • Clean equipment and workplace • Perform riveting work	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
		(b) Repairing compressor	**Brainstorm:** Guide the students to define compressor and their application **Demonstration:** Demonstrate to the students on how to repair compressor and to handle tools and equipment **Practical work:** Organise the students into manageable groups to repair compressor	• Select tools and equipment for a task • Perform diagnostic troubleshooting • Repair/replace control equipment • Perform pump down • Purge the system of non-condensates • Replace air filters • Repair compressors • Repair water pumps • Repair or replace condenser • Repair or replace evaporator • Repair or replace duct	A record of maintenance and repair works carried out conforms to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Perform pump down • To install new equipment • Apply different leakage detection methods • Perform diagnostic trouble shooting • Charge refrigerant in a system using different methods **Principles:** The student should explain the principles of: • Heat transfer in a heat exchanger • Compression refrigeration cycle • Primary and secondary refrigerants **Theories:** The student should explain:	The following tools, equipment and safety gear are to be available: • Select tools and equipment for a task • Perform diagnostic troubleshooting • Repair/replace control equipment • Perform pump down • Purge the system of non-condensates • Replace air filters • Repair compressors • Repair water pumps • Repair or replace condenser • Repair or replace evaporator • Repair or replace duct and pipe installations	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				and pipe installations • Perform sheet metal works • Carry out plumbing works • Perform balancing of air delivery equipment • Perform machine erection • Store tools and equipment • Clean equipment and workplace • Perform riveting work		• Pressure temperature charts for different refrigerants • Super heating as it refers to refrigeration **Circumstantial knowledge:** **Detailed knowledge about:** • Dismantling and assembling procedures • Safe handling of working tools and equipment • Electric circuitry • Pressure and temperature quantities with reference to refrigeration • Safe handling of refrigerants during charging, discharging and storage Environmental regulations on green gases	• Perform sheet metal works • Carry out plumbing works • Perform balancing of air delivery equipment • Perform machine erection • Store tools and equipment • Clean equipment and workplace • Perform riveting work	
		(c) Repairing	**Brainstorm:**	• Select tools and	A record of maintenance and	**Knowledge Evidence:**	The following tools, equipment and safety	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
		air handling unit	Guide the students to define air handling unit and their application **Demonstration:** Demonstrate to the students on how to repair air handling unit and to handle tools and equipment **Practical work:** Organise the students into manageable groups to repair air handling unit	equipment for a task • Perform diagnostic troubleshooting • Repair/replace control equipment • Perform pump down • Purge the system of non-condensates • Replace air filters • Repair compressors • Repair water pumps • Repair or replace condenser • Repair or replace evaporator • Repair or replace duct and pipe installations	repair works carried out conforms to technical specifications	**Detailed knowledge of:** **Method used:** The student should explain how to: • Perform pump down • To install new equipment • Apply different leakage detection methods • Perform diagnostic trouble shooting • Charge refrigerant in a system using different methods **Principles:** The student should explain the principles of: • Heat transfer in a heat exchanger • Compression refrigeration cycle • Primary and secondary refrigerants **Theories:** The student should explain:	gear are to be available: • Select tools and equipment for a task • Perform diagnostic troubleshooting • Repair/replace control equipment • Perform pump down • Purge the system of non-condensates • Replace air filters • Repair compressors • Repair water pumps • Repair or replace condenser • Repair or replace evaporator • Repair or replace duct and pipe installations • Perform sheet metal works	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Perform sheet metal works • Carry out plumbing works • Perform balancing of air delivery equipment • Perform machine erection • Store tools and equipment • Clean equipment and workplace • Perform riveting work		• Pressure temperature charts for different refrigerants • Super heating as it refers to refrigeration **Circumstantial knowledge:** **Detailed knowledge about:** • Dismantling and assembling procedures • Safe handling of working tools and equipment • Electric circuitry • Pressure and temperature quantities with reference to refrigeration • Safe handling of refrigerants during charging, discharging and storage Environmental regulations on green gases	• Carry out plumbing works • Perform balancing of air delivery equipment • Perform machine erection • Store tools and equipment • Clean equipment and workplace • Perform riveting work	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
		(e) Repairing duct work	**Brainstorm:** Guide the students to define duct work and their application **Demonstration:** Demonstrate to the students on how to repair duct work and to handle tools and equipment **Practical work:** Organise the students into manageable groups to repair duct work	• Select tools and equipment for a task • Perform diagnostic troubleshooting • Repair/replace control equipment • Perform pump down • Purge the system of non-condensates • Replace air filters • Repair compressors • Repair water pumps • Repair or replace condenser • Repair or replace evaporator • Repair or replace duct	A record of maintenance and repair works carried out conforms to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Perform pump down • To install new equipment • Apply different leakage detection methods • Perform diagnostic trouble shooting • Charge refrigerant in a system using different methods **Principles:** The student should explain the principles of: • Heat transfer in a heat exchanger • Compression refrigeration cycle • Primary and secondary refrigerants **Theories:** The student should explain:	• Select tools and equipment for a task • Perform diagnostic troubleshooting • Repair/replace control equipment • Perform pump down • Purge the system of non-condensates • Replace air filters • Repair compressors • Repair water pumps • Repair or replace condenser • Repair or replace evaporator • Repair or replace duct and pipe installations • Perform sheet metal works • Carry out plumbing works	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				and pipe installations • Perform sheet metal works • Carry out plumbing works • Perform balancing of air delivery equipment • Perform machine erection • Store tools and equipment • Clean equipment and workplace • Perform riveting work		• Pressure temperature charts for different refrigerants • Super heating as it refers to refrigeration **Circumstantial knowledge:** **Detailed knowledge about:** • Dismantling and assembling procedures • Safe handling of working tools and equipment • Electric circuitry • Pressure and temperature quantities with reference to refrigeration • Safe handling of refrigerants during charging, discharging and storage Environmental regulations on green gases	• Perform balancing of air delivery equipment • Perform machine erection • Store tools and equipment • Clean equipment and workplace • Perform riveting work	
	2.7 Servicing	(a) Dismantle	**Brainstorm:**	• Select tools and	A record of service works	**Knowledge evidence:**	The following tools, equipment and safety	31

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
	compressors above 60 kw	for overhaul and assembling	Guide the students to define overhaul and assembling and their application **Demonstration:** Demonstrate to the students on how to dismantle for overhaul and assembling and to handle tools and equipment **Practical work:** Organise the students into manageable groups to repair dismantle for overhaul and assembling	equipment for a task • Performing diagnostic troubleshooting • Performing bearing greasing • Performing pump down • Replace air filters • Repair compressors • Detect leaks • Performing sheet metal works • Inspect electrical components • Carry out plumbing works • Check/refill oil level • Store tools and equipment	carried out conforms to technical specifications	**Detailed knowledge of:** **Method used:** The student should explain how to: • Assemble and disassemble according to procedures • Apply different leakage detection methods • Performing diagnostic trouble shooting **Principles:** The student should explain the principles of: • Heat transfer in a heat exchanger • Compression refrigeration cycle • Primary and secondary refrigerants **Theories:** The student should explain: • Pressure temperature charts for different refrigerants	gear are to be available: • Working hand gloves • Electro mechanical toolbox • Wire brush • Lifting tackles • Grease gun • Revolving wire brush • Compressed air hose • Compressed air supply • Dust mask • Refrigerant leak detector • Flash light • Inspection lamp • Pail or containers	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Clean equipment and workplace		• Super heating as it refers to refrigeration • Application of oil and greasing lubricants **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools and equipment • Electric circuitry • Pressure and temperature quantities with reference to refrigeration • Safe handling of refrigerants during charging, discharging and storage Environmental regulations on green gases		
		(b) Lubricating bearing	**Brainstorm:** Guide the students to define Lubricate bearing and their application	• Select tools and equipment for a task • Performing diagnostic	A record of service works carried out conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:**	The following tools, equipment and safety gear are to be available: • Working hand gloves	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Demonstration: Demonstrate to the students on how to Lubricate bearing and to handle tools and equipment **Practical work:** Organise the students into manageable groups to repair Lubricate bearing	troubleshooting • Performing bearing greasing • Performing pump down • Replace air filters • Repair compressors • Detect leaks • Performing sheet metal works • Inspect electrical components • Carry out plumbing works • Check/refill oil level • Store tools and equipment • Clean equipment and workplace		**Method used:** The student should explain how to: • Assemble and disassemble according to procedures • Apply different leakage detection methods • Performing diagnostic trouble shooting **Principles:** The student should explain the principles of: • Heat transfer in a heat exchanger • Compression refrigeration cycle • Primary and secondary refrigerants **Theories:** The student should explain: • Pressure temperature charts for different refrigerants	• Electro mechanical toolbox • Wire brush • Lifting tackles • Grease gun • Revolving wire brush • Compressed air hose • Compressed air supply • Dust mask • Refrigerant leak detector • Flash light • Inspection lamp • Pail or containers	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						• Super heating as it refers to refrigeration • Application of oil and greasing lubricants **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools and equipment • Electric circuitry • Pressure and temperature quantities with reference to refrigeration • Safe handling of refrigerants during charging, discharging and storage • Environmental regulations on green gases		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
		(c) Replacing bearing	**Brainstorm:** Guide the students to define bearing and their application **Demonstration:** Demonstrate to the students on how to replace bearing and to handle tools and equipment **Practical work:** Organise the students into manageable groups to replace bearing	• Select tools and equipment for a task • Performing diagnostic troubleshooting • Performing bearing greasing • Performing pump down • Replace air filters • Repair compressors • Detect leaks • Performing sheet metal works • Inspect electrical components • Carry out plumbing works • Check/refill oil level	A record of service works carried out conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Assemble and disassemble according to procedures • Apply different leakage detection methods • Performing diagnostic trouble shooting **Principles:** The student should explain the principles of: • Heat transfer in a heat exchanger • Compression refrigeration cycle • Primary and secondary refrigerants **Theories:** The student should explain:	The following tools, equipment and safety gear are to be available: • Working hand gloves • Electro mechanical toolbox • Wire brush • Lifting tackles • Grease gun • Revolving wire brush • Compressed air hose • Compressed air supply • Dust mask • Refrigerant leak detector • Flash light • Inspection lamp • Pail or containers	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Store tools and equipment • Clean equipment and workplace		• Pressure temperature charts for different refrigerants • Super heating as it refers to refrigeration • Application of oil and greasing lubricants **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools and equipment • Electric circuitry • Pressure and temperature quantities with reference to refrigeration • Safe handling of refrigerants during charging, discharging and storage Environmental regulations on green gases		
		(d) Replace oil seal	**Brainstorm:** Guide the students to define oil seal	• Select tools and	A record of service works carried out	**Knowledge evidence:** **Detailed knowledge of:**	The following tools, equipment and safety	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			and their application **Demonstration:** Demonstrate to the students on how to replace oil seal and to handle tools and equipment **Practical work:** Organise the students into manageable groups to replace oil seal	equipment for a task • Performing diagnostic troubleshooting • Performing bearing greasing • Performing pump down • Replace air filters • Repair compressors • Detect leaks • Performing sheet metal works • Inspect electrical components • Carry out plumbing works • Check/refill oil level • Store tools and equipment	conforms to technical specifications	**Method used:** The student should explain how to: • Assemble and disassemble according to procedures • Apply different leakage detection methods • Performing diagnostic trouble shooting **Principles:** The student should explain the principles of: • Heat transfer in a heat exchanger • Compression refrigeration cycle • Primary and secondary refrigerants **Theories:** The student should explain: • Pressure temperature charts for different refrigerants	gear are to be available: • Working hand gloves • Electro mechanical toolbox • Wire brush • Lifting tackles • Grease gun • Revolving wire brush • Compressed air hose • Compressed air supply • Dust mask • Refrigerant leak detector • Flash light • Inspection lamp • Pail or containers	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Clean equipment and workplace		• Super heating as it refers to refrigeration • Application of oil and greasing lubricants **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools and equipment • Electric circuitry • Pressure and temperature quantities with reference to refrigeration • Safe handling of refrigerants during charging, discharging and storage Environmental regulations on green gases		
		(e) Replacing piston rings	**Brainstorm:** Guide the students to define piston ring and their application	• Select tools and equipment for a task • Performing diagnostic	A record of service works carried out conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:**	The following tools, equipment and safety gear are to be available: • Working hand gloves	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Demonstration: Demonstrate to the students on how to replace piston rings and to handle tools and equipment **Practical work:** Organise the students into manageable groups to replace piston rings	troubleshooting • Performing bearing greasing • Performing pump down • Replace air filters • Repair compressors • Detect leaks • Performing sheet metal works • Inspect electrical components • Carry out plumbing works • Check/refill oil level • Store tools and equipment • Clean equipment and workplace		**Method used:** The student should explain how to: • Assemble and disassemble according to procedures • Apply different leakage detection methods • Performing diagnostic trouble shooting **Principles:** The student should explain the principles of: • Heat transfer in a heat exchanger • Compression refrigeration cycle • Primary and secondary refrigerants **Theories:** The student should explain: • Pressure temperature charts for different refrigerants	• Electro mechanical toolbox • Wire brush • Lifting tackles • Grease gun • Revolving wire brush • Compressed air hose • Compressed air supply • Dust mask • Refrigerant leak detector • Flash light • Inspection lamp • Pail or containers	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						• Super heating as it refers to refrigeration • Application of oil and greasing lubricants **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools and equipment • Electric circuitry • Pressure and temperature quantities with reference to refrigeration • Safe handling of refrigerants during charging, discharging and storage • Environmental regulations on green gases		
		(f) Replace valves	**Brainstorm:** Guide the students to define valve and their application	• Select tools and equipment for a task • Performing diagnostic	A record of service works carried out conforms to	**Knowledge evidence:** **Detailed knowledge of:**	The following tools, equipment and safety gear are to be available: • Working hand gloves	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Demonstration: Demonstrate to the students on how to replace valves and to handle tools and equipment **Practical work:** Organise the students into manageable groups to replace valves	troubleshooting • Performing bearing greasing • Performing pump down • Replace air filters • Repair compressors • Detect leaks • Performing sheet metal works • Inspect electrical components • Carry out plumbing works • Check/refill oil level • Store tools and equipment • Clean equipment and workplace	technical specifications	**Method used:** The student should explain how to: • Assemble and disassemble according to procedures • Apply different leakage detection methods • Performing diagnostic trouble shooting **Principles:** The student should explain the principles of: • Heat transfer in a heat exchanger • Compression refrigeration cycle • Primary and secondary refrigerants **Theories:** The student should explain: • Pressure temperature charts for different refrigerants	• Electro mechanical toolbox • Wire brush • Lifting tackles • Grease gun • Revolving wire brush • Compressed air hose • Compressed air supply • Dust mask • Refrigerant leak detector • Flash light • Inspection lamp • Pail or containers	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						• Super heating as it refers to refrigeration • Application of oil and greasing lubricants **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools and equipment • Electric circuitry • Pressure and temperature quantities with reference to refrigeration • Safe handling of refrigerants during charging, discharging and storage Environmental regulations on green gases		
		(g) Measuring electrical quantities	**Brainstorm:** Guide the students to define measure electrical quantities	• Select tools and equipment for a task • Performing diagnostic	A record of service works carried out conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:**	The following tools, equipment and safety gear are to be available: • Working hand gloves	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			and their application **Demonstration:** Demonstrate to the students on how to measure electrical quantities and to handle tools and equipment **Practical work:** Organise the students into manageable groups to measure electrical quantities	troubleshooting • Performing bearing greasing • Performing pump down • Replace air filters • Repair compressors • Detect leaks • Performing sheet metal works • Inspect electrical components • Carry out plumbing works • Check/refill oil level • Store tools and equipment • Clean equipment and workplace		**Method used:** The student should explain how to: • Assemble and disassemble according to procedures • Apply different leakage detection methods • Performing diagnostic trouble shooting **Principles:** The student should explain the principles of: • Heat transfer in a heat exchanger • Compression refrigeration cycle • Primary and secondary refrigerants **Theories:** The student should explain: • Pressure temperature charts for different refrigerants	• Electro mechanical toolbox • Wire brush • Lifting tackles • Grease gun • Revolving wire brush • Compressed air hose • Compressed air supply • Dust mask • Refrigerant leak detector • Flash light • Inspection lamp • Pail or containers	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						• Super heating as it refers to refrigeration • Application of oil and greasing lubricants **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools and equipment • Electric circuitry • Pressure and temperature quantities with reference to refrigeration • Safe handling of refrigerants during charging, discharging and storage • Environmental regulations on green gases		
	2.8 Servicing receiver tank	(a) Dismounting receiver Tank	**Brainstorm:** Guide the students to define Dismount Receiver Tank and their application	• Select tools and equipment for a task • Performing diagnostic	A record of **receiver** service works carried out conforms to	**Knowledge evidence:** **Detailed knowledge of:**	The following tools, equipment and safety gear are to be available: • Working hand gloves	15

