FEDERAL MINISTRY OF EDUCATION

National Technical Certificate (NTC) Curriculum in

MOTORCYCLE AND TRICYCLE ASSEMBLY, REPAIR AND MAINTENANCE

February, 2025

Innovation Development and Effectiveness in the Acquisition of Skills (IDEAS) Project

Funded by IDEAS project

NATIONAL BOARD FOR TECHNICAL EDUCATION
Plot B, Bida Road, P.M.B. 2239, Kaduna, Nigeria

NATIONAL TECHNICAL CERTIFICATE

CURRICULUM AND MOUDULE SPECIFICATIONS

IN

MOTORCYCLE AND TRICYCLE ASSEMBLY, REPAIRS AND MAINTENANCE

FEBRUARY, 2025

GENERAL INFORMATION

AIM

To give training and impart the necessary skills leading to the production of craftsmen and other skilled personnel who will be enterprising and self-reliant**.**

ENTRY QUALIFICATIONS

Candidates must not be less than 14 years of age and should have successfully completed three years of Junior Secondary education or its equivalent. Special consideration may be given to sponsored candidates with lower academic qualifications who hold trade test certificate and are capable of benefiting from the programme.

The Curriculum

The Curriculum of each programme is broadly divided into three components:

a. General Education, which accounts for 30% of the total hours required for the programme.
b. Trade Theory, Trade Practice and Related Studies which account for 65% and,
c. Supervised Industrial Training/Work Experience which accounts for about 5% of the total hours required for the programme. This component of the course which may be taken in industry or in the College production unit is compulsory for the full-time students.

Included in the curriculum are the teacher's activity and learning resources required for the guidance of the teacher.

Unit Course/Modules

A course/ module is defined as a body of knowledge and skills capable of being utilized on its own or as a foundation or pre-requisite knowledge for more advanced work in the same or other fields of study. Each trade course/ module when successfully completed can be used for employment purposes.

Behavioral Objectives

These are educational objectives, which identify precisely the type of behaviour a student should exhibit at the end of a course/module or programme. Two types of behavioral objectives have been used in the curriculum. They are:

a. General Objectives
b. Specific Objectives

General objectives are concise but general statements of the behavior of the students on completion of a unit of week such as understanding the principles and application of:

a Service Operation
b Engine Operation – motorcycles and tricycles
c Assembly

Specific objectives are learning outcomes of the specific behavior expressed in units of discrete practical tasks and related knowledge the students should demonstrate as a result of the educational process to ascertain that the general objectives of course/ programme have been achieved. They are more discrete and quantitative expressions of the scope of the tasks contained in a teaching unit.

General Education in Technical Colleges

The General Education component of the curriculum aims at providing the trainee with knowledge in critical subjects like English Language, Mathematics, Economics, Physics, Chemistry, Biology and Entrepreneurial Studies etc. to enhance the understanding of machines, tools and materials of their trades and their application as a foundation for post-secondary technical education for the above average trainee. Hence, it is hoped that trainees who successfully complete their trade and general education may be able to compete with their secondary school counterparts for direct entry into Universities, Polytechnics or Colleges of Education (Technical) for degree, ND or NCE courses respectively.

For the purpose of certification, only the first three courses in mathematics will be required. The remaining modules are optional and are designed for the above average students.

National Certification

The NTC programme is run by Technical Colleges accredited by N.B.T.E.

NABTEB conducts the final nnational examination and awards certificates.

Trainees who successfully complete all the courses/ modules specified in the curriculum table and passed the national examinations in the trade will be awarded one of the following certificates:

S/NO	LEVEL	CERTIFICATE
	Technical Programme	
1.	NTC	National Technical Certificate

Guidance Notes For Teacher implementing the Curriculum

The number of hours stated in the curriculum table may be increased or decreased to suit individual institutions' timetable provided the entire course content is properly covered and goals and objectives of each module are achieved at the end of the term.

The maximum duration of any module in the new scheme is 300 hours. This means that for a term of 15 weeks, the course should be offered for 20 hours a week. This can be scheduled in sessions of 4 hours in a day leaving the remaining hours for general education. However, properly organized and if there are adequate resources, most of these courses can be offered in two sessions a day, one in the morning and the other one in the afternoon. In so doing, some of these programmes may be completed in lesser number of years than at present.

The sessions of 4 hours include the trade theory and practice. It is left to the teacher to decide when the class should be held in the workshop or in a lecture room.

INTEGRATED APPROACH IN THE TEACHING OF TRADE

Theory, Trade Science and Trade Calculation

The traditional approach of teaching trade science and trade calculation as separate and distinct subjects in Technical College programmes is not relevant to the new programme as it will amount to a duplication of the teaching of mathematics and physical science subjects in the course. The basic concepts and principles in mathematics and physical science are the same as in the trade calculation and trade science. In the new scheme therefore, qualified persons in these fields will teach mathematics and physical science and the instructors will apply the principles and concepts in solving trade science and calculation problems in the trade theory classes. To this end, efforts have been made to ensure that mathematics and science modules required to be able to solve technical problems were taken as pre-requisite

Evaluation of Programme/Module

For the programme to achieve its objectives, any course started at the beginning of a term must terminate at the end of the term.

Instructors should therefore device methods of accurately assessing the trainees to enable them give the student's final grades at the end of the term. A national examination will be taken by all students who have successfully completed their modules. The final award will be based on the aggregate of the scores attained in the course work and the national examination.

PROGRAMME:
NATIONAL TECHNICAL CERTIFICATE IN MOTORCYCLE AND TRICYCLE ASSEMBLY, REPAIR AND MAINTENANCE

GOAL: The Motorcycle and Tricycle Assembly, Repair and Maintenance Programme is intended to produce a trainee who should be able to diagnose faults, carry out repairs and maintenance for motorcycles and tricycles assembly work, and their tools and equipment, the trainee should also have an in-depth theoretical knowledge of its operations.

CURRICULUM TABLE AND COURSE HOURS/WEEK
PROGRAMME: NATIONAL TECHNICAL CERTIFICATE

Module Code	MODULE	YEAR I						YEAR 2						YEAR 3						TOTAL HOURS
		Term 1		Term 2		Term 3		Term 1		Term 2		Term3		Term 1		Term 2		Term 3		
		T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	
CAM 12 – 15	Mathematics	2	-	2	-	2	-	2	-	2	-	2	-	2	-	2	-	2	-	216
CEN 11 - 17	English	2	-	2	-	2	-	3	-	3	-	3	-	3	-	3	-	3	-	288
CPH 10 - 12	Physics	2	-	2	-	2	-	2	1	2	1	2	1	2	1	2	1	2	1	288
CCH 10 - 12	Chemistry	2	-	2	-	2	1	2	1	2	1	2	1	2	1	2	1	2	1	288
CEC 11 - 13	Economics	2	-	2	-	2	-	2	-	2	-	2	-	2	-	2	-	2	-	216
CBM 11	Entrepreneurship	-	-	-	-	-	-	2	-	2	-	2	-	-	-	-	-	-	-	72
ICT 11 - 15	Computer Studies	-	-	-	-	-	-	1	2	1	2	1	2	1	2	1	2	-	-	180
CTD 11 - 13	Drawings	-	3	-	3	-	3	-	3	-	3	-	2	-	2	-	2	-	2	288
CME11	General Metal Work I	3	4					-	-	-	-	-	-	-	-	-	-	-	-	84
CME12	General Metal Work II	-	-	-	-	-	-	2	3	-	-	-	-	-	-	-	-	-	-	60
CMT111,	Introduction to Workshop Tools	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	60
CMT121	Introduction to Workshop Tools II	-	-	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	60
CMT132	Introduction Workshop Equipment and Specialised Tools	-	-	-	-	2	3	-	-	-	-	-	-	-	-	-	-	-	-	60
CMT113	History of Motorcycle and Tricycle I	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24
CMT123	History of Motorcycle	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24

	and Tricycle II																			
CMT133	History of Motorcycle and Tricycle III	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	24
CMT214,	Materials and Workshop Process I	-	-	-	-	-	-	2	4	-	-	-	-	-	-	-	-	-	-	72
CMT224	Materials and Workshop Process II	-	-	-	-	-	-	-	-	2	4	-	-	-	-	-	-	-	-	72
CMT235	Machining	-	-	-	-	-	-	-	-	-	-	2	4	-	-	-	-	-	-	72
CMT216	Steering, Suspension and Braking Systems I	-	-	-	-	-	-	2	4	-	-	-	-	-	-	-	-	-	-	72
CMT226	Steering, Suspension and Braking Systems II	-	-	-	-	-	-	-	-	2	4	-	-	-	-	-	-	-	-	72
CMT236	Steering, Suspension and Braking Systems III	-	-	-	-	-	-	-	-	-	-	2	4	-	-	-	-	-	-	72
CMT227	Auto-Electricity I	-	-	-	-	-	-	-	-	2	4	-	-	-	-	-	-	-	-	72
CMT237	Auto-Electricity II	-	-	-	-	-	-	-	-	-	-	2	4	-	-	-	-	-	-	72
CMT318	Internal Combustion Engine I	-	-	-	-	-	-	-	-	-	-	-	-	2	4	-	-	-	-	72
CMT328	Internal Combustion Engine II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	4	-	-	72
CMT338	Internal Combustion Engine III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	4	72
CMT319	Transmission System I	-	-	-	-	-	-	-	-	-	-	-	-	2	4	-	-	-	-	72
CMT329	Transmission System II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	4	-	-	72
CMT339	Transmission System III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	4	72

CMT310	Motorcycle and Tricycle Assembly	-	-	-	-	-	-	-	-	-	-	-	-	2	4	-	-	-	-	72
CMT320	Motorcycle and Tricycle Assembly	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	4	-	-	72
CMT330	Motorcycle and Tricycle Assembly	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	4	72
		17	10	14	6	14	7	20	18	20	19	20	18	18	18	18	18	17	16	3456

Contents

PROGRAMME:

NATIONAL TECHNICAL CERTIFICATE IN MOTORCYCLE ASSEMBLY, REPAIRS AND MANTENANCE.

MODULE: CME 11: GENERAL METAL WORK

DURATION: 84 HOURS

GOAL: This module is designed to introduce the trainee to the fundamentals of general metal work processes including fitting of mechanical parts and production of simple engineering components.

GENERAL OBJECTIVES:

On completion of this module, the trainee should be able to:

1.0 Understand workshop safety rules and their applications in machine shop.
2.0 Know the physical properties, manufacturing processes and applications of ferrous and non-ferrous metals in common use.
3.0 Understand the selection and use of common measuring, marking out, cutting and striking tools.
4.0 Understand the basic working principles of drilling machine and use them for various drilling operations.
5.0 Understand the application of various types of screw threads and rivets, to rivet and cut screws by hand.
6.0 Understand the ISO system of tolerances and fits and their applications in engineering production.
7.0 Produce simple engineering components on the bench.
8.0 Understand the essential features and working principles of the centre lathe and carry out basic operations such as turning, step turning, facing, taper turning, knurling, chamfering and undercutting.

PROGRAMME: NATIONAL TECHNICAL CERTIFICATE IN ENGINEERING CRAFT PRACTICE						
MODULE: General Metal Work I				**COURSE CODE:** CME 11		**CONTACT HOURS:** 84
YEAR: 1	**TERM:** 1	**PRE: REQUISITE:**	**Theoretical:** 36 Hours **Practical:** 48 Hours			
GOAL: This module is designed to introduce the trainee to the fundamentals of general metal work processes including fitting of mechanical part and production of simple engineering components.						
Theoretical Content				**Practical Content**		
GENERAL OBJECTIVE 1.0: Understand workshop safety rules and application in machine shop						
Week	**Specific Learning Outcome**	**Teacher Activities**	**Learning Resources**	**Specific Learning Objectives**	**Teacher Activities**	**Learning Resources**
1	1.1 State sources of hazards in the workshop and how to prevent them.e.g. handling and using hand tools, portable power tools and machines; - stepping on or striking obstructions left on floors or benches; - lifting, moving and storing materials or jobs; - using inflammable or corrosive liquids and gases; inhaling vapours or fumes; 1.2 Explain the applications of factory safety regulations in the machine shop. 1.3 Name safety equipment and wears essential in the machine shop, and state their application in working situations. Note: Example of safety wears and equipment should include overall,	State sources of hazards in the workshop. Through questions and answer, determine whether the students grasped the topic Show a film on industrial safety. Through question and answer determine comprehension. Demonstrate how to treat emergency cases like artificial respiration, cold compress etc. List the safety equipment and	Safety posters, common hard tools like files hacksaw Television, Video machine. Overall, goggles, gloves, hard shoes, head shield, fire extinguishers.	Identify sources of hazards and how to prevent them. E.g. handling and using hand tools, portable power tools and machines; stepping on or striking obstructions left on floors or benches; lifting, moving and storing materials or jobs; using inflammable or corrosive liquids and gases; inhaling vapours or fumes;	Demonstrate safe ways of handling basic hand tools Show a film on industrial safety Demonstrate how to treat energy cases like artificial respiration cold compress, etc Assess the students	Hand tools: files, hacksaw Television, Video machines Posters on artificial respiration