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Demonstration: Demonstrate to the students on how to Dismount Receiver Tank and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Dismount Receiver Tank	troubleshooting • Read refrigerant level gauge • Check for oil emulsification • Drain safely oil • Performing pump down • Detect leaks • Check/refill oil level • Store tools and equipment • Clean equipment and workplace	technical specifications	**Method used:** The student should explain how to: • Assembly and disassembly procedures • Apply different leakage detection methods • Emulsification • Performing diagnostic trouble shooting **Principles:** The student should explain the principles of: • Lubrication • Compression refrigeration cycle • Primary and secondary refrigerants **Theories:** The student should explain: • Pressure temperature charts for different refrigerants • Application of oil and greasing lubricants	• Electro mechanical toolbox • Wire brush • Revolving wire brush • Cotton waste • Compressed air hose • Compressed air supply • Dust mask • Refrigerant leak detector • Flash light • Inspection lamp • Pail or container	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						Circumstantial knowledge **Detailed knowledge about:** • Safe handling of working tools and equipment • Electric circuitry • Pressure and temperature quantities with reference to refrigeration • Safe handling of refrigerants during charging, discharging and storage • Environmental regulations on green gases		
		(b) Testing leakage of receiver Tank	**Brainstorm:** Guide the students to define Test leakage of receiver Tank and their application **Demonstration:**	• Select tools and equipment for a task • Performing diagnostic troubleshooting	A record of **receiver** service works carried out conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Assembly and disassembly procedures	The following tools, equipment and safety gear are to be available: • Working hand gloves • Electro mechanical toolbox • Wire brush	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Demonstrate to the students on how to Test leakage of receiver Tank and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Test leakage of receiver Tank	• Read refrigerant level gauge • Check for oil emulsification • Drain safely oil • Performing pump down • Detect leaks • Check/refill oil level • Store tools and equipment • Clean equipment and workplace		• Apply different leakage detection methods • Emulsification • Performing diagnostic trouble shooting **Principles:** The student should explain the principles of: • Lubrication • Compression refrigeration cycle • Primary and secondary refrigerants **Theories:** The student should explain: • Pressure temperature charts for different refrigerants • Application of oil and greasing lubricants **Circumstantial knowledge** **Detailed knowledge about:**	• Revolving wire brush • Cotton waste • Compressed air hose • Compressed air supply • Dust mask • Refrigerant leak detector • Flash light • Inspection lamp • Pail or container	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						• Safe handling of working tools and equipment • Electric circuitry • Pressure and temperature quantities with reference to refrigeration • Safe handling of refrigerants during charging, discharging and storage Environmental regulations on green gases		
		(c) Cleaning receiver tank	**Brainstorm:** Guide the students to define receiver tank and their application **Demonstration:** Demonstrate to the students on how to Clean receiver tank and to handle tools and equipment **Practical work:**	• Select tools and equipment for a task • Performing diagnostic troubleshooting • Read refrigerant level gauge • Check for oil emulsification • Drain safely oil	A record of **receiver** service works carried out conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Assembly and disassembly procedures • Apply different leakage detection methods • Emulsification	The following tools, equipment and safety gear are to be available: • Working hand gloves • Electro mechanical toolbox • Wire brush • Revolving wire brush • Cotton waste • Compressed air hose	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Organise the students into manageable groups to clean receiver tank	• Performing pump down • Detect leaks • Check/refill oil level • Store tools and equipment • Clean equipment and workplace		• Performing diagnostic trouble shooting **Principles:** The student should explain the principles of: • Lubrication • Compression refrigeration cycle • Primary and secondary refrigerants **Theories:** The student should explain: • Pressure temperature charts for different refrigerants • Application of oil and greasing lubricants **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools and equipment • Electric circuitry	• Compressed air supply • Dust mask • Refrigerant leak detector • Flash light • Inspection lamp • Pail or container	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						• Pressure and temperature quantities with reference to refrigeration • Safe handling of refrigerants during charging, discharging and storage Environmental regulations on green gases		
		(e) Repainting receiver tank	**Brainstorm:** Guide the students to define Repaint receiver tank and their application **Demonstration:** Demonstrate to the students on how to Repaint receiver tank and to handle tools and equipment **Practical work:** Organise the students into manageable groups	• Select tools and equipment for a task • Performing diagnostic troubleshooting • Read refrigerant level gauge • Check for oil emulsification • Drain safely oil • Performing pump down • Detect leaks	A record of **receiver** service works carried out conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Assembly and disassembly procedures • Apply different leakage detection methods • Emulsification • Performing diagnostic trouble shooting	The following tools, equipment and safety gear are to be available: • Working hand gloves • Electro mechanical toolbox • Wire brush • Revolving wire brush • Cotton waste • Compressed air hose • Compressed air supply • Dust mask	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			to Repaint receiver tank	• Check/refill oil level • Store tools and equipment • Clean equipment and workplace		**Principles:** The student should explain the principles of: • Lubrication • Compression refrigeration cycle • Primary and secondary refrigerants **Theories:** The student should explain: • Pressure temperature charts for different refrigerants • Application of oil and greasing lubricants **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools and equipment • Electric circuitry • Pressure and temperature quantities with reference to refrigeration	• Refrigerant leak detector • Flash light • Inspection lamp • Pail or container	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						• Safe handling of refrigerants during charging, discharging and storage • Environmental regulations on green gases		
	2.9 Repairing receiver tank	(a) Repairing receiver tank	**Brainstorm:** Guide the students to define Repair receiver tan and their application **Demonstration:** Demonstrate to the students on how to Repair receiver tan and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Repair receiver tan	• Select tools and equipment for a task • Performing diagnostic troubleshooting • Read refrigerant level gauge • Check for oil emulsification • Drain safely oil • Performing pump down • Detect leaks • Check/refill oil level • Store tools and equipment	A record of receiver repair works carried out conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Assembly and disassembly procedures • Apply different leakage detection methods • Emulsification • Performing diagnostic trouble shooting **Principles:** The student should explain the principles of: • Lubrication • Compression refrigeration cycle	The following tools, equipment and safety gear are to be available: • Working hand gloves • Electro mechanical toolbox • Wire brush • Revolving wire brush • Cotton waste • Compressed air hose • Compressed air supply • Dust mask • Refrigerant leak detector • Flash light • Inspection lamp • Pail or container	20

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Clean equipment and workplace		• Primary and secondary refrigerants **Theories:** The student should explain: • Pressure temperature charts for different refrigerants • Application of oil and greasing lubricants **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools and equipment • Electric circuitry • Pressure and temperature quantities with reference to refrigeration • Safe handling of refrigerants during charging, discharging and storage Environmental regulations on green gases		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
		(b) Repairing receiver tank flare connection	**Brainstorm:** Guide the students to define Repair receiver tank flare connection and their application **Demonstration:** Demonstrate to the students on how to Repair receiver tank flare connection and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Repair receiver tank flare connection	• Select tools and equipment for a task • Performing diagnostic troubleshooting • Read refrigerant level gauge • Check for oil emulsification • Drain safely oil • Performing pump down • Detect leaks • Check/refill oil level • Store tools and equipment • Clean equipment and workplace	A record of receiver repair works carried out conforms to technical specifications	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Assembly and disassembly procedures • Apply different leakage detection methods • Emulsification • Performing diagnostic trouble shooting **Principles:** The student should explain the principles of: • Lubrication • Compression refrigeration cycle • Primary and secondary refrigerants **Theories:** The student should explain:	The following tools, equipment and safety gear are to be available: • Working hand gloves • Electro mechanical toolbox • Wire brush • Revolving wire brush • Cotton waste • Compressed air hose • Compressed air supply • Dust mask • Refrigerant leak detector • Flash light • Inspection lamp • Pail or container	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						• Pressure temperature charts for different refrigerants • Application of oil and greasing lubricants **Circumstantial knowledge** **Detailed knowledge about:** • Safe handling of working tools and equipment • Electric circuitry • Pressure and temperature quantities with reference to refrigeration • Safe handling of refrigerants during charging, discharging and storage • Environmental regulations on green gases		
		(c) Repairing receiver tank leakage	**Brainstorm:** Guide the students to define Repair receiver tank	• Select tools and equipment for a task	A record of receiver repair works carried out conforms to	**Knowledge evidence:** **Detailed knowledge of:**	The following tools, equipment and safety gear are to be available:	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			leakage and their application **Demonstration:** Demonstrate to the students on how to Repair receiver tank leakage and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Repair receiver tank leakage	• Performing diagnostic troubleshooting • Read refrigerant level gauge • Check for oil emulsification • Drain safely oil • Performing pump down • Detect leaks • Check/refill oil level • Store tools and equipment • Clean equipment and workplace	technical specifications	**Method used:** The student should explain how to: • Assembly and disassembly procedures • Apply different leakage detection methods • Emulsification • Performing diagnostic trouble shooting **Principles:** The student should explain the principles of: • Lubrication • Compression refrigeration cycle • Primary and secondary refrigerants **Theories:** The student should explain: • Pressure temperature charts for different refrigerants • Application of oil and greasing lubricants	• Working hand gloves • Electro mechanical toolbox • Wire brush • Revolving wire brush • Cotton waste • Compressed air hose • Compressed air supply • Dust mask • Refrigerant leak detector • Flash light • Inspection lamp • Pail or container	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						Circumstantial knowledge **Detailed knowledge about:** • Safe handling of working tools and equipment • Electric circuitry • Pressure and temperature quantities with reference to refrigeration • Safe handling of refrigerants during charging, discharging and storage • Environmental regulations on green gases		
3.0 Applying advanced material joining techniques	3.1 Performing arc welding	(a) Welding straight beads	**Brainstorm:** Guide the students to define Weld straight beads and their application **Demonstration:** Demonstrate to the students on how to	**The student should be able to:** • Inspect the machine, cable and electrode holder	Welded metal conforms to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain the welding technique used	The following tools, equipment and safety gear are to be available: • Welding machine • Welding cables • Electrode holder • Welding shield • Chipping hammer • Wire brush	23