	eye goggles, gloves, safety boots, helmet, fire extinguishers, etc 1.4 Outline safety rules and regulations relating to:- clothing and health hazards; workshop hygiene; movement and other behaviour of workers in the workshops; materials handling; too handling, storage and usage; machine operation; fire protection. State appropriate procedures in the events of a workshop accident Examples of procedures may include: application of first aid to the victim; removal or rectification of the accident; reporting the accident to the appropriate authority; keeping a record of accidents for management use.	wears that are essential in the workshop. Give detail notes and explanation in each topic a-g. Use questions and answers to determine comprehension. Assess the students Give detail notes and explanation as appropriate. Explain the procedures to be taken in the event of workshop accident				
	General Objective 2.0: Know the physical properties, manufacturing process and application of ferrous and non-ferrous metals in common use.					
week	**Specific Learning Outcome**	**Teacher Activities**	**Learning Resources**	**Specific Learning objectives**	**Teacher Activities**	**Learning Resources**
2	2.1 Explain the meaning of the following general physical properties of metals:- ductility, malleability, strength, toughness, brittleness, elasticity, plasticity. 2.2 Describe the basic composition and properties of plain carbon steels, cast iron and alloy steel and state	Give detailed notes and explanations for the topics in 2.0 ▪ Give notes and specific examples of tools	Video and television including cassettes on production processes.			

	their application in the engineering industry. Note: Specific examples of tools and equipment made from the various steel and cast iron should be mentioned. Examples of steels and cast irons should include: plain carbon steels, dead mild steels, mild steel, medium carbon steel, high carbon steel. Cast Irons - gray cast iron, malleable cast iron, alloy cast irons (spheroidal and acicular) Alloy Steels - High speed steels, high tensile steels, tungsten, carbide, stainless steels, stellite 2.3 Outline: the cupola process of manufacture of cast iron; the blast furnace process of manufacture of pig iron; the direct reduction process of manufacture of steel. Note: A visit to a steel manufacturing plant is recommended. 2.4 Describe the physical properties and applications of non-ferrous metals below: copper, tin, zinc, aluminium and aluminium alloys brass (muntz metal, cartridge brass,	▪ and equipment made from the various ▪ steels and cast iron. ▪ Examples of steels and cast irons should include plain carbon steels dead mild steels, mild steel, medium carbon steel high carbon steel, gray cast iron, malleable cast iron, alloy cast iron high speed steels, high tensile steels tungsten, carbide, stainless steels ▪ Give notes and explanation on the cupola process, ▪ blast furnace and the direct reduction process				

	gilding etc) metal,bronze (manganese bronze tunmetal, bell metal, aluminium bronze, phosphor bronze and lead.	▪ manufacture of steel. This can be preceded by film show and a visit to a manufacturing plant. Give detail notes and explanations describing the physical properties and applications of the following non-ferrous metals: copper, tin, zinc, aluminium, aluminium alloys, brass, (muntzmetal, cartridge brass gilding metal) etc. bronze, manganese bronze bell metal, aluminium bronze phosphor bronze and lead. Assess the students				

	General Objective 3.0: Understand the selection and use common measuring, marking out, cutting and striking tools.					
week	**Specific Learning Outcome**	**Teacher Activities**	**Learning Resources**	**Specific Learning objectives**	**Teacher Activities**	**Learning Resources**
3	3.1 Select common measuring, marking out, cutting and striking tools. 3.2 Explain with examples the difference between "line" and "end" measurement. 3.3 Explain the use of datum points, datum lines and datum faces in marking out. 3.4 Describe, the functions and application of the following instruments used in metal-work: steel rule, dividers, calipers (inside, outside and odd-legs), trammel, scriber angle plate, vee-block, centre square. 3.5 Describe the various types of files, stating their grades and applications. Note: Types of files should include: flat, square, round, half round, three square, warding polar, mill and rasp. 3.6 Classify the common files used in metal work and state their composition of material used for their manufacture. 3.7Sketch the bench vice, explain its	Prepare notes that will clearly differentiate between "line" and "end" measurement. Prepare notes and examples that will explain the use of datum points, datum lines, and datum faces in marking out. Demonstrate and give detail notes and explanations regarding the functions and application of: steel rule, dividers, calipers (inside, outside and odd leg) trammel, scriber, angle plate, vee block, centre square Prepare notes that	Steel rule, divides calipers, trammel, scribe angle plate vee block, centre square. Micrometer vernier calipers vernier height gauge combination set Flat file, hard file, round file square, half round, triangular warding, mill file, rasp file. Flat file, hand file engineers square.	Describe the essential features and use of the following micrometer vernier caliper Venier height gauge combination set Maintain and care for the instruments listed above Perform marking out exercise on plane surfaces including profiles File a piece of metal to given specifications using any of the following: Cross filing, draw filing, filing square and flat surfaces Test surface for flatness using surface plate	▪ Demonstrate how to use micrometer, venier caliper, vernier height gauge, combination set ▪ Demonstrate the maintenance and care of the instruments listed above ▪ Perform marking out for the students to learn and practice till they become competent ▪ Demonstrate how flat surfaces can be tested using surface plate and try square	Micrometer, vernier calipers, vernier height gauge, combination sets Steel rules, dividers, punches, trammel, scribe angle plate, vee block center square Flat file, try square File card, flat file Ball pein hammers, mallet Hacksaw blade, Hacksaw frame

	clamping power and demonstrate the technique of holding work in the vice for filing, tapping and designing operations. 3.8 Describe the functions of the various parts of a bench vice, its holding power while performing various operations on such as filing, tapping, sawing etc. 3.9 Describe and use the following tools: cold chisels (flat, cross, cut half round, diamond-point) centre punch and dot punch Scrapers (flat, triangular, half round) power hack saw	will describe the various types of files stating their grades and applications, by type, e.g. flat, square round, half round, three square, warding, mill and rasp. Prepare detail notes that will classify the common files used in the metal work as swell as stating the composition of materials used for their manufacture.	Surface plate try square (engineers square) File card Flat file Bench vice.	and try square and state precautions to be taken to avoid pinning Maintain files in good working conditions Apply various hammers and mallets e.g ball pen, rubber mallets, etc for engineering purposes Select and insert hacksaw blade correctly Cut metal and other engineering materials to given specifications using the adjustable hacksaws, junior hacksaws, piercing saw, etc drills and Drilling. Assess the students	▪ Demonstrate how files are cleaned and state the precautions to be taken against pinning. Students to practice till they become competent ▪ Demonstrate the application of hammers and mallets for engineering purposes ▪ Demonstrate how a hacksaw blade can be inserted correctly ▪ Demonstrate how to use adjustable hacksaw, junior hacksaw piercing ▪ Students	