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Weld straight beads and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Weld straight beads in arc welding	• Interpret working drawing • Prepare materials for welding • Select type and size of electrode for the job • Set recommended current • Weld a work piece • Maintain electrode angle and arc length • Control electrode travel speed along the joint • Chip off metal slag and wire brush • Inspect for weld defect		**Principles:** The student should explain the principles of: • Arc welding • Minimizing distortion • Obtaining good penetration • Selecting weld current **Theories:** The student should explain: • Types of metals and their properties • Types and functions of welding equipment • Groove preparations • Uses of wire brush and chipping hammer • Metallurgical effects on weldment • Characteristics of AC and DC welding machine • Types of welds • Types of electrode coatings and function • Work angle and lead angle • Welding symbols • Types of distortion	• Work bench • Welding tongs • Angle grinder • Flat file • Bench vice • Scriber • Earth clamp • Ball pein hammer • Centre punch • Overalls • Leather gloves • Canvas spats • Safety boots • Leather apron	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Clean workplace • Clean tools and equipment • Store tools and equipment in safe place		• Joint design **Circumstantial knowledge:** **Detailed knowledge about:** • Safety precautions to be observed while welding work piece • First Aid		
		(b) Welding metal in down hand butt joint	**Brainstorm:** Guide the students to define Weld metal in down hand butt joint and their application **Demonstration:** Demonstrate to the students on how to Weld metal in down hand butt joint and to handle tools and equipment **Practical work:**	**The student should be able to:** • Inspect the machine, cable and electrode holder • Interpret working drawing • Prepare materials for welding • Select type and size of electrode for the job	Welded metal conforms to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain the welding technique used **Principles:** The student should explain the principles of: • Arc welding • Minimizing distortion • Obtaining good penetration • Selecting weld current **Theories:** The student should explain:	The following tools, equipment and safety gear are to be available: • Welding machine • Welding cables • Electrode holder • Welding shield • Chipping hammer • Wire brush • Work bench • Welding tongs • Angle grinder • Flat file • Bench vice • Scriber • Earth clamp • Ball pein hammer • Centre punch	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Organise the students into manageable groups to Weld metal in down hand butt joint in arc welding	• Set recommended current • Weld a work piece • Maintain electrode angle and arc length • Control electrode travel speed along the joint • Chip off metal slag and wire brush • Inspect for weld defect • Clean workplace • Clean tools and equipment • Store tools and equipment in safe place		• Types of metals and their properties • Types and functions of welding equipment • Groove preparations • Uses of wire brush and chipping hammer • Metallurgical effects on weldment • Characteristics of AC and DC welding machine • Types of welds • Types of electrode coatings and function • Work angle and lead angle • Welding symbols • Types of distortion • Joint design **Circumstantial knowledge:** **Detailed knowledge about:** • Safety precautions to be observed while welding work piece • First Aid	• Overalls • Leather gloves • Canvas spats • Safety boots • Leather apron	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
		(c) Welding metal in down hand lap joint	**Brainstorm:** Guide the students to define Weld metal in down hand lap joint and their application **Demonstration:** Demonstrate to the students on how to Weld metal in down hand lap joint and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Weld metal in down hand lap joint in arc welding	**The student should be able to:** • Inspect the machine, cable and electrode holder • Interpret working drawing • Prepare materials for welding • Select type and size of electrode for the job • Set recommended current • Weld a work piece • Maintain electrode angle and arc length • Control electrode travel speed	Welded metal conforms to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain the welding technique used **Principles:** The student should explain the principles of: • Arc welding • Minimizing distortion • Obtaining good penetration • Selecting weld current **Theories:** The student should explain: • Types of metals and their properties • Types and functions of welding equipment • Groove preparations • Uses of wire brush and chipping hammer • Metallurgical effects on weldment • Characteristics of AC and DC welding machine	The following tools, equipment and safety gear are to be available: • Welding machine • Welding cables • Electrode holder • Welding shield • Chipping hammer • Wire brush • Work bench • Welding tongs • Angle grinder • Flat file • Bench vice • Scriber • Earth clamp • Ball pein hammer • Centre punch • Overalls • Leather gloves • Canvas spats • Safety boots • Leather apron	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				along the joint • Chip off metal slag and wire brush • Inspect for weld defect • Clean workplace • Clean tools and equipment • Store tools and equipment in safe place		• Types of welds • Types of electrode coatings and function • Work angle and lead angle • Welding symbols • Types of distortion • Joint design **Circumstantial knowledge:** **Detailed knowledge about:** • Safety precautions to be observed while welding work piece • Administer First Aid		
		(d) Welding metal in down hand corner joint	**Brainstorm:** Guide the students to define Weld metal in down hand corner joint and their application **Demonstration:** Demonstrate to the students on how to Weld metal in	**The student should be able to:** • Inspect the machine, cable and electrode holder • Interpret working drawing	Welded metal conforms to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain the welding technique used **Principles:** The student should explain the principles of: • Arc welding • Minimizing distortion	The following tools, equipment and safety gear are to be available: • Welding machine • Welding cables • Electrode holder • Welding shield • Chipping hammer • Wire brush • Work bench • Welding tongs	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			down hand corner joint and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Weld metal in down hand corner joint in arc welding	• Prepare materials for welding • Select type and size of electrode for the job • Set recommended current • Weld a work piece • Maintain electrode angle and arc length • Control electrode travel speed along the joint • Chip off metal slag and wire brush • Inspect for weld defect • Clean workplace		• Obtaining good penetration • Selecting weld current **Theories:** The student should explain: • Types of metals and their properties • Types and functions of welding equipment • Groove preparations • Uses of wire brush and chipping hammer • Metallurgical effects on weldment • Characteristics of AC and DC welding machine • Types of welds • Types of electrode coatings and function • Work angle and lead angle • Welding symbols • Types of distortion • Joint design **Circumstantial** **knowledge:**	• Angle grinder • Flat file • Bench vice • Scriber • Earth clamp • Ball pein hammer • Centre punch • Overalls • Leather gloves • Canvas spats • Safety boots • Leather apron	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Clean tools and equipment • Store tools and equipment in safe place		**Detailed knowledge about:** • Safety precautions to be observed while welding work piece • Administer First Aid		
		(e) Welding metal in down hand tee joint	**Brainstorm:** Guide the students to define Weld metal in down hand tee joint and their application **Demonstration:** Demonstrate to the students on how to Weld metal in down hand tee joint and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Weld metal in	**The student should be able to:** • Inspect the machine, cable and electrode holder • Interpret working drawing • Prepare materials for welding • Select type and size of electrode for the job • Set recommended current	Welded metal conforms to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain the welding technique used **Principles:** The student should explain the principles of: • Arc welding • Minimizing distortion • Obtaining good penetration • Selecting weld current **Theories:** The student should explain: • Types of metals and their properties	The following tools, equipment and safety gear are to be available: • Welding machine • Welding cables • Electrode holder • Welding shield • Chipping hammer • Wire brush • Work bench • Welding tongs • Angle grinder • Flat file • Bench vice • Scriber • Earth clamp • Ball pein hammer • Centre punch • Overalls • Leather gloves • Canvas spats	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			down hand tee joint in arc welding	• Weld a work piece • Maintain electrode angle and arc length • Control electrode travel speed along the joint • Chip off metal slag and wire brush • Inspect for weld defect • Clean workplace • Clean tools and equipment • Store tools and equipment in safe place		• Types and functions of welding equipment • Groove preparations • Uses of wire brush and chipping hammer • Metallurgical effects on weldment • Characteristics of AC and DC welding machine • Types of welds • Types of electrode coatings and function • Work angle and lead angle • Welding symbols • Types of distortion • Joint design **Circumstantial knowledge:** **Detailed knowledge about:** • Safety precautions to be observed while welding work piece • First Aid	• Safety boots • Leather apron	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
		(f) Welding metal in horizontal butt joint	**Brainstorm:** Guide the students to define Weld metal in horizontal butt joint and their application **Demonstration:** Demonstrate to the students on how to Weld metal in horizontal butt joint and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Weld metal in horizontal butt joint in arc welding	**The student should be able to:** • Inspect the machine, cable and electrode holder • Interpret working drawing • Prepare materials for welding • Select type and size of electrode for the job • Set recommended current • Weld a work piece • Maintain electrode angle and arc length • Control electrode travel speed	Welded metal conforms to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain the welding technique used **Principles:** The student should explain the principles of: • Arc welding • Minimizing distortion • Obtaining good penetration • Selecting weld current **Theories:** The student should explain: • Types of metals and their properties • Types and functions of welding equipment • Groove preparations • Uses of wire brush and chipping hammer • Metallurgical effects on weldment • Characteristics of AC and DC welding machine	The following tools, equipment and safety gear are to be available: • Welding machine • Welding cables • Electrode holder • Welding shield • Chipping hammer • Wire brush • Work bench • Welding tongs • Angle grinder • Flat file • Bench vice • Scriber • Earth clamp • Ball pein hammer • Centre punch • Overalls • Leather gloves • Canvas spats • Safety boots • Leather apron	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				along the joint • Chip off metal slag and wire brush • Inspect for weld defect • Clean workplace • Clean tools and equipment • Store tools and equipment in safe place		• Types of welds • Types of electrode coatings and function • Work angle and lead angle • Welding symbols • Types of distortion • Joint design **Circumstantial knowledge:** **Detailed knowledge about:** • Safety precautions to be observed while welding work piece • First Aid		
	3.2 Performing resistance welding	(a) Joining steel plates	**Brainstorm:** Guide the students to define Join steel plates their application **Demonstration:** Demonstrate to the students on how to Join steel plates	**The student should be able to:** • Select tools and equipment • Mark the two pieces • Perform spot welding to join two flat metal pieces	A set of work pieces joined conform to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Prepare work piece • Perform spot welding • Set current	The following tools, equipment and safety gear are to be available: • Resistance welding machine • Tongs • Welding apron • Welding hand gloves • Welding shield • Safety boots	27

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Join steel plates in resistance welding	• Hold the work pieces together using a grip plier • Set proper current • Radius gauge • Store tools and equipment • Clean workplace		**Principles:** The student should explain the principles of: • Resistance welding • Spot welding **Theories:** The student should explain: • Importance of cleaning the joint area before joining • Resistance welding • Current settings for different sheet thicknesses • Safe handling of work pieces • Safe handling of working tools • Safe handling of measuring instruments **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of work pieces	• Tin snip • Power supply • Wire brush	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						• Safe handling of working tools • Safe handling of measuring instruments		
		(b) Joining steel pipes	**Brainstorm:** Guide the students to define Join steel pipes their application **Demonstration:** Demonstrate to the students on how to Join steel pipes and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Join steel pipes in resistance welding	**The student should be able to:** • Select tools and equipment • Mark the two pieces • Perform spot welding to join two flat metal pieces • Hold the work pieces together using a grip plier • Set proper current • Radius gauge • Store tools and equipment • Clean workplace	A set of work pieces joined conform to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Prepare work piece • Perform spot welding • Set current **Principles:** The student should explain the principles of: • Resistance welding • Spot welding **Theories:** The student should explain: • Importance of cleaning the joint area before joining • Resistance welding • Current settings for different sheet thicknesses	The following tools, equipment and safety gear are to be available: • Resistance welding machine • Tongs • Welding apron • Welding hand gloves • Welding shield • Safety boots • Tin snip • Power supply • Wire brush	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						• Safe handling of work pieces • Safe handling of working tools • Safe handling of measuring instruments **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of work pieces • Safe handling of working tools • Safe handling of measuring instruments		
	3.3 Performing aluminium welding	(a) Joining aluminium sheets	**Brainstorm:** Guide the students to define aluminium sheets **Demonstration:** Demonstrate to the students on how to aluminium sheets and to handle tools and equipment	**The student should be able to:** • Select tools and equipment • Set correct welding parameters • Perform sheet joints	A set of work pieces welded conform to specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Set correct gas pressure • Set correct current	The following tools, equipment and safety gear are to be available: • Safety boots • Welding hand gloves • Welding apron • Head fixed welding shield • TIG machine • Wire brush	15

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Practical work: Organise the students into manageable groups to aluminium sheets in aluminium welding	• Perform tube joint • Perform butt welding • Perform overhead welding • Clean tools and workplace • Store tools and equipment • Perform left and right welding		**Principles:** The student should explain the principles of metal fusion **Theories:** The student should explain: • Oxide formation problems with aluminium welding • Different welding processes **Circumstantial knowledge:** **Detailed knowledge about:** • Work safety and health regulation • Properties of engineering materials		
		(b) Joining aluminium tubes	**Brainstorm:** Guide the students to define Join aluminium tubes **Demonstration:**	**The student should be able to:** • Select tools and equipment	A set of work pieces welded conform to specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to:	The following tools, equipment and safety gear are to be available: • Safety boots • Welding hand gloves	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Demonstrate to the students on how to Join aluminium tubes and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Join aluminium tubes in aluminium welding	• Set correct welding parameters • Perform sheet joints • Perform tube joint • Perform butt welding • Perform overhead welding • Clean tools and workplace • Store tools and equipment • Perform left and right welding		• Set correct gas pressure • Set correct current **Principles:** The student should explain the principles of metal fusion **Theories:** The student should explain: • Oxide formation problems with aluminium welding • Different welding processes **Circumstantial knowledge:** **Detailed knowledge about:** • Work safety and health regulation • Properties of engineering materials	• Welding apron • Head fixed welding shield • TIG machine • Wire brush	
4.0 Managing safe work environment	4.1 Managing hazards	(a) Controlling mechanical hazards	**Brainstorm:** Guide the students to define Control mechanical hazard	**The student should be able to:**	Hazards, risks, incident and accidents are managed according to	**Knowledge evidence:** **Detailed knowledge of:**	The following tools, equipment and safety gear are to be available: • Electrical equipment	18