					should be allowed to practise till competent ▪ Assess the students	
4	3.10 Describe the various parts of a hack saw and their function. 3.11 Describe the common types of hacksaw blades, their range of pitches and their applications. 3.12 Show a bench vice and demonstrate the technique of holding work in the vice for filing, tapping and designing operations .Prepare detail notes that will describe the functions of the various parts of a bench vice, its holding power while performing various operations. 3.13 State the safety precautions to be observed when using a hand hacksaw	Show a bench vice and demonstrate the work in the vice for filing, tapping and designing operations Prepare detail notes that will describe the functions of the various parts of a bench vice, its holding power while performing various operations Assess the students Prepare detail notes and demonstrations that will describe and uses of: cold chisels, center punch dot punch, scrapers and power hacksaw.	Bench vice. Ball pen hammers and mallets. Cold chisels, centre punches, dot punch, scrapers, power hacksaw blades. Hacksaw blade Hacksaw frame Adjustable hacksaw junior hacksaw piercing saw. Bench drill Pillar drill. Twist drill, flat drill counter sink drill, counter bore drill			

		Prepare notes that will describe the various parts of a hacksaw and their functions. Show samples of hacksaw blades as well as prepare notes that will describe the common types of hacksaw blades, their range of pitches and their applications. Prepare notes that will show correct way of inserting blades. Prepare detail notes and explanation, stating the safety precautions to be observed when using a hand hacksaw. Prepare notes that will describe the uses of various	combination centre drill.			

		hacksaws. Assess the students				
	General Objective 4.0: Understand the working principles of a drilling machine, use it to drill and ream holes on metals and other engineering materials.					
Week	**Specific Learning Outcome**	**Teacher Activities**	**Learning Resources**	**Specific Learning objectives**	**Teacher Activities**	**Learning Resources**
5-6	4.1 Identify the various types of drilling machines. 4.2 Describe, with sketches, the main features of a bench or pillar drilling machine. 4.4 Describe with sketches and state where each of the following types of drills are best suited: twist drill (taper shank, parallel shank and jobbers drill, and their relative merits), flat drill, countersink drill, counter bore drill, combination centre drill. 4.5 Explain the effects of the following faults in a ground twist drill bit: point angle too acute; point angle too obtuse; cutting edges at unequal angles; insufficient lip clearance; excessive lip clearance. 4.6 Calculate spindle revolution or cutting speed for specified size of drill using the formulae: - N = 1000S/πd S = πdN/1000	Show different types of drilling machines Make notes and drawings that will identify the various types of drilling m/cs. Prepare detail notes and drawings that will describe the main features of a bench or pillar drilling machine. Solve many problems for students to practices. Prepare notes and drawings that will describe where each of the following drills are best suited Twist drill (taper	Ball pen hammers, mallets, cold chisels, do center punches, hacksaw and hacksaw blades Drilling machines and their accessories.	Setting up and operate a drilling machine in given situations Note: Setting up drilling machine should include a) change of spindle speed b) adjustment of drilling table to required height and angle, to required height and angle, holding of work on drilling table using appropriate clamping devices c) Install the drill bit in chuck Sharpen a twist drill correctly to	Demonstrate how to set up and operate a drilling machine in given situation Students to practice till they become competent Demonstrate how a twist drill can be sharpened correctly Demonstrate with the appropriate facility how to perform all the drilling operations Students to practice till they become	Bench drill pillar drill, drill bits Bench drill, pillar drill, twist drill, flat drill, counter sink drill, counterb ore drill, center drill Drills, taps, tap wrench, die and die stock Rivets and sets of drill bits Surface table, surface plate, marking solution, center/do

	Where S = cutting speed (m/min) N = revolutions/minute D = diameter of drill (mm) π = 3.142 4.8 State the causes and remedies of drilling faults such as:- drill breaking; drill colored blue; walls of drilled hole left rough; chipped cutting lips. 4.9 State the safety precautions to be observed when using a drilling machine. 4.10 Explain the purpose of reaming and describe different types of hand and machine reamers. 4.11 Ream to given specifications by hand and machine method.	shank, parallel shank, jobber drill and their relative merits), flat drill, counter bore drill and combination center drill. Assess the students.		manufacturer's specification Perform with facility the following operations: a. drilling blind holes b. drilling round stock c. counter boring and counter-sinking d. drilling large diameter holes List the operation square and cut internal (through and blind) and external threads by hand method and state precautions to be taken when taping on the bench Rivet metals together in any given situations Mark out only given bench work using datum points, datum lines, datum faces, chalk or	competent Give notes as well as demonstrate the operation sequence in cutting internal (through and blind) and external threads by hand method Demonstrate how riveting can be done and let the students practice same till they become competent Demonstrate the marking out procedures on bench working using datum lines, datum faces, etc Students to practice till they become	t punches, scribing block

				marking solution center or dot, punch, scribing block or measurement transfer.	competent Assess the students	
	General Objective 5.0: Understand the applications of various types of screw threads rivet and cut screws by hand.					
Week	**Specific Learning Outcome**	**Teacher Activities**	**Learning Resources**	**Specific Learning objectives**	**Teacher Activities**	**Learning Resources**
7	Sketch the thread forms below and state their applications: - the ISO metric thread the unified thread Whitworth and British fine threads British Association (BA) thread British Standard pipe Square thread Acme thread Buttress thread. 5.2 Sketch and state the functions of:- a. taps (taper tap, second tap, plug) b. tap wrench c. die and die stock. 5.3 Explain the meaning of tapping size or tapping drill and estimate its value in given situations using formulae such as:- T = D - P Where T = tapping diameter D = thread top diameter P = pitch State precautions to be taken when	Give detailed notes with diagrams that will show the various forms of trade and their uses. Prepare notes that will state the functions of taps, tap wrench, die and die stock . Give detailed notes that will explain the meaning of tapping size or tapping drill and estimate its values using the formula: T = D – P Where T = tapping diameter D = thread top	Diagrams/charts of thread forms Parallel reamers, taper reamers twist drills. Rivet sets, drills.			

	taping on the bench. 5.5 Describe and differentiate types of rivets. e.g. Snap and pan head, mushroom and counter-sunk head, flat head, dod rivet, etc. 5.6 Sketch the rivet set and state its use. 5.7 Calculate the diameter of rivet and riveting allowance in given situations.	diameter and P = Pitch Prepare notes that will state precautions to be taken when tapping on bench. Give notes and diagrams that will describe and differentiate types of rivets, rivet sets, and its uses and guide to calculate the diameter of rivet and riveting allowance. Assess the students.				
	General Objective 6.0: Understand the ISO tolerances and fits and its application in engineering production.					
Week	**Specific Learning Outcome**	**Teacher Activities**	**Learning Resources**	**Specific Learning objectives**	**Teacher Activities**	**Learning Resources**
8	6.1 Differentiate between the following:- - nominal size - limits (upper and lower) - tolerance (unilateral and bilateral) - fit (clearance, transition interference). 6.2 Explain the importance of tolerance and fit in engineering production and describe briefly the ISO system of limits and fits.	Give detailed notes that will differentiate between nominal size, limits, tolerance and fits. Prepare detailed note and diagrams that will explain	Charts on tolerances, limits and fits.			

	6.3 Determine by calculation the amount of tolerance and types of fit in given situations.	the importance of tolerance and fits in engineering production as well as describing the ISO systems of limits and fits. Give notes and explanations that will guide in calculating the amount of tolerance and types of fits in given situations. Assess the students.				
	General Objective 7.0: Produce simple Engineering Components on the bench.					
9	7.1 Explain layout procedures from working drawing of simple engineering components or tools such as:- - open ended spanner - engineer's try square - tool maker's clamp - plate bracket or gusset (involving rounds, angles, holes) - centre square.	Teachers to prepare notes and explanations to guide the students in producing simple engineering components in 7.1 Assess the students	Lesson notes. Diagrams and charts.			
	General Objective 8.0: Understand the essential features and working principles of the centre lathe and use it to carry out basic operations such as plain turning, stepped turning, facing taper turning, chamfering, and under-cutting.					
10	8.1 Describe the essential features of a centre lathe and state their	Prepare detailed notes that will	Centre lathe and accessories	Sharpen cutting tool for plain	Guide the students to sharpen	Point tools, grinding

	functions e.g lathe bed, headstock, tailstock, saddle or carriage, etc. 8.2 Explain the working principles of the centre lathe. Identify and state the functions of center lathe accessories such as: catch or driving plate, face plate, lathe dog or carrier, lathe centres, fixed and travelling steadies. 8.4 Explain the difference between the centre lathe, capstan lathe, in terms, of their main features and functions. Name types of cutting fluids used for lathe turning operations and state their composition and purposes. Outline safety precautions to be observed when working on the lathe 8.7 Sketch and describe common tools: e.g butt-brazed tool, tipped tool, bit and holder. Note: Tool description should include tool materials e.g plain carbon steel, high speed steel, satellite, cemented carbide, diamond. 8.8 Explain with sketches the functions of tool angles (rake, clearance), and state their values for different metals to be machined.	describe the essential features of center lathe and their functions. Give notes and diagrams that will explain the working principles of center lathe and functions of its accessories. Give explanations that will show the difference between center lathe and capstan lathe in terms of their main features and functions. Prepare notes that will list types of cutting fluid used for lathe turning operations and their composition and purposes. Prepare detailed notes and	like catch plates, face plates, centers, fixed and travelling steadies. Charts of center lathe and capstan lathe. Round nose turning tool, finishing tool, site finishing, knife tools, form tools, parting off tools, and boring tools.	turning, shouldering, parting off and facing operations Set up rough and turned stock in 3-jaw-chuck Select appropriate cutting tool and set them up to center height for turning or facing operations Carry out chuck work involving facing, step turning, undercutting, chamfering, parting off and knurling Note: Components should be produced to specified tolerance and finish Produce simple components involving taper turning using the compound	cutting tool for plain turning shouldering, parting off and facing operations and allow students to practice till competent Demonstrate how to set-up rough and turned stock in a 3-jaw-chuck and operate lathe. Allow students to practice till they become competent Guide the students to select appropriate cutting tools and set them up to center height for lathe work (turning or facing)	machine, lathe machine 3-jaw chuck and lathe machine Point tools lathe machine Lathe machine and accessories Centre lathe and accessories like catch plate, face plate, dog lathe, lathe centers fixed steady and travelling steadies Round nose turning tool, fine finishing

		explanation that will outline safety precautions, common tools and materials used in marking them. Give detailed notes and diagrams that will explain the functions of tool angles (rake, clearance) stating their values for different metals to be machined. Assess the students		slide	Guide students to produce simple engineering components like open ended spanner, engineers square, tool makers clamp, center square, etc. Make a simple precision fitting project like hexagonal mild steel bar making push fit through a mild steel plate Students should be allowed to practice till they become competent Prepare simple exercises that will guide students to produce components	tool, form tool, parting off tool, boring tool, bar of good length and 4mm diameter, Live/dead centers catch plates Standard exercises or prepared jobs

					involving taper turning using the compound slide. Assess the students	
11-12	8.9 Differentiate between various tool shapes and state their uses e.g. Round nose rougher, fine finishing, side finishing, knife tool, form tool, parting off tool, boring tool, etc. Explain with sketches the effects of wrong setting cutting tools: e.g. vibration and chatter, tool rubbing against or digging into the job. 8.11 Define cutting speed and feed with respect to lathe operation. Calculate the cutting speed and feed for given turning operation. Estimate the rate of metal removal and time required for carrying out specified turning operations State precautions to be observed when turning between centres. Set up the lathe for and carry out basic turning operations between centres. Compute required taper dimensions from given data using taper ratio angle formulae i.e. $\text{Taper Ratio} = \frac{d2 - d1}{L}$	Give notes and diagrams of various tool shapes and their uses. Prepare detailed notes and explanations to cover 8.10 to 8.15 Solve many problems for the students to practise. Assess the students	Charts on tool height Charts and diagrams of different machining operations.			

	OR Tan = d2 d1 2 2 where = taper angle d1 - small end diameter d2 = large end diameter L = length of taper					

Assessment profile: Practical to take 60% of overall assessment

COURSE: GENERAL METAL WORK

MODULE: CME 12 GENERAL METAL WORK II

CONTACT HOUR: 60 HOURS

GOAL: This module is designed to introduce the trainee to basic processes in mechanical engineering such as forging, sheet-metal work and welding.

General Objectives:

On completion of this module, the trainee should be able to:

1. Understand the basic principles and processes of heat treatment of metal in the workshop.
2. Produce simple engineering components by forging.
3. Understand the basic principles and techniques of gas and metal arc welding and apply them in fabricating simple metal components.