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Demonstration: Demonstrate to the students on how to Control mechanical hazard and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Control mechanical hazard in Manage hazards	• Interpret service manuals • Select tools and equipment • Use OSHA rules and regulations • Prepare workshop inspection report • Prepare workshop colour code and safety signs • Identify any safety hazard materials • Handle hazards material • Prepare preventive maintenance schedule • Identify and apply all emergency	OSHA's rules and regulations	**Method used:** The student should explain how to: • Interpret OSHA rules and regulations • Use safety gears • Prepare preventive maintenance schedule and inspection report • Prepare warning signs and safety instructions • Conduct assessment • Carry out accident investigation • Monitor safe working environment • Manage uses of safety gears **Principles:** The student should explain the principles of: • Preparing inspection check lists • Preparing warning signs and safety instructions • Identifying hazards materials	• Mechanical equipment • Power machines • Measuring tools • Cutting tools • First aid kit • Fire extinguishers • Service manuals • OSHA rules and regulations • Helmet • Gloves • Ear plug • Mask • Gloves	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				equipment and supplies • Conduct safety awareness training to sub-ordinates • Monitor safety environment • Manage uses of safety gears • Cleaning tools and equipment • Storing tools and equipment		• Preparing and conducting training • Handing hazard materials **Theories:** The student should explain: - • Function of inspection check list • Importance of posting warning sign and safety instructions • Advantages of risk assessment • Importance of carry out accident investigation • Importance of monitor safety at working place **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions while manage hazards		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						• Safe handling of tools and equipment • Waste disposal		
		(b) Controlling chemical hazards	**Brainstorm:** Guide the students to define Control chemical hazards **Demonstration:** Demonstrate to the students on how to Control mechanical hazard and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Control mechanical hazard in Manage hazards	**The student should be able to:** • Interpret service manuals • Select tools and equipment • Use OSHA rules and regulations • Prepare workshop inspection report • Prepare workshop colour code and safety signs • Identify any safety hazard materials • Handle hazards material	Hazards, risks, incident and accidents are managed according to OSHA's rules and regulations	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Interpret OSHA rules and regulations • Use safety gears • Prepare preventive maintenance schedule and inspection report • Prepare warning signs and safety instructions • Conduct assessment • Carry out accident investigation • Monitor safe working environment • Manage uses of safety gears **Principles:** The student should explain the principles of:	The following tools, equipment and safety gear are to be available: • Electrical equipment • Mechanical equipment • Power machines • Measuring tools • Cutting tools • First aid kit • Fire extinguishers • Service manuals • OSHA rules and regulations • Helmet • Gloves • Ear plug • Mask • Gloves	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Prepare preventive maintenance schedule • Identify and apply all emergency equipment and supplies • Conduct safety awareness training to sub-ordinates • Monitor safety environment • Manage uses of safety gears • Cleaning tools and equipment • Storing tools and equipment		• Preparing inspection check lists • Preparing warning signs and safety instructions • Identifying hazards materials • Preparing and conducting training • Handing hazard materials **Theories:** The student should explain: - • Function of inspection check list • Importance of posting warning sign and safety instructions • Advantages of risk assessment • Importance of carry out accident investigation • Importance of monitor safety at working place **Circumstantial knowledge**		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						Detailed knowledge about: • Safety precautions while manage hazards • Safe handling of tools and equipment Waste disposal		
		(c) Controlling Physical hazards	**Brainstorm:** Guide the students to define Control Physical hazards **Demonstration:** Demonstrate to the students on how to Control Physical hazards and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Control Physical hazards in Manage hazards	**The student should be able to:** • Interpret service manuals • Select tools and equipment • Use OSHA rules and regulations • Prepare workshop inspection report • Prepare workshop colour code and safety signs	Hazards, risks, incident and accidents are managed according to OSHA's rules and regulations	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Interpret OSHA rules and regulations • Use safety gears • Prepare preventive maintenance schedule and inspection report • Prepare warning signs and safety instructions • Conduct assessment • Carry out accident investigation • Monitor safe working environment	The following tools, equipment and safety gear are to be available: • Electrical equipment • Mechanical equipment • Power machines • Measuring tools • Cutting tools • First aid kit • Fire extinguishers • Service manuals • OSHA rules and regulations • Helmet • Gloves • Ear plug • Mask • Gloves	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Identify any safety hazard materials • Handle hazards material • Prepare preventive maintenance schedule • Identify and apply all emergency equipment and supplies • Conduct safety awareness training to sub-ordinates • Monitor safety environment • Manage uses of safety gears • Cleaning tools and equipment		• Manage uses of safety gears **Principles:** The student should explain the principles of: • Preparing inspection check lists • Preparing warning signs and safety instructions • Identifying hazards materials • Preparing and conducting training • Handing hazard materials **Theories:** The student should explain: - • Function of inspection check list • Importance of posting warning sign and safety instructions • Advantages of risk assessment • Importance of carry out accident investigation		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Storing tools and equipment		• Importance of monitor safety at working place **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions while manage hazards • Safe handling of tools and equipment Waste disposal		
		(d) Controlling ergonomic hazards	**Brainstorm:** Guide the students to define Control ergonomic hazards **Demonstration:** Demonstrate to the students on how to Control ergonomic hazards and to handle tools and equipment **Practical work:**	**The student should be able to:** • Interpret service manuals • Select tools and equipment • Use OSHA rules and regulations • Prepare workshop inspection report	Hazards, risks, incident and accidents are managed according to OSHA's rules and regulations	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Interpret OSHA rules and regulations • Use safety gears • Prepare preventive maintenance schedule and inspection report • Prepare warning signs and safety instructions	The following tools, equipment and safety gear are to be available: • Electrical equipment • Mechanical equipment • Power machines • Measuring tools • Cutting tools • First aid kit • Fire extinguishers • Service manuals • OSHA rules and regulations	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Organise the students into manageable groups to Control ergonomic hazards in Manage hazards	• Prepare workshop colour code and safety signs • Identify any safety hazard materials • Handle hazards material • Prepare preventive maintenance schedule • Identify and apply all emergency equipment and supplies • Conduct safety awareness training to sub-ordinates • Monitor safety environment • Manage uses of safety gears		• Conduct assessment • Carry out accident investigation • Monitor safe working environment • Manage uses of safety gears **Principles:** The student should explain the principles of: • Preparing inspection check lists • Preparing warning signs and safety instructions • Identifying hazards materials • Preparing and conducting training • Handing hazard materials **Theories:** The student should explain: - • Function of inspection check list • Importance of posting warning sign and safety instructions • Advantages of risk assessment	• Helmet • Gloves • Ear plug • Mask • Gloves	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Cleaning tools and equipment • Storing tools and equipment		• Importance of carry out accident investigation • Importance of monitor safety at working place **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions while manage hazards • Safe handling of tools and equipment • Waste disposal		
	4.2 Carrying out risk assessment	(a) Controlling risk	**Brainstorm:** Guide the students to define Control risk **Demonstration:** Demonstrate to the students on how to Control risk and to handle tools and equipment **Practical work:**	**The student should be able to:** • Interpret service manuals • Select tools and equipment • Supervise practice safe workshop practices to	Risk assessment carried out as per OSHA standard and automobile regulations	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Conduct safety training • Identify safety hazard material • Handle hazard material	The following tools, equipment and safety gear are to be available: • Service manuals • OSHA regulations • Workshop rules • Camera • Risk assessment sheet • Mask • Ear plug • Gloves	12

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Organise the students into manageable groups to Control risk in Carry out risk assessment	protect yourself, other and properties • React correctly and safely when faced with an emergency • Identify and apply correctly all emergency equipment and supplies • Make periodic inspections of workshop area and all equipment and prepare report • Conduct safety training • Identify any safety hazard material • Handle hazard		• Prepare inspection report **Principles:** The student should explain the principles of: • Reacting correctly and safely when faced with an emergency • Identifying and applying correctly all emergency equipment and supplies • Conducting safety training • Identifying safely hazards materials • Handling hazard materials **Theories:** The student should explain: - • Carryout risk assessment • Conducting safety training • Inspecting workshop areas tools and equipment	• Overall • Safety boots • Safety clear glasses	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				material correctly • Prepare universal workshop colour codes and know what the colour represents • Make out and file safe report • Be aware of the dangerous of compressed air • Ensure availability of personal protective equipment • Supervise compressed air rules • Monitor good environmental practices		• Handling Hazard material correctly • Follow compressed air rules **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions while carrying out risk management • Safe handling of tools and equipment • Waste disposal		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Clean tools and equipment • Store tools and equipment				
		(b) Managing safety gears	**Brainstorm:** Guide the students to define Manage safety gears **Demonstration:** Demonstrate to the students on how to Manage safety gears and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Manage safety gears in Carry out risk assessment	**The student should be able to:** • Interpret service manuals • Select tools and equipment • Supervise practice safe workshop practices to protect yourself, other and properties • React correctly and safely when faced with an emergency	Risk assessment carried out as per OSHA standard and automobile regulations	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Conduct safety training • Identify safety hazard material • Handle hazard material • Prepare inspection report **Principles:** The student should explain the principles of: • Reacting correctly and safely when faced with an emergency	The following tools, equipment and safety gear are to be available: • Service manuals • OSHA regulations • Workshop rules • Camera • Risk assessment sheet • Mask • Ear plug • Gloves • Overall • Safety boots • Safety clear glasses	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Identify and apply correctly all emergency equipment and supplies • Make periodic inspections of workshop area and all equipment and prepare report • Conduct safety training • Identify any safety hazard material • Handle hazard material correctly • Prepare universal workshop colour codes and know what the		• Identifying and applying correctly all emergency equipment and supplies • Conducting safety training • Identifying safely hazards materials • Handling hazard materials **Theories:** The student should explain: - • Carryout risk assessment • Conducting safety training • Inspecting workshop areas tools and equipment • Handling Hazard material correctly • Follow compressed air rules **Circumstantial knowledge** **Detailed knowledge about:**		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				colour represents • Make out and file safe report • Be aware of the dangerous of compressed air • Ensure availability of personal protective equipment • Supervise compressed air rules • Monitor good environmental practices • Clean tools and equipment • Store tools and equipment		• Safety precautions while carrying out risk management • Safe handling of tools and equipment • Waste disposal		
	4.3 Managing environment	(a) Managing air pollution	**Brainstorm:**	**The student should be able to:**	Workshop environment managed as per		The following tools, equipment and safety gear are to be available:	15

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Guide the students to define Manage air pollution **Demonstration:** Demonstrate to the students on how to Manage air pollution and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Manage air pollution in Manage environment	• Select relevant safety gears • Prepare preventive maintenance schedule • Control environmental pollution • Maintaining safety environment • Managing safety personal environment • Control tools, equipment and safety gears • Control different types of wastes as per OSHA • Conduct safety awareness training to subordinates	rules and regulations		• Tool kit • Sprit level • Multimeter • Safety boots • Gloves • Overalls • Cleaning materials • Hoe • Broom • Brush • Safety gears • Dust covers • Dust mask • Dust bin • Wheel barrow	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Clean tools and equipment • Store tools and equipment				
		(b) Managing water pollution	**Brainstorm:** Guide the students to define Manage water pollution **Demonstration:** Demonstrate to the students on how to Manage water pollution and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Manage water pollution in Manage environment	**The student should be able to:** • Select relevant safety gears • Prepare preventive maintenance schedule • Control environmental pollution • Maintaining safety environment • Managing safety personal environment • Control tools, equipment and safety gears	Workshop environment managed as per rules and regulations		The following tools, equipment and safety gear are to be available: • Tool kit • Sprit level • Multimeter • Safety boots • Gloves • Overalls • Cleaning materials • Hoe • Broom • Brush • Safety gears • Dust covers • Dust mask • Dust bin • Wheel barrow	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Control different types of wastes as per OSHA • Conduct safety awareness training to subordinates • Clean tools and equipment • Store tools and equipment				
		(c) Managing land pollution	**Brainstorm:** Guide the students to define Manage land pollution **Demonstration:** Demonstrate to the students on how to Manage land pollution and to handle tools and equipment **Practical work:**	**The student should be able to:** • Select relevant safety gears • Prepare preventive maintenance schedule • Control environmental pollution	Workshop environment managed as per rules and regulations		The following tools, equipment and safety gear are to be available: • Tool kit • Sprit level • Multimeter • Safety boots • Gloves • Overalls • Cleaning materials • Hoe • Broom • Brush	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Organise the students into manageable groups to Manage land pollution in Manage environment	• Maintaining safety environment • Managing safety personal environment • Control tools, equipment and safety gears • Control different types of wastes as per OSHA • Conduct safety awareness training to subordinates • Clean tools and equipment • Store tools and equipment			• Safety gears • Dust covers • Dust mask • Dust bin • Wheel barrow	
5.0 Managing preventive maintenance	5.1 Planning preventive maintenance	(a) Preparing schedules of preventive	**Brainstorm:** Guide the students to define Prepare schedules of	**The student should be able to:**	Preventive maintenance is planned as per	**Knowledge evidence:** **Detailed knowledge of**:	The following tools, equipment and safety gear are to be available:	23