PROGRAMME: NATIONAL TECHNICAL CERTIFICATE IN ENGINEERING CRAFT PRACTICE						
MODULE: General Metal Work II				**COURSE CODE:** CME 12		**CONTACT HOURS:** 60
YEAR: 2	**TERM:** 1	**PRE: REQUISITE:** CME 11		**Theoretical:** 24 Hours **Practical:** 36 Hours		
GOAL: This module is designed to introduce the trainee to basic processes in mechanical engineering such as forging, sheet-metal work and welding.						
Theoretical Content				**Practical Content**		
GENERAL OBJECTIVE 1.0: Understand the basic principles and processes of heat treatment of metal in the workshop.						
Week	**Specific Learning Outcome**	**Teacher Activities**	**Learning Resources**	**Specific Learning Objectives**	**Teacher Activities**	**Learning Resources**
1-4	On completion of this module, the trainee should be able to: 1.1 Explain briefly the structural behaviour of plain carbon steel as it is heated from room temperature to about 1000°C for the purposes of: a hardening b tempering c annealing d normalising e case-hardening. 1.2 Explain the meaning of hardening metal work. 1.3 Outline safety precautions relating to heat treatment processes apply them in given situations.	▪ Prepare detail notes that will explain the structural behaviour of plain carbon steel as it is heated from room temperature to about 1000°C. ▪ Prepare detail notes that will explain the meaning of hardening in metalwork. ▪ Prepare notes that will outline safety precautions relating to heat treatment	▪ Recommended Text books ▪ Lesson notes, etc	Carry out the following heat treatment processes; Hardening, tempering, annealing normalizing, case hardening on given plain carbon steel, engineering component or tool Anneal copper, brass and aluminium for various purposes	▪ Demonstrate heat treatment processes and explain the stages ▪ Demonstrate the annealing process on brass, copper and aluminium for various purposes. ▪ Assess the students.	▪ Furnace, Forge tongs

		processes. ▪ Assess the students				
	General Objective 2.0: Understand The Techniques Of Producing Simple Engineering Components By Forging.					
Week	**Specific Learning Outcome**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objectives**	**Teachers Activities**	**Learning Resources**
5-6 7-8	2.1 Explain with outline sketch the main features and working principles of the black smith's forge. 2.2 Describe and state the functions of common forging tools. e.g anvil, swage block, leg vice, forging hammers, hot and cold sets, set hammer, punches and drifts, hardie, fullers, top and bottom swages flatter, tongs (open mouth, closed mouth, hollow bit, etc.). 2.3 Describe with sketches the following forging operations: a. upsetting b. drawing down c. setting down d. twisting e. forge welding (scarf and splice welds) f. bending g. forming closed ring h. forming an eye.	▪ Prepare detail notes and diagrams that will explain the main features and working principles of the black smith's forge. ▪ Prepare notes and diagrams that will describe the functions of common forging tools. ▪ Prepare detail notes that will describe the following forging operations: upsetting, drawing down, setting down, twisting, forge welding, bending, forming closed ring,	▪ Charts etc.	Select appropriate forging tools and produce to specification given engineering components by forging processes a upsetting – drawing down b setting down – twisting c forge welding (scarf and spice welds) d bending, turning closed ring e forming an eye	▪ Demonstrate with appropriate forging tools how to produce some engineering components and let the student practice till they become competent ▪ Assess the students	▪ Anvil, swage block, leg vice, forging hammers, hot set, cold set, sets of hammer, punchers, drifts, fillers, top swage, bottom swage, flatter, open tongs, hallow bit

		forming an eye. ▪ Assess the students.				
	General Objective 3.0: Understand the Basic Principles and Techniques Of Gas And Metal Are Welding And Apply Them In Fabricating Simple Metal Components.					
Week	**Specific Learning Outcome**	**Teacher Activities**	**Learning Resources**	**Specific Learning Objectives**	**Teacher Activities**	**Learning Resources**
9-12	3.1 Describe the equipment and explain the basic principles and application of gas and metal arc welding. 3.2 State the safety precautions to be observed and apply them in given welding situations. 3.3 Differentiate between various tool shapes and state their uses. e.g round nose rougher, fine finishing, side finishing, knife tool, form tool, parting off tool, boring tool, etc.	▪ Prepare detail notes and diagrams that will describe the equipment and explain the basic principles and application of gas and metal arc welding. ▪ Prepare diagrams of joints that the students will practice. ▪ Prepare detail notes that will state the safety precautions to be observed during welding. ▪ Assess the students.	▪ Oxygen cylinder acetylene cylinder regulations arc welding set goggles, shield electrode. ▪ Diagrams and charts of various welding joints, and techniques.	Set up and operate gas or metal arc welding equipment in given situations. Note: Equipment operation should include choice of correct nozzles or electrode. Adjustment for correct gas pressure/flame or voltage Prepare joints for welding in given situations Weld given components by arc or gas welding methods, and state safety precautions to be observed	▪ List and identify gas and metal arc welding equipment. ▪ Demonstrate the use of both gas and metal welding equipment; and all the students to practice ▪ Demonstrate to the students how to prepare joints for welding purposes ▪ Guide students to weld various	▪ Oxygen, acetylene regulators, cylinders, arc, welding equipment goggles, shield, electrodes, diagrams and charts of various welding joints

					components using both gas and arc welding processes and state safety precautions to students to practise till competent	

Assessment: Practical – 60% of overall assessment

PROGRAMME:

NATIONAL TECHNICAL CERTIFICATE IN MOTORCYCLE AND TRICYCLE ASSEMBLY, REPAIRS AND MAINTENANCE.

MODULE: CMT 111: INTRODUCTION TO WORKSHHOP TOOLS

DURATION: 120 HOURS

GOAL: This module introduces students to essential workshop tools for motorcycle and tricycle maintenance and repair. It covers tool identification, classification, and proper use, including fasteners, sealants, and seals, fitting, measuring, marking, cutting, filing, drilling, and threading tools. Emphasis is placed on safety, tool maintenance, and hands-on application in a workshop setting.