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
		maintenance of tools, machines and equipment	preventive maintenance of tools, machines and equipment **Demonstration:** Demonstrate to the students on how to Prepare schedules of preventive maintenance of tools, machines and equipment and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Prepare schedules of preventive maintenance of tools, machines and equipment in Plan preventive maintenance	• Interpret service manuals • Read and apply workshop rules and regulations • Select tools and equipment • Make periodic inspection of workshop area and all equipment • Prepare workshop inspection report of tools and equipment • Prepare preventive maintenance programs • Prepare workshop preventive	workshop standards	**Method used:** The student should explain how to: • Prepare workshop inspection report • Prepare workshop colour code and safety signed • Plan and prepare workshop inventory • Plan and prepare preventive maintenance training **Principles:** The student should explain the principles of: • Preparing colour code and safety signs • Preparing preventive maintenance schedule • Plan and prepare workshop inventory **Theories:** The student should explain: - • Importance of interpret service manuals	• General hand foot kit • Workshop tools, equipment and machines • Service manuals • Workshop rules and regulations • Gloves • Overall • Safety boots • Safety clear glasses • Helmet • Mask • Ear plug	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				maintenance schedule • Prepare and use workshop colour court and safety signs • Plan and Prepare workshop inventory • Clean tools and equipment • Store tools and equipment		• Importance of preparing workshop inspection and maintenance schedule reports • Importance of preparing maintenance training programs • Importance of Cleaning and storing tools and equipment **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions while planning preventive maintenance • Safe handling of tools and equipment Waste disposal		
		(b) Preparing inspection check list of tools,	**Brainstorm:** Guide the students to define Prepare inspection check list of tools, equipment and	**The student should be able to:** • Interpret service manuals	Preventive maintenance is planned as per workshop standards	**Knowledge evidence:** **Detailed knowledge of**:	The following tools, equipment and safety gear are to be available: • General hand foot kit	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
		equipment and machine	machine and equipment **Demonstration:** Demonstrate to the students on how to Prepare inspection check list of tools, equipment and machine and equipment and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Prepare inspection check list of tools, equipment, machine, and Plan preventive maintenance	• Read and apply workshop rules and regulations • Select tools and equipment • Make periodic inspection of workshop area and all equipment • Prepare workshop inspection report of tools and equipment • Prepare preventive maintenance programs • Prepare workshop preventive maintenance schedule • Prepare and use workshop		**Method used:** The student should explain how to: • Prepare workshop inspection report • Prepare workshop colour code and safety signed • Plan and prepare workshop inventory • Plan and prepare preventive maintenance training **Principles:** The student should explain the principles of: • Preparing colour code and safety signs • Preparing preventive maintenance schedule • Plan and prepare workshop inventory **Theories:** The student should explain: - • Importance of interpret service manuals	• Workshop tools, equipment and machines • Service manuals • Workshop rules and regulations • Gloves • Overall • Safety boots • Safety clear glasses • Helmet • Mask • Ear plug	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				colour court and safety signs • Plan and Prepare workshop inventory • Clean tools and equipment • Store tools and equipment		• Importance of preparing workshop inspection and maintenance schedule reports • Importance of preparing maintenance training programs • Importance of Cleaning and storing tools and equipment **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions while planning preventive maintenance • Safe handling of tools and equipment • Waste disposal		
	5.2 Supervising preventive maintenance	(a) Performing preventive maintenance of tools, equipment	**Brainstorm:** Guide the students to define preventive maintenance of	**The student should be able to:** • Interpret service manuals	Preventive maintenance of tools, equipment, machines and building are performed as per	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to:	The following tools, equipment and safety gear are to be available: • General hand foot kit	23

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
		and machines	tools, equipment and machines handle tools and equipment **Demonstration:** Demonstrate to the students on how to Perform preventive maintenance of tools, equipment and machines and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Perform preventive maintenance of tools, equipment and machines in Supervise preventive maintenance	• Read and apply rules and regulations • Prepare and apply workshop inspection report • Prepare and use safety signs and colour code • Prepare and apply workshop preventive maintenance schedule • Plan and conduct preventive maintenance training • Practice correct hand tools and equipment safety	workshop standards	• Prepare and apply workshop preventive schedule • Plan and conduct preventive maintenance training • Prepare safety signs and colour code • Correct hand tools and equipment safety • Practice correct lift and jack safety • Good electrical safety • Follow good environmental practices **Principles:** The student should explain the principles of: • Preparing and applying preventive maintenance schedule • Preparing and use safety signs and colour code • Plan and conduct preventive maintenance training **Theories:** The student should explain: -	• Workshop tools, equipment and machines • Service manuals • Workshop rules and regulations • Gloves • Overall • Safety boots • Safety clear glasses • Helmet • Mask • Ear plug	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Practice correct lift and jack safety • Practice good electrical safety • Monitor good and environmental practices • Clean tools and equipment • Store tools and equipment		• Importance of preparing and applying preventive maintenance schedule • Importance of preparing and use safety signs and colour code • Importance of Planning and conducting preventive maintenance training • Importance of follow good environmental practices **Circumstantial knowledge** **Detailed knowledge about:** • Safety precautions while planning preventive maintenance • Safe handling of tools and equipment • Waste disposal		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
		(b) Performing preventive maintenance of working environment	**Brainstorm:** Guide the students to define preventive maintenance of working environment and machine and handle tools and equipment **Demonstration:** Demonstrate to the students on how to Perform preventive maintenance of working environment and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Perform preventive maintenance of working environment in	**The student should be able to:** • Interpret service manuals • Read and apply rules and regulations • Prepare and apply workshop inspection report • Prepare and use safety signs and colour code • Prepare and apply workshop preventive maintenance schedule • Plan and conduct preventive	Preventive maintenance of tools, equipment, machines and building are performed as per workshop standards	**Knowledge evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Prepare and apply workshop preventive schedule • Plan and conduct preventive maintenance training • Prepare safety signs and colour code • Correct hand tools and equipment safety • Practice correct lift and jack safety • Good electrical safety • Follow good environmental practices **Principles:** The student should explain the principles of: • Preparing and applying preventive maintenance schedule	The following tools, equipment and safety gear are to be available: • General hand foot kit • Workshop tools, equipment and machines • Service manuals • Workshop rules and regulations • Gloves • Overall • Safety boots • Safety clear glasses • Helmet • Mask • Ear plug	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Supervise preventive maintenance	maintenance training • Practice correct hand tools and equipment safety • Practice correct lift and jack safety • Practice good electrical safety • Monitor good and environmental practices • Clean tools and equipment • Store tools and equipment		• Preparing and use safety signs and colour code • Plan and conduct preventive maintenance training **Theories:** The student should explain: - • Importance of preparing and applying preventive maintenance schedule • Importance of preparing and use safety signs and colour code • Importance of Planning and conducting preventive maintenance training • Importance of follow good environmental practices **Circumstantial knowledge** **Detailed knowledge about:**		

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						• Safety precautions while planning preventive maintenance • Safe handling of tools and equipment • Waste disposal		
6.0 Installing commercial and industrial air conditioning systems	6.1 Installing cold rooms	(a) Installing condensing unit on slab	**Brainstorm:** Guide the students to define Installing condensing unit on slab and handle tools and equipment **Demonstration:** Demonstrate to the students on how to Installing condensing unit on slab and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Installing	**The student should be able to:** • Read and interpret installation drawings • Select tools and equipment • Prepare time frame for installation • Perform diagnostic trouble shooting • Perform modifications to suit site conditions • Prepare foundation	A record of values of pressure, temperature and electrical quantities conforming to the specified ratings	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Perform levelling of equipment • Prepare installation site • Install the various components • Perform test run • Fabricate copper tubing • Procedurally install or erect machinery **Principles:** The student should explain the principles of: (ii) Making an alignment	The following tools, equipment and safety gear are to be available: • Pressure gauge manifold • Oxy-acetylene welding set • • Wattmeter • Volt-ohm milliammeter (VOM) • Digital multimeter • Spirit level • Laser beam spirit level • Hand power tools (drilling machine, grinder) • Lifting tackle • Megger • Noise meter	30

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			condensing unit on slab	• Grout and fix foundation bolts • Position major components in accordance with drawings, design • Specifications and instructions • Run refrigerant piping, tubing and condensate drain • Ensure ancillary components are installed in accordance with drawings, design specifications and instruction		(jj) Temperature controls (kk) Levelling a machine (ll) Test running equipment **Theories:** The student should explain: • Different preservation temperatures for different items • Use of installation drawings • Importance of control systems • Verification of acceptable performances of equipment • Machinery erection procedures **Circumstantial knowledge:** **Detailed knowledge about:** • Installation codes of practice	• Oil pump • Pipe cutters • Pipe expanders (swaging tools) • Leak detector • Flaring tool • Electronic leak detector • Pinch off tool • Charging cylinder • Capacitor analyser • Air flow meter • Electro-mechanical toolbox • Measuring tape	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Test run the equipment • Produce documentation in accordance with work site procedures • Clean the workplace and tools • Store tools and equipment		• Documented safety procedures and safety plans for personal and work site safety • Safe handling of tools, measuring instruments and materials		
		(b) Installing indoor unit	**Brainstorm:** Guide the students to define Install indoor unit and handle tools and equipment **Demonstration:** Demonstrate to the students on how to Install indoor unit and to handle tools and equipment	**The student should be able to:** • Read and interpret installation drawings • Select tools and equipment • Prepare time frame for installation	A record of values of pressure, temperature and electrical quantities conforming to the specified ratings	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Perform levelling of equipment • Prepare installation site • Install the various components • Perform test run	The following tools, equipment and safety gear are to be available: • Pressure gauge manifold • Oxy-acetylene welding set • • Wattmeter • Volt-ohm milliammeter (VOM)	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Practical work: Organise the students into manageable groups to Install indoor unit	• Perform diagnostic trouble shooting • Perform modifications to suit site conditions • Prepare foundation • Grout and fix foundation bolts • Position major components in accordance with drawings, design specifications and instructions • Run refrigerant piping, tubing and condensate drain • Ensure ancillary		• Fabricate copper tubing • Procedurally install or erect machinery **Principles:** The student should explain the principles of: (c) Making an alignment (d) Temperature controls (e) Levelling a machine (f) Test running equipment **Theories:** The student should explain: • Different preservation temperatures for different items • Use of installation drawings • Importance of control systems • Verification of acceptable performances of equipment	• Digital multimeter • Spirit level • Laser beam spirit level • Hand power tools (drilling machine, grinder) • Lifting tackle • Megger • Noise meter • Oil pump • Pipe cutters • Pipe expanders (swaging tools) • Leak detector • Flaring tool • Electronic leak detector • Pinch off tool • Charging cylinder • Capacitor analyser • Air flow meter • Electro-mechanical toolbox • Measuring tape	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				components are installed in accordance with drawings, design specifications and instruction • Test run the equipment • Produce documentation in accordance with work site procedures • Clean the workplace and tools • Store tools and equipment		• Machinery erection procedures **Circumstantial knowledge:** **Detailed knowledge about:** • Installation codes of practice • Documented safety procedures and safety plans for personal and work site safety • Safe handling of tools, measuring instruments and materials		
		(c) Installing piping circuit	**Brainstorm:** Guide the students to define Install piping circuit and	**The student should be able to:** • Read and interpret	A record of values of pressure, temperature and electrical quantities	**Knowledge Evidence:** **Detailed knowledge of:**	The following tools, equipment and safety gear are to be available: • Pressure gauge manifold	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			handle tools and equipment **Demonstration:** Demonstrate to the students on how to Install piping circuit and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Install piping circuit	installation drawings • Select tools and equipment • Prepare time frame for installation • Perform diagnostic trouble shooting • Perform modifications to suit site conditions • Prepare foundation • Grout and fix foundation bolts • Position major components in accordance with drawings, design specifications and instructions	conforming to the specified ratings	**Method used:** The student should explain how to: • Perform levelling of equipment • Prepare installation site • Install the various components • Perform test run • Fabricate copper tubing • Procedurally install or erect machinery **Principles:** The student should explain the principles of: (d) Making an alignment (e) Temperature controls (f) Levelling a machine (g) Test running equipment **Theories:** The student should explain: • Different preservation	• Oxy-acetylene welding set • • Wattmeter • Volt-ohm milliammeter (VOM) • Digital multimeter • Spirit level • Laser beam spirit level • Hand power tools (drilling machine, grinder) • Lifting tackle • Megger • Noise meter • Oil pump • Pipe cutters • Pipe expanders (swaging tools) • Leak detector • Flaring tool • Electronic leak detector • Pinch off tool • Charging cylinder • Capacitor analyser • Air flow meter	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Run refrigerant piping, tubing and condensate drain • Ensure ancillary components are installed in accordance with drawings, design specifications and instruction • Test run the equipment • Produce documentation in accordance with work site procedures • Clean the workplace and tools		temperatures for different items • Use of installation drawings • Importance of control systems • Verification of acceptable performances of equipment • Machinery erection procedures **Circumstantial knowledge:** **Detailed knowledge about:** • Installation codes of practice • Documented safety procedures and safety plans for personal and work site safety • Safe handling of tools, measuring instruments and materials	• Electro-mechanical toolbox • Measuring tape	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Store tools and equipment				
		(d) Installing supply circuit	**Brainstorm:** Guide the students to define Install supply circuit and handle tools and equipment **Demonstration:** Demonstrate to the students on how to Install supply circuit and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Install supply circuit	**The student should be able to:** • Read and interpret installation drawings • Select tools and equipment • Prepare time frame for installation • Perform diagnostic trouble shooting • Perform modifications to suit site conditions • Prepare foundation • Position major components	A record of values of pressure, temperature and electrical quantities conforming to the specified ratings	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Perform levelling of equipment • Prepare installation site • Install the various components • Perform test run • Fabricate copper tubing • Procedurally install or erect machinery **Principles:** The student should explain the principles of: (h) Making an alignment (i) Temperature controls	The following tools, equipment and safety gear are to be available: • Pressure gauge manifold • Oxy-acetylene welding set • • Wattmeter • Volt-ohm milliammeter (VOM) • Digital multimeter • Spirit level • Laser beam spirit level • Hand power tools (drilling machine, grinder) • Lifting tackle • Megger • Noise meter • Oil pump • Pipe cutters	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				in accordance with drawings, design Specifications and instructions • Condensate drains • Ensure ancillary components are installed in accordance with drawings, design specifications and instruction • Test run the equipment • Produce documentation in accordance with work site procedures		(j) Levelling a machine (k) Test running equipment **Theories:** The student should explain: • Different preservation temperatures for different items • Use of installation drawings • Importance of control systems • Verification of acceptable performances of equipment • Machinery erection procedures **Circumstantial knowledge:** **Detailed knowledge about:** • Installation codes of practice • Documented safety procedures and safety	• Pipe expanders (swaging tools) • Leak detector • Flaring tool • Electronic leak detector • Pinch off tool • Charging cylinder • Capacitor analyser • Air flow meter • Electro-mechanical toolbox • Measuring tape	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Clean the workplace and tools • Store tools and equipment		plans for personal and work site safety • Safe handling of tools, measuring instruments and materials		
		(e) Installing electric control circuit	**Brainstorm:** Guide the students to define Install electric control circuit and handle tools and equipment **Demonstration:** Demonstrate to the students on how to Install electric control circuit and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Install electric control circuit	**The student should be able to:** • Read and interpret installation drawings • Select tools and equipment • Prepare time frame for installation • Perform diagnostic trouble shooting • Perform modifications to suit site conditions • Prepare foundation	A record of values of pressure, temperature and electrical quantities conforming to the specified ratings	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Perform levelling of equipment • Prepare installation site • Install the various components • Perform test run • Fabricate copper tubing • Procedurally install or erect machinery **Principles:** The student should explain the principles of: (l) Making an alignment	The following tools, equipment and safety gear are to be available: • Pressure gauge manifold • Oxy-acetylene welding set • • Wattmeter • Volt-ohm milliammeter (VOM) • Digital multimeter • Spirit level • Laser beam spirit level • Hand power tools (drilling machine, grinder) • Lifting tackle • Megger	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Grout and fix foundation bolts • Position major components in accordance with drawings, design • Specifications and instructions • Run refrigerant piping, tubing and condensate drain • Ensure ancillary components are installed in accordance with drawings, design specifications and instruction		(m) Temperature controls (n) Levelling a machine (o) Test running equipment **Theories:** The student should explain: • Different preservation temperatures for different items • Use of installation drawings • Importance of control systems • Verification of acceptable performances of equipment • Machinery erection procedures **Circumstantial knowledge:** **Detailed knowledge about:** • Installation codes of practice	• Noise meter • Oil pump • Pipe cutters • Pipe expanders (swaging tools) • Leak detector • Flaring tool • Electronic leak detector • Pinch off tool • Charging cylinder • Capacitor analyser • Air flow meter • Electro-mechanical toolbox • Measuring tape	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Test run the equipment • Produce documentation in accordance with work site procedures • Clean the workplace and tools • Store tools and equipment		• Documented safety procedures and safety plans for personal and work site safety. Safe handling of tools, measuring instruments and materials		
		(f) Charging with refrigerant and commission the system	**Brainstorm:** Guide the students to define Charge with refrigerant and commission the system and handle tools and equipment **Demonstration:** Demonstrate to the students on how to Charge with refrigerant and	**The student should be able to:** • Read and interpret installation drawings • Select tools and equipment • Perform diagnostic trouble shooting	A record of values of pressure, temperature and electrical quantities conforming to the specified ratings	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Perform levelling of equipment • Prepare installation site • Install the various components • Perform test run	The following tools, equipment and safety gear are to be available: • Pressure gauge manifold • Oxy-acetylene welding set • Wattmeter • Volt-ohm milliammeter (VOM) • Digital multimeter	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			commission the system and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Charge with refrigerant and commission the system	• Perform modifications to suit site conditions • Grout and fix foundation bolts • Position major components in accordance with drawings, design specifications and instructions • Test run the equipment • Produce documentation in accordance with work site procedures • Clean the workplace and tools		• Fabricate copper tubing • Procedurally install or erect machinery **Principles:** The student should explain the principles of: (p) Making an alignment (q) Temperature controls (r) Levelling a machine (s) Test running equipment **Theories:** The student should explain: • Different preservation temperatures for different items • Use of installation drawings • Importance of control systems • Verification of acceptable performances of equipment	• Spirit level • Laser beam spirit level • Hand power tools (drilling machine, grinder) • Lifting tackle • Megger • Noise meter • Oil pump • Pipe cutters • Pipe expanders (swaging tools) • Leak detector • Flaring tool • Electronic leak detector • Pinch off tool • Charging cylinder • Capacitor analyser • Air flow meter • Electro-mechanical toolbox • Measuring tape	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Store tools and equipment		• Machinery erection procedures **Circumstantial knowledge:** **Detailed knowledge about:** • Installation codes of practice • Documented safety procedures and safety plans for personal and work site safety • Safe handling of tools, measuring instruments and materials		
	6.2 Installing chilling plants	(a) Installing condensing unit	**Brainstorm:** Guide the students to define Install condensing unit and handle tools and equipment **Demonstration:** Demonstrate to the students on how to Install condensing unit and to handle tools and equipment	**The student should be able to:** • Select tools and equipment • Read installation drawings • Prepare machine foundations • Perform grouting	The chilling plant installed and documentation conform to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Perform machinery alignment • Anchor equipment **Principles:** The student should explain the principles of: (t) Heat transfer	The following tools, equipment and safety gear are to be available: • Lifting tackles • Hammers of different weights • Electro mechanical toolbox • Arc welding set • Oxy-acetylene welding set • Masonry tools	30