GENERAL OBJECTIVES:

On completion of this module, the trainee should be able to:

1.0 Know workshop tools used in motorcycle and tricycle workshops.

2.0 Know Fasteners, Sealants and Seals.

3.0 Know Fitting, measuring, and marking tools.

4.0 Know cutting, filling, drilling, and threading tools

PROGRAMME: NTC IN MOTORCYCLE AND TRICYCLE ASSEMBLY, REPAIRS AND MAINTENANCE					
MODULE: INTRODUCTION TO WORKSHOP TOOLS			**COURSE CODE: CMT 111**	**CONTACT HOURS:** 120	
YEAR: 1	**TERM:** 1 and 2	**PRE: REQUISITE:**	**Theoretical:** 48 Hours **Practical:** 72 Hours		
GOAL: This module introduces students to essential workshop tools for motorcycle and tricycle maintenance and repair. It covers tool identification, classification, and proper use, including fasteners, sealants, seals, fitting, measuring, marking, cutting, filing, drilling, and threading tools. Emphasis is placed on safety, tool maintenance, and hands-on application in a workshop setting.					
Theoretical Content				**Practical Content**	
GENERAL OBJECTIVE 1.0: Know workshop tools used in motorcycle and tricycle workshops					
week	**Specific Learning Outcome**	**Teacher Activities**	**Learning Resources**	**Specific Learning objectives**	**Teacher Activities**	**Learning Resources**
1	1.1 Define workshop tools 1.2 Explain the importance of workshop tools in motorcycle and tricycle repair 1.3 Classify tools a) Fasteners (bolts, nuts, screws, washers) b) Sealants and seals (gaskets, O-rings, thread sealants) c) Fitting tools	1.1 Explain workshop tools 1.2 Discuss the importance of workshop tools in motorcycle and tricycle repair 1.3 Explain classification of workshop tools: a) Fasteners (bolts, nuts, screws, washers) b) Sealants and seals (gaskets, O-rings,	Marker, white board, charts, CD, projector, relevant textbooks, Slides	1.1 Identify workshop tools and their classification. 1.2 Carry-out Safety drills and proper use of PPE. 1.3 Handle and inspect workshop tools.	1.1 Guide the students in identification and classification. 1.2 Demonstrate the proper use of safety drills and PPE. 1.3 Guide students in Handling and inspecting tools.	Complete hand tools, rivet, bolt & nut, sealant, clips, riveting gun, screws, washers, gaskets, O-rings, ruler, micrometer, vernier caliper, scriber, puncher, wrenches, hacksaws, chisels, drill bits, hand rills

	(spanners, pliers, wrenches) d) Measuring tools (vernier calipers, micrometer, rulers) e) Marking tools (scribers, punches, markers) f) Cutting tools (hacksaws, chisels, snips) g) Filing tools (flat files, round files) h) Drilling tools (hand drills, drill bits) i) Threading tools (taps, dies) 1.4 Explain basic workshop safety rules 1.5 List PPEs used in motorcycle and tricycle workshops	thread sealants) c) Fitting tools (spanners, pliers, wrenches) d) Measuring tools (vernier calipers, micrometer, rulers) e) Marking tools (scribers, punches, markers) f) Cutting tools (hacksaws, chisels, snips) g) Filing tools (flat files, round files) h) Drilling tools (hand drills, drill bits) i) Threading tools (taps, dies) 1.4 Discuss basic workshop safety rules 1.5 Discuss PPEs used				

	e.g. helmets, handgloves, shoes, google, overall	in motorcycle and tricycle workshops e.g. helmets, handgloves, shoes, google, overall				
General Objective 2.0: Know Fasteners, Sealants and Seals						
Week	**Specific Objectives**	**Teacher Activity**	**Resources**	**Specific Learning Outcomes**	**Teacher Activities**	**Resources**
2-3	2.1 Define Fasteners in motorcycles and tricycles 2.2 List types of fasteners in motorcycles and tricycles e.g. bolts, screws, nuts, washers, rivets, pins 2.3 Classify fasteners i.e. a) Threaded Fasteners (bolts, nuts, screws, studs); b) Non-Threaded Fasteners (pins, rivets, clips) 2.4 Explain the material	2.1 Describe Fasteners in motorcycles and tricycles 2.2 Discuss types of fasteners in motorcycles and tricycles e.g. bolts, screws, nuts, washers, rivets, pins 2.3 Explain fasteners i.e. a) Threaded Fasteners (bolts, nuts, screws, studs); b) Non-Threaded Fasteners (pins,	Marker, white board, charts, CD, slides, projector, relevant textbooks.	2.1 Identify different types of fasteners. 2.2 Use tools for fastener installation and removal (wrenches, spanners, torque wrenches). 2.3 Carryout tightening and loosening of bolts and nuts using appropriate tools. 2.4 Use sealant application techniques. 2.5 Apply liquid gaskets and thread sealants on mock assemblies. 2.6 Clean and prepare surfaces before sealant application. 2.7 Identify different	2.1 Guide student to identify different types of fasteners. 2.2 Demonstrate to students the use of tools for fastener installation and removal (wrenches, spanners, torque wrenches). 2.3 Guide students in Tightening and loosening bolts and nuts using appropriate tools. 2.4 Demonstrate to students sealant application techniques. 2.5 Demonstrate to students how to apply liquid gaskets	bolts, screws, nuts, washers, rivets, pins, clips, Liquid gaskets (silicone, RTV, anaerobic sealants), b) Thread sealants (Teflon tape, thread lockers), O-rings, Gaskets, Oil seals, Lip seal

	used in fastener manufacturing e.g. steel, aluminium, titanium 2.5 Explain sealants 2.6 List types of sealants; a) Liquid gaskets (silicone, RTV, anaerobic sealants), b) Thread sealants (Teflon tape, thread lockers) 2.7 Discuss the factors to consider when selecting sealants e.g. temperature, pressure, chemical resistance 2.8 Define seals and its types e.g. O-rings, Gaskets, Oil seals, Lip seal 2.9 Discuss materials used in seal Manufacturing e.g.	rivets, clips) 2.4 Discuss the material used in fastener manufacturing e.g. steel, aluminium, titanium 2.5 Describe sealants 2.6 Discuss types of sealants; a) Liquid gaskets (silicone, RTV, anaerobic sealants), b) Thread sealants (Teflon tape, thread lockers) 2.7 Explain the factors to consider when selecting sealants e.g. temperature, pressure, chemical resistance 2.8 Explain seals and		types of seals.	and thread sealants on mock assemblies. 2.6 Show students how to clean and prepare surfaces before sealant application. 2.7 Guide students in identification of different types of seals.	

	rubber, silicone, PTFE	its types e.g. O-rings, Gaskets, Oil seals, Lip seal 2.9 Describe materials used in seal Manufacturing e.g. rubber, silicone, PTFE				
	General Objective 3.0: Know Fitting, measuring, and marking tools					
Week	**Specific Objectives**	**Teacher Activity**	**Resource s**	**Specific Learning Outcomes**	**Teacher Activities**	**Resources**
4-5	3.1 Explain fitting 3.2 List Fitting tools and their uses: spanners, pliers, and wrenches. 3.3 Describe Measuring tools 3.4 List Measuring tools and their uses: vernier calipers, micrometers, and rulers. 3.5. Explain Marking out tools	3.1 Discuss fitting 3.2 Describe Fitting tools and their uses: spanners, pliers, and wrenches. 3.3 Explain Measuring tools 3.4 Identify Measuring tools and their uses: vernier calipers, micrometers, and rulers. 3.5. Discuss Marking out tools	Marker, white board, charts, CD, projector, relevant textbooks, Slides	3.1 Use fitting tools: Tightening and loosening bolts and nuts. 3.4 Measure components using vernier calipers and micrometers.	3.1Demonstrate to students the use of fitting tools: Tightening and loosening bolts and nuts. 3.4 Show student how to measure components using vernier calipers and micrometers.	scriber, pen, pencil, center punch, vernier calliper, Micrometer

	3.6 List Marking out tools and their uses: scribers and punches 3.7 Describe the techniques for accurate marking using scribers and punches	3.6 Explain Marking tools and their uses: scribers and punches 3.7 Explain the techniques for accurate marking using scribers and punches		3.7 Use scribers and punches to mark metal surfaces.	3.7 Guide students in using scribers and punches to mark metal surfaces.	
	General Objective 4.0: Know cutting, filling, drilling, and threading tools					
Week	**Specific Objectives**	**Teacher Activity**	**Resources**	**Specific Learning Outcomes**	**Teacher Activities**	**Resources**
6	4.1 Explain the importance of cutiing, filling, drilling, and threading tools in workshop operation 4.2 Explain tools and their functions: Hacksaws, chisels, files, hand drills, electric drills, taps, dies, threading machines.	4.1 Discuss the importance of cutiing, filling, drilling, and threading tools in workshop operation 4.2 Describe tools and their functions: Hacksaws, chisels, files, hand drills, electric drills, taps, dies, threading	Marker, white board, charts, CD, projector, relevant textbooks, Slides	4.1 Identify tools: Cutting tools (hacksaws, chisels), filling tools (files), drilling tools (hand drills, electric drills), and threading tools (taps, dies). 4.2 Carryout tool handling and basic operations	4.1 Guide students to identify tools: Cutting tools (hacksaws, chisels), filling tools (files), drilling tools (hand drills, electric drills), and threading tools (taps, dies). 4.2 Demonstrate tool handling and basic operation	hacksaws, chisels, snips, and cutters, flat files, round files, and half-round files, hand drills, electric drills, and drill bits, taps, dies, and threading machines

	4.3 List types of cutting tools: hacksaws, chisels, snips, and cutters. 4.4 List types of Filling tools: filling tools: flat files, round files, and half-round files. 4.5 List types of drilling tools: filling tools: hand drills, electric drills, and drill bits. 4.6 List types of threading tools: taps, dies, and threading machines	machines. 4.3 Describe types of cutting tools: hacksaws, chisels, snips, and cutters. 4.4 Describe types of Filling tools: filling tools: flat files, round files, and half-round files. 4.5 Describe types of drilling tools: filling tools: hand drills, electric drills, and drill bits. 4.6 Describe types of threading tools: taps, dies, and threading machines				

	ASSESSMENT CRITERIA			
	Coursework	Course Test 20%	Practical 60%	Other: Examination/Project 20%

PROGRAMME:

NATIONAL TECHNICAL CERTIFICATE IN MOTORCYCLE AND TRICYCLE ASSEMBLY, REPAIRS AND MAINTENANCE

MODULE: CMT 132: INTRODUCTION TO WORKSHOP TOOLS AND EQUIPMENT

DURATION: 60 Hours

GOAL: This module introduces students to the fundamental workshop equipment and special tools used in motorcycle and tricycle workshops. Students will learn the purpose, operation, and safety precautions associated with tools such as magnetic pullers, timing guns, digital tachometers, indicator testers, multimeters, magnet base plates, and valve compressors. The course combines theoretical knowledge with hands-on practical sessions to ensure students gain both understanding and proficiency

GENERAL OBJECTIVES:

On completion of this module, the trainee should be able to:

1.0 Understand the classification of tools into hand tools, power tools and special tools

2.0 Know Magnetic Puller and Magnetic Base Plate.

3.0 Know Timing gun and digital tachometer.

4.0 Know Indicator Tester, Multimeter, and valve compressor

PROGRAMME: NTC IN MOTORCYCLE AND TRICYCLE ASSEMBLY, REPAIR AND MAINTENANCE						
MODULE: INTRODUCTION TO WORKSHOP TOOLS AND EQUIPMENT				**COURSE CODE:** CMT 132		**CONTACT HOURS: 60**
YEAR: 1	**TERM:** 3	**PRE: REQUISITE:**		**Theoretical:** 24 Hours **Practical: 36** Hours		
GOAL: This module introduces students to the fundamental workshop equipment and special tools used in motorcycle and tricycle workshops. Students will learn the purpose, operation, and safety precautions associated with tools such as magnetic pullers, timing guns, digital tachometers, indicator testers, multimeters, magnet base plates, and valve compressors. The course combines theoretical knowledge with hands-on practical sessions to ensure students gain both understanding and proficiency						
Theoretical Content				**Practical Content**		
GENERAL OBJECTIVE 1.0: Understand the classification of tools into hand tools, power tools and special tools						
week	**Specific Learning Outcome**	**Teacher Activities**	**Learning Resources**	**Specific Learning objectives**	**Teacher Activities**	**Learning Resources**
1-3	1.1 Describe hand tools in motorcycle and tricycle repair and maintenance 1.2 List some common hand tools and their uses: • Wrenches (Open-end, Box-end, Adjustable, Torque) • Screwdrivers (Flathead, Phillips, Torx). • Pliers (Slip-joint, Needle-nose, Locking, Cutting) • Hammers (Ball-peen, Rubber Mallet, Claw Hammer) – • Files and Rasps. • Measuring Tools (Rulers, Calipers, Micrometers, Feeler Gauges).	1.1 Explain hand tools in motorcycle and tricycle repair and maintenance 1.2 Explain some common hand tools and their uses: • Wrenches (Open-end, Box-end, Adjustable, Torque) • Screwdrivers (Flathead, Phillips, Torx). • Pliers (Slip-joint, Needle-nose, Locking, Cutting) • Hammers (Ball-peen, Rubber Mallet, Claw Hammer) – • Files and Rasps.	Marker, white board, charts, CD, projector, relevant textbooks, Slides	1.1 Identify basic hand tools	Guide