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Practical work: Organise the students into manageable groups to Install condensing unit	• Perform machinery alignment for belt driven components • Build piping circuit • Use safely lifting tackles • Fabricate simple items as per on site requirements • Measure and record required operation parameters • Clean workplace tools and equipment • Store tools and equipment		(u) Air flow in ducts / pipes **Theories:** The student should explain: • Super heating and sub-cooling • Refrigeration cycle • Storage temperature requirements of different commodities • Classification of refrigerants **Circumstantial knowledge:** **Detailed knowledge about:** • Construction site safety management • Environmental regulations	• Head pans and water pails • Electrical hand tools • Safety apparels • Spirit level • Steel rule • Straight edges • Vernier calliper • Micrometer • Multimeter • Thermometer • System analyser	
		(b) Installing indoor unit	**Brainstorm:** Guide the students to define Install indoor unit and	**The student should be able to:** • Select tools and equipment	The chilling plant installed and documentation conform to technical specifications	**Knowledge Evidence: Detailed knowledge of:** **Method used:** The student should explain how to:	The following tools, equipment and safety gear are to be available: • Lifting tackles	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		

			handle tools and equipment
			
			Demonstration:
			
			Demonstrate to the students on how to Install indoor unit and to handle tools and equipment
			
			Practical work:
			
			Organise the students into manageable groups to Install indoor unit
				• Read installation drawings
				• Prepare machine foundations
				• Perform grouting
				• Perform machinery alignment for belt driven components
				• Build piping circuit
				• Use safely lifting tackles
				• Fabricate simple items as per on site requirements
				• Measure and record required operation parameters
				• Clean workplace tools and equipment
						• Perform machinery alignment
						• Anchor equipment
						Principles: The student should explain the principles of:
						  • Heat transfer
						  • Air flow in ducts / pipes
						Theories: The student should explain:
						• Super heating and sub-cooling
						• Refrigeration cycle
						• Storage temperature requirements of different commodities
						• Classification of refrigerants
						Circumstantial knowledge:
						Detailed knowledge about:
						• Construction site safety management
						Environmental regulations
							• Hammers of different weights
							• Electro mechanical toolbox
							• Arc welding set
							• Oxy-acetylene welding set
							• Masonry tools
							• Head pans and water pails
							• Electrical hand tools
							• Safety apparels
							• Spirit level
							• Steel rule
							• Straight edges
							• Vernier calliper
							• Micrometer
							• Multimeter
							• Thermometer
							• System analyser	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Store tools and equipment				
		(c) Installing cooling tower	**Brainstorm:** Guide the students to define Installing cooling tower and handle tools and equipment **Demonstration:** Demonstrate to the students on how to Installing cooling tower and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Installing cooling tower	**The student should be able to:** • Select tools and equipment • Read installation drawings • Prepare machine foundations • Perform grouting • Perform machinery alignment for belt driven components • Build piping circuit • Use safely lifting tackles • Fabricate simple items as per on site requirements	The chilling plant installed and documentation conform to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Perform machinery alignment • Anchor equipment **Principles:** The student should explain the principles of: • Heat transfer • Air flow in ducts / pipes **Theories:** The student should explain: • Super heating and sub-cooling • Refrigeration cycle • Storage temperature requirements of different commodities • Classification of refrigerants	The following tools, equipment and safety gear are to be available: • Lifting tackles • Hammers of different weights • Electro mechanical toolbox • Arc welding set • Oxy-acetylene welding set • Masonry tools • Head pans and water pails • Electrical hand tools • Safety apparels • Spirit level • Steel rule • Straight edges • Vernier calliper • Micrometer • Multimeter • Thermometer • System analyser	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Measure and record required operation parameters • Clean workplace tools and equipment • Store tools and equipment		**Circumstantial knowledge:** **Detailed knowledge about:** • Construction site safety management • Environmental regulations		
		(d) Installing piping circuit	**Brainstorm:** Guide the students to define Install piping circuit and handle tools and equipment **Demonstration:** Demonstrate to the students on how to Install piping circuit and to handle tools and equipment **Practical work:** Organise the students into	**The student should be able to:** • Select tools and equipment • Read installation drawings • Prepare machine foundations • Perform grouting • Perform machinery alignment for belt driven components	The chilling plant installed and documentation conform to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Perform machinery alignment • Anchor equipment **Principles:** The student should explain the principles of: • Heat transfer • Air flow in ducts / pipes **Theories:** The student should explain:	The following tools, equipment and safety gear are to be available: • Lifting tackles • Hammers of different weights • Electro mechanical toolbox • Arc welding set • Oxy-acetylene welding set • Masonry tools • Head pans and water pails • Electrical hand tools • Safety apparels	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			manageable groups to Install piping circuit	• Build piping circuit • Use safely lifting tackles • Fabricate simple items as per on site requirements • Measure and record required operation parameters • Clean workplace tools and equipment • Store tools and equipment		• Super heating and sub-cooling • Refrigeration cycle • Storage temperature requirements of different commodities • Classification of refrigerants **Circumstantial knowledge:** **Detailed knowledge about:** • Construction site safety management • Environmental regulations	• Spirit level • Steel rule • Straight edges • Vernier calliper • Micrometer • Multimeter • Thermometer • System analyser	
		(e)Installing electrical supply circuit	**Brainstorm:** Guide the students to define Install electrical supply circuit and handle tools and equipment **Demonstration:**	**The student should be able to:** • Select tools and equipment • Read installation drawings	The chilling plant installed and documentation conform to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Perform machinery alignment • Anchor equipment	The following tools, equipment and safety gear are to be available: • Lifting tackles • Hammers of different weights • Electro mechanical toolbox • Arc welding set	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Demonstrate to the students on how to Install electrical supply circuit and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Install electrical supply circuit	• Prepare machine foundations • Perform grouting • Perform machinery alignment for belt driven components • Build piping circuit • Use safely lifting tackles • Fabricate simple items as per on site requirements • Measure and record required operation parameters • Clean workplace tools and equipment • Store tools and equipment		**Principles:** The student should explain the principles of: • Heat transfer • Air flow in ducts / pipes **Theories:** The student should explain: • Super heating and sub-cooling • Refrigeration cycle • Storage temperature requirements of different commodities • Classification of refrigerants **Circumstantial knowledge:** **Detailed knowledge about:** • Construction site safety management • Environmental regulations	• Oxy-acetylene welding set • Masonry tools • Head pans and water pails • Electrical hand tools • Safety apparels • Spirit level • Steel rule • Straight edges • Vernier calliper • Micrometer • Multimeter • Thermometer • System analyser	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
		(f)Installing electric control circuit	**Brainstorm:** Guide the students to define Install electric control circuit and handle tools and equipment **Demonstration:** Demonstrate to the students on how to Install electric control circuit and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Install electric control circuit	**The student should be able to:** • Select tools and equipment • Read installation drawings • Prepare machine foundations • Perform grouting • Perform machinery alignment for belt driven components • Build piping circuit • Use safely lifting tackles • Fabricate simple items as per on site requirements • Measure and record required	The chilling plant installed and documentation conform to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Perform machinery alignment • Anchor equipment **Principles:** The student should explain the principles of: • Heat transfer • Air flow in ducts / pipes **Theories:** The student should explain: • Super heating and sub-cooling • Refrigeration cycle • Storage temperature requirements of different commodities • Classification of refrigerants **Circumstantial knowledge:** **Detailed knowledge**	The following tools, equipment and safety gear are to be available: • Lifting tackles • Hammers of different weights • Electro mechanical toolbox • Arc welding set • Oxy-acetylene welding set • Masonry tools • Head pans and water pails • Electrical hand tools • Safety apparels • Spirit level • Steel rule • Straight edges • Vernier calliper • Micrometer • Multimeter • Thermometer • System analyser	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				operation parameters • Clean workplace tools and equipment • Store tools and equipment		**about:** • Construction site safety management Environmental regulations		
		(g)Charging with refrigerant and commission the system	**Brainstorm:** Guide the students to define Charge with refrigerant and commission the system and handle tools and equipment **Demonstration:** Demonstrate to the students on how to Charge with refrigerant and commission the system and to handle tools and equipment **Practical work:**	**The student should be able to:** • Select tools and equipment • Read installation drawings • Prepare machine foundations • Use safely lifting tackles • Measure and record required operation parameters • Clean workplace	The chilling plant installed and documentation conform to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Perform machinery alignment • Anchor equipment **Principles:** The student should explain the principles of: • Heat transfer • Air flow in ducts / pipes **Theories:** The student should explain: • Super heating and sub-cooling • Refrigeration cycle	The following tools, equipment and safety gear are to be available: • Lifting tackles • Hammers of different weights • Electro mechanical toolbox • Arc welding set • Oxy-acetylene welding set • Masonry tools • Head pans and water pails • Electrical hand tools • Safety apparels • Spirit level • Steel rule • Straight edges	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Organise the students into manageable groups to Charge with refrigerant and commission the system	tools and equipment • Store tools and equipment		• Storage temperature requirements of different commodities • Classification of refrigerants **Circumstantial knowledge:** **Detailed knowledge about:** • Construction site safety management • Environmental regulations	• Vernier calliper • Micrometer • Multimeter • Thermometer • System analyser	
	6.3 Installing small central air conditioners	(a) Installing condensing unit	**Brainstorm:** Guide the students to define Install condensing unit and handle tools and equipment **Demonstration:** Demonstrate to the students on how to Install condensing unit and to handle	**The student should be able to:** • Select tools and equipment • Read installation drawings • Prepare machinery foundations • Perform grouting	The installed central air conditioning system and documentation conform to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Perform machinery alignment • Measure duct pressure • Anchor equipment • Equipment vibration control	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Arc welding machine • Electromechanical toolbox • Set of plumbing tools • Water manometer • Thermometer	20

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			tools and equipment **Practical work:** Organise the students into manageable groups to Install condensing unit	• Install the main components • Perform machinery alignment • Install ducts • Perform modifications according to site conditions • Perform trial run • Take measurements of temperature and pressure quantities • Clean tools, equipment and workplace • Store tools and equipment		**Principles:** The student should explain fluid dynamic in pipes or ducts **Theories:** The student should explain the principles of: • Pressure volume relationship • Manometry • Classes of fans • Surface heat transfer **Circumstantial knowledge:** **Detailed knowledge about:** • Construction site safety management • Environmental regulations	• Refrigerant leak detector • Spirit level • Steel rule or straight edge • Vernier calliper • Electrical hand tools • System analyser • Masonry tools • Lifting tackles • Hammers of different weights	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
		(b) Installing air handling unit	**Brainstorm:** Guide the students to define Install air handling unit and handle tools and equipment **Demonstration:** Demonstrate to the students on how to Install air handling unit and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Install air handling unit	**The student should be able to:** • Select tools and equipment • Read installation drawings • Prepare machinery foundations • Perform grouting • Install the main components • Perform machinery alignment • Install ducts • Perform modifications according to site conditions • Perform trial run • Take measurements of	The installed central air conditioning system and documentation conform to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Perform machinery alignment • Measure duct pressure • Anchor equipment • Equipment vibration control **Principles:** The student should explain fluid dynamic in pipes or ducts **Theories:** The student should explain the principles of: • Pressure volume relationship • Manometry • Classes of fans • Surface heat transfer **Circumstantial knowledge:** **Detailed knowledge**	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Arc welding machine • Electromechanical toolbox • Set of plumbing tools • Water manometer • Thermometer • Refrigerant leak detector • Spirit level • Steel rule or straight edge • Vernier calliper • Electrical hand tools • System analyser • Masonry tools • Lifting tackles • Hammers of different weights	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				temperature and pressure quantities • Clean tools, equipment and workplace • Store tools and equipment		**about:** • Construction site safety management • Environmental regulations		
		(c) Installing refrigerant piping circuit	**Brainstorm:** Guide the students to define Install refrigerant piping circuit and handle tools and equipment **Demonstration:** Demonstrate to the students on how to Install refrigerant piping circuit and to handle tools and equipment **Practical work:**	**The student should be able to:** • Select tools and equipment • Read installation drawings • Prepare machinery foundations • Perform grouting • Install the main components	The installed central air conditioning system and documentation conform to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Perform machinery alignment • Measure duct pressure • Anchor equipment • Equipment vibration control **Principles:** The student should explain fluid dynamic in pipes or ducts	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Arc welding machine • Electromechanical toolbox • Set of plumbing tools • Water manometer • Thermometer • Refrigerant leak detector • Spirit level • Steel rule or straight edge	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Organise the students into manageable groups to Install refrigerant piping circuit	• Perform machinery alignment • Install ducts • Perform modifications according to site conditions • Perform trial run • Take measurements of temperature and pressure quantities • Clean tools, equipment and workplace • Store tools and equipment		**Theories:** The student should explain the principles of: • Pressure volume relationship • Manometry • Classes of fans • Surface heat transfer **Circumstantial knowledge:** **Detailed knowledge about:** • Construction site safety management • Environmental regulations	• Vernier calliper • Electrical hand tools • System analyser • Masonry tools • Lifting tackles • Hammers of different weights	
		(d) Installing air duct system	**Brainstorm:** Guide the students to define Install air duct system and	**The student should be able to:**	The installed central air conditioning system and documentation conform to	**Knowledge Evidence:** **Detailed knowledge of:**	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			handle tools and equipment **Demonstration:** Demonstrate to the students on how to Install air duct system and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Install air duct system	• Select tools and equipment • Read installation drawings • Prepare machinery foundations • Perform grouting • Install the main components • Perform machinery alignment • Install ducts • Perform modifications according to site conditions • Perform trial run • Take measurements of temperature and pressure quantities	technical specifications	**Method used:** The student should explain how to: • Perform machinery alignment • Measure duct pressure • Anchor equipment • Equipment vibration control **Principles:** The student should explain fluid dynamic in pipes or ducts **Theories:** The student should explain the principles of: • Pressure volume relationship • Manometry • Classes of fans • Surface heat transfer **Circumstantial knowledge:** **Detailed knowledge about:** • Construction site safety management • Environmental regulations	• Arc welding machine • Electromechanical toolbox • Set of plumbing tools • Water manometer • Thermometer • Refrigerant leak detector • Spirit level • Steel rule or straight edge • Vernier calliper • Electrical hand tools • System analyser • Masonry tools • Lifting tackles • Hammers of different weights	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Clean tools, equipment and workplace • Store tools and equipment				
		(e) Installing electrical supply circuit	**Brainstorm:** Guide the students to define Install electrical supply circuit and handle tools and equipment **Demonstration:** Demonstrate to the students on how to Install electrical supply circuit and to handle tools and equipment **Practical work:** Organise the students into manageable groups	**The student should be able to:** • Select tools and equipment • Read installation drawings • Prepare machinery foundations • Perform grouting • Install the main components • Perform machinery alignment • Install ducts	The installed central air conditioning system and documentation conform to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Perform machinery alignment • Measure duct pressure • Anchor equipment • Equipment vibration control **Principles:** The student should explain fluid dynamic in pipes or ducts **Theories:** The student should explain the principles of:	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Arc welding machine • Electromechanical toolbox • Set of plumbing tools • Water manometer • Thermometer • Refrigerant leak detector • Spirit level • Steel rule or straight edge • Vernier calliper • Electrical hand tools	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			to Install electrical supply circuit t	• Perform modifications according to site conditions • Perform trial run • Take measurements of temperature and pressure quantities • Clean tools, equipment and workplace • Store tools and equipment		• Pressure volume relationship • Manometry • Classes of fans • Surface heat transfer **Circumstantial knowledge:** **Detailed knowledge about:** • Construction site safety management • Environmental regulations	• System analyser • Masonry tools • Lifting tackles • Hammers of different weights	
		(f) Installing electric control circuit	**Brainstorm:** Guide the students to define Install electric control circuit t and handle tools and equipment **Demonstration:**	**The student should be able to:** • Select tools and equipment • Read installation drawings	The installed central air conditioning system and documentation conform to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Perform machinery alignment	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Arc welding machine • Electromechanical toolbox	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Demonstrate to the students on how to Install electric control circuit and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Install electric control circuit	• Prepare machinery foundations • Perform grouting • Install the main components • Perform machinery alignment • Install ducts • Perform modifications according to site conditions • Perform trial run • Take measurements of temperature and pressure quantities • Clean tools, equipment and workplace		• Measure duct pressure • Anchor equipment • Equipment vibration control **Principles:** The student should explain fluid dynamic in pipes or ducts **Theories:** The student should explain the principles of: • Pressure volume relationship • Manometry • Classes of fans • Surface heat transfer **Circumstantial knowledge:** **Detailed knowledge about:** • Construction site safety management • Environmental regulations	• Set of plumbing tools • Water manometer • Thermometer • Refrigerant leak detector • Spirit level • Steel rule or straight edge • Vernier calliper • Electrical hand tools • System analyser • Masonry tools • Lifting tackles • Hammers of different weights	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Store tools and equipment				
		(g) Installing Secondary refrigerant system	**Brainstorm:** Guide the students to define Install Secondary refrigerant system and handle tools and equipment **Demonstration:** Demonstrate to the students on how to Install Secondary refrigerant system and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Install Secondary refrigerant system	**The student should be able to:** • Select tools and equipment • Read installation drawings • Prepare machinery foundations • Perform grouting • Install the main components • Perform machinery alignment • Install ducts • Perform modifications according to site conditions	The installed central air conditioning system and documentation conform to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Perform machinery alignment • Measure duct pressure • Anchor equipment • Equipment vibration control **Principles:** The student should explain fluid dynamic in pipes or ducts **Theories:** The student should explain the principles of: • Pressure volume relationship • Manometry • Classes of fans • Surface heat transfer	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Arc welding machine • Electromechanical toolbox • Set of plumbing tools • Water manometer • Thermometer • Refrigerant leak detector • Spirit level • Steel rule or straight edge • Vernier calliper • Electrical hand tools • System analyser • Masonry tools • Lifting tackles	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Perform trial run • Take measurements of temperature and pressure quantities • Clean tools, equipment and workplace • Store tools and equipment		**Circumstantial knowledge:** **Detailed knowledge about:** • Construction site safety management • Environmental regulations	• Hammers of different weights	
		(h) Charging with refrigerant and commission the system	**Brainstorm:** Guide the students to define Charge with refrigerant and commission the system and handle tools and equipment **Demonstration:** Demonstrate to the students on how to Charge with refrigerant and	**The student should be able to:** • Select tools and equipment • Perform trial run • Take measurements of temperature and pressure quantities	The installed central air conditioning system and documentation conform to technical specifications	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Perform machinery alignment • Measure duct pressure • Anchor equipment • Equipment vibration control	The following tools, equipment and safety gear are to be available: • Oxy-acetylene welding set • Arc welding machine • Electromechanical toolbox • Set of plumbing tools • Water manometer • Thermometer	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			commission the system and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Charge with refrigerant and commission the system	• Clean tools, equipment and workplace • Store tools and equipment		**Principles:** The student should explain fluid dynamic in pipes or ducts **Theories:** The student should explain the principles of: • Pressure volume relationship • Manometry • Classes of fans • Surface heat transfer **Circumstantial knowledge:** **Detailed knowledge about:** • Construction site safety management • Environmental regulations	• Refrigerant leak detector • Spirit level • Steel rule or straight edge • Vernier calliper • Electrical hand tools • System analyser • Masonry tools • Lifting tackles • Hammers of different weights	
7.0 Managing workshop activities	7.1 Designing workshop layout	(a) Outlining workshop service area	**Brainstorm:** Guide the students to define Outline workshop service area and handle	**The student should be able to:** • Plan workshop layout	Designed workshop layout conforms to environmental and Ministry of	**Knowledge Evidence:** **Detailed knowledge of:**	The following tools, equipment and safety gear are to be available: • Organisational structures	29

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			tools and equipment **Demonstration:** Demonstrate to the students on how to Outline workshop service area and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Outline workshop service area	• Locate workshop sections • Locate the installation of different machines • Identify places for safety gears equipment • Identify convenient place for stores • Identify convenient place to assemble in case of emergency • Mark emergency exit • Locate information resource centre • Implement safety system to workers	Labour rules and regulations	**Method used:** The student should explain how to: • Arrange different workshop sections • Apply safety precautions **Principles:** The student should explain the principles of: • Laying out workshop • Machine installation in workshop **Theories:** The student should explain: • Steps to design workshop layout • Components applied in workshop safety and security systems **Circumstantial knowledge:** **Detailed knowledge about:** • Workshop service • Environmental impacts	• Different workshop layouts • Overhead projector • Computer • Chalk board • Workshop with various sections • Different management text books • Handouts • Drawing instruments	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Identify marks and postures • Place sign mark and postures • Label safety precautions for workshop materials and goods				
		(b) Designing layout of light duty equipment	**Brainstorm:** Guide the students to define Design layout of light duty equipment and handle tools and equipment **Demonstration:** Demonstrate to the students on how to Design layout of light duty equipment and to handle tools and equipment **Practical work:**	**The student should be able to:** • Design a place to put a light duty equipment • Identify convenient place for stores • Locate information resource centre • Implement safety system to workers	Designed workshop layout conforms to environmental and Ministry of Labour rules and regulations	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Design layout of light duty equipment **Principles:** The student should explain the principles related to • Design layout of light duty equipment **Theories:** The student should exp1lain: • Steps to design workshop layout	The following tools, equipment and safety gear are to be available: • Organisational structures • Different workshop layouts • Overhead projector • Computer • Chalk board • Workshop with various sections • Different management text books • Handouts • Drawing instruments	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Organise the students into manageable groups to Design layout of light duty equipment	• Identify marks and postures • Place sign mark and postures • Label safety precautions for workshop materials and goods		**Circumstantial knowledge:** **Detailed knowledge about:** • Workshop service Environmental impacts		
		(c) Designing layout of heavy-duty equipment	**Brainstorm:** Guide the students to define Design layout of heavy-duty equipment and handle tools and equipment **Demonstration:** Demonstrate to the students on how to Design layout of heavy-duty equipment and to handle tools and equipment **Practical work:**	**The student should be able to:** • Design a place to put a light duty equipment • Identify convenient place for stores • Locate information resource centre • Implement safety system to workers	Designed workshop layout conforms to environmental and Ministry of Labour rules and regulations	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Design layout of heavy-duty equipment **Principles:** The student should explain the principles related to Design layout of heavy-duty equipment **Theories:** The student should exp1lain:	The following tools, equipment and safety gear are to be available: • Organisation structures • Different workshop layouts • Overhead projector • Computer • Chalk board • Workshop with various sections • Different management text books • Handouts • Drawing instruments	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Organise the students into manageable groups to Design layout of heavy-duty equipment	• Identify marks and postures • Place sign mark and postures • Label safety precautions for workshop materials and goods		• Steps to design heavy duty layout **Circumstantial knowledge:** **Detailed knowledge about:** • Workshop service Environmental impacts		
	7.2 Controlling tools and equipment	(a) Maintaining tools control system	**Brainstorm:** Guide the students to define Maintain tools control system and handle tools and equipment **Demonstration:** Demonstrate to the students on how to Maintain tools control system and to handle tools and equipment **Practical work:** Organise the students into	**The student should be able to:** Keep record of tools and equipment in workshop Record tools and equipment issued and received daily Record damaged tools and equipment Produce report of tools and equipment	Tools and equipment controlled as per stores and financial regulations	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Maintain tools control system **Principles:** The student should explain the principles related to maintain tools control system **Theories:** The student should explain:	The following tools, equipment and safety gear are to be available: • Skills logbook • Tools and equipment catalogue • Scientific calculator • Staple machine • Binding machine • Tools list • Wall cupboards • Bench with tool grip • Tool kit • Tools issue voucher • Tools ledger	14

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			manageable groups to Maintain tools control system			• Properties of tools and equipment • Effects of weather on different tools • Required security in stores/workshops **Circumstantial knowledge:** **Detailed knowledge about:** • Safety precautions while controlling tools and equipment • Safe handling of tools and equipment • Waste disposal	• Files • Equipment ledger • Tools inventory list • Overcoat • Safety boots	
		(b) Taking inventory of tools and equipment	**Brainstorm:** Guide the students to define Take inventory of tools and equipment and handle tools and equipment **Demonstration:**	**The student should be able to:** Keep record of tools and equipment in workshop Record tools and equipment issued and received daily	Tools and equipment controlled as per stores and financial regulations	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Maintain Tools inventory records of tools and equipment	The following tools, equipment and safety gear are to be available: • Skills logbook • Tools and equipment catalogue • Scientific calculator • Staple machine	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Demonstrate to the students on how to Take inventory of tools and equipment and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Take inventory of tools and equipment	Record damaged tools and equipment Record lost equipment and tools Discard damaged tools and equipment Order new tools and equipment		**Principles:** The student should explain the principles related to Take inventory of tools and equipment **Theories:** The student should explain the procedure • Take inventory of tools and equipment **Circumstantial knowledge:** **Detailed knowledge about:** • Types of inventories • Procedure for inventory	• Binding machine • Tools list • Wall cupboards • Bench with tool grip • Tool kit • Tools issue voucher • Tools ledger • Files • Equipment ledger • Tools inventory list • Overcoat • Safety boots	
	7.3 Estimating materials and labour cost	(a) Maintaining records of workshop materials	**Brainstorm:** Guide the students to define Maintain records of workshop materials and handle tools and equipment **Demonstration:**	**The student should be able to:** Select tools and equipment Repair material cost estimates Prepare overhead costs	Cost estimates of materials and labour prepared as per task requirements	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Maintain records of workshop materials	This unit can be achieved at a workplace or training institution The following tools, equipment and safety gear are to be available: • List of spares and material	14

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Demonstrate to the students on how to Maintain records of workshop materials and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Maintain records of workshop materials	Prepare material requisition list Clean tools and equipment Store tools, equipment and materials		**Principles:** The student should explain the principles related to maintaining records of workshop materials **Theories:** The student should explain: • Importance of Maintaining records of workshop materials **Circumstantial knowledge:** **Detailed knowledge about:** • Safe handling of materials and documents	• Prepared materials • Local purchases order (LPO) • Calculator/Computer • Binding machine • Material requisition form (Material requisition voucher form (MVR) • Job card • Price list • Mask • Goods receive note (GRN) • Gloves • Overcoat • Safety boot	
		(b)Performing job cost calculations	**Brainstorm:** Guide the students to define Perform job cost calculations and	**The student should be able to:** • Prepare material cost estimates	Cost estimates of materials and labour prepared as per task requirements	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to:	The following tools, equipment and safety gear are to be available: • List of spares and material • Prepared materials	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			handle tools and equipment **Demonstration:** Demonstrate to the students on how to Perform job cost calculations and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Perform job cost calculations	• Prepare overhead costs • Prepare material requisition list • Distribute quotations to shops • Prepare job cost • Clean tools and equipment • Store tools, equipment and materials		• Perform job cost calculations **Principles:** The student should explain the principles related to Perform job cost calculations **Theories:** The student should explain: • Perform job cost calculations **Circumstantial knowledge:** **Detailed knowledge about:** • Job cost calculation	• Local purchases order (LPO) • Calculator/Computer • Binding machine • Material requisition form (Material requisition voucher form (MVR) • Job card • Price list • Mask • Goods receive note (GRN) • Gloves • Overcoat • Safety boot	
	7.4 Training subordinates	(a) Preparing training needs	**Brainstorm:** Guide the students to define Prepare training needs and handle tools and equipment **Demonstration:**	**The student should be able to:** • Prepare capability chart of the subordinates	• A training program prepared to meet job requirements • A student trained is able to execute standard required tasks	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to prepare training needs **Principles:** The student should explain the	The following tools, equipment and safety gear are to be available: • Workshop • Toolbox • Tools • Multimeter	14

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Demonstrate to the students on how to Prepare training needs and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Prepare training needs	• Conduct training needs assessment • Identify knowledge and skills to be imparted • Identify previous knowledge and skills possessed by the person to be trained • Prepare a training programme for the subordinate • Carryout the training programme by using four steps plan (prepare, present, try-out, assign work) • Continually assess	according to regulations	principles related to training needs **Theories:** The student should explain: • Training needs **Circumstantial knowledge:** **Detailed knowledge about:** • Procedure for training need	• Workshop machines such as; - Grinding machine - Drilling machine - Valve grinder - Drum and disc service machine - Wheel balancing machine - Wheel alignment machine/gauge - Head light aiming machine - Test benches - Bench vices - Anvil - Hydraulic press • Surface block • First aid kit • Firefighting equipment • Emergency exit	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				progress of workers • Make necessary adjustments to the training programme schedule • Clean the work area • Store tools, equipment, safety gears and other items			• Overhead projector • Computer • TV • Organisational structure • Overcoat • Safety boots • Gloves • Safety clear glasses	
		(b) Carrying out training of subordinates	**Brainstorm:** Guide the students to define Carry out training of subordinates and handle tools and equipment **Demonstration:** Demonstrate to the students on how to Carry out training of subordinates and to handle tools and equipment	**The student should be able to:** • Prepare capability chart of the subordinates • Conduct training needs assessment • Identify knowledge and skills to be imparted • Identify previous	• A training program prepared to meet job requirements • A student trained is able to execute standard required tasks according to regulations	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to prepare Carry out training of subordinates **Principles:** The student should explain the principles related to Carry out training of subordinates **Theories:** The student should explain:	The following tools, equipment and safety gear are to be available: • Workshop • Toolbox • Tools • Multimeter • Workshop machines i.e. - Grinding machine - Drilling machine - Valve grinder	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
			Practical work: Organise the students into manageable groups to Carry out training of subordinates	knowledge and skills possessed by the person to be trained • Prepare a training programme for the subordinate • Carryout the training programme by using four steps plan (prepare, present, try-out, assign work) • Continually assess progress of workers • Make necessary adjustments to the training programme schedule • Clean the work area		Carry out training of subordinate's **Circumstantial knowledge:** **Detailed knowledge about:** • Procedure for carry out training of subordinates	- Drum and disc service machine - Wheel balancing machine - Wheel alignment machine/gauge - Head light aiming machine - Test benches - Bench vices - Anvil - Hydraulic press • Surface block • First aid kit • Firefighting equipment • Emergency exit • Overhead projector • Computer • TV • Organisational structure • Overcoat • Safety boots	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Store tools, equipment, safety gears and other items			• Gloves • Safety clear glasses	
	7.5 Preparing reports	(a) Collecting information	**Brainstorm:** Guide the students to define Collect information and handle tools and equipment **Demonstration:** Demonstrate to the students on how to Collect information and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Collect information	**The student should be able to:** • Collect information • Write technical reports • Prepare action plan • Prepare budget report • Keep records	Prepared reports contain required contents as per management requirements	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Prepare technical reports • Keep records **Principles:** The student should explain the principles of: • Supervision • Reporting **Theories:** The student should explain: • Importance of reports • Contents of reports • Writing of technical report **Circumstantial knowledge:** **Detailed knowledge about:**	The following tools, equipment and safety gear are to be available: • Office/table and chairs • Computer • Subordinates' reports • Binding machine • Photocopy machine • Overcoat • Safety boots	14

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
						• Collection of information		
		(b) Preparing technical reports	**Brainstorm:** Guide the students to define Preparing technical reports and handle tools and equipment **Demonstration:** Demonstrate to the students on how to Preparing technical reports and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Preparing technical reports	**The student should be able to:** • Collect information • Write technical reports • Prepare action plan • Prepare budget report • Keep records	Prepared reports contain required contents as per management requirements	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Prepare technical reports • Keep records **Principles:** The student should explain the principles of: • Supervision • Reporting **Theories:** The student should explain: • Importance of reports • Contents of reports • Writing of technical report **Circumstantial knowledge:** **Detailed knowledge about:** • Writing technical report	The following tools, equipment and safety gear are to be available: • Office/table and chairs • Computer • Subordinates' reports • Binding machine • Photocopy machine • Overcoat • Safety boots	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
	7.6 Managing workshop business	(a) Performing entrepreneur tactics	**Brainstorm:** Guide the students to define Perform entrepreneur tactics and handle tools and equipment **Demonstration:** Demonstrate to the students on how to Perform entrepreneur tactics and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Perform entrepreneur tactics	**The student should be able to:** • Calculate total project cost • Prepare project write up • Select appropriate site for establishing workshop • Acquire land/building for setting workshop • Prepare initial salaries for potential workers • Exercise good customer care • Supervise provision of payment invoices and receipts • Identify labour and overhead costs	Managed workshop business conforms to stipulated regulations	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Perform entrepreneur tactics **Principles:** The student should explain principles related to: • Perform entrepreneur tactics **Theories:** The student should explain: • Meaning of "business" • Meaning of workshop • Project write up procedures • Good customer care **Circumstantial knowledge:** **Detailed knowledge about:** Proper way of to perform entrepreneur tactics Safe handling of business capital	This element can be achieved at a workplace or training institution The following tools, equipment and safety gear are to be available: • Workshop layout chart • Business films/video cassettes • Business magazines • Workshop business regulations • Scheduled maintenance of machines • Job card sheets • Safety gears • Workshop tools and equipment • Personal computer • Workshop stores • Workshop office • Tool ledger book	14

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
				• Analyse profit and loss • Revisit business plan				
		(b) Conducting manpower planning	**Brainstorm:** Guide the students to define Conduct manpower planning and handle tools and equipment **Demonstration:** Demonstrate to the students on how to Conduct manpower planning and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Conduct manpower planning	**The student should be able to:** • Perform manpower planning • Prepare initial salaries for potential workers • Exercise good customer care • Supervise provision of payment invoices and receipts • Identify labour and overhead costs	Managed workshop business conforms to stipulated regulations	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Conduct manpower planning **Principles:** The student should explain principles of: • Conduct manpower planning **Theories:** The student should explain: • Conduct manpower planning **Circumstantial knowledge:** **Detailed knowledge about:** Safe handling of manpower planning	The following tools, equipment and safety gear are to be available: • Workshop layout chart • Business films/video cassettes • Business magazines • Workshop business regulations • Scheduled maintenance of machines • Job card sheets • Safety gears • Workshop tools and equipment • Personal computer • Workshop stores • Workshop office • Tool ledger book	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria			Training Requirements/ Suggested Resources	Number of Periods per Unit
				Process Assessment	Product/Services Assessment	Knowledge assessment		
		(c) Supervising junior workers	**Brainstorm:** Guide the students to define Supervise junior workers and handle tools and equipment **Demonstration:** Demonstrate to the students on how to Supervise junior workers and to handle tools and equipment **Practical work:** Organise the students into manageable groups to Supervise junior workers	**The student should be able to:** • Perform manpower planning • Exercise good customer care • Identify labour and overhead costs	Managed workshop business conforms to stipulated regulations	**Knowledge Evidence:** **Detailed knowledge of:** **Method used:** The student should explain how to: • Conduct manpower planning **Principles:** The student should explain principles of: • Conduct manpower planning **Theories:** The student should be able to: • Conduct manpower planning **Circumstantial knowledge:** **Detailed knowledge about:** Safe handling of manpower planning	The following tools, equipment and safety gear are to be available: • Business magazines • Workshop business regulations • Scheduled maintenance of machines • Job card sheets • Safety gears • Workshop tools and equipment • Personal computer • Workshop stores • Workshop office • Tool ledger book	

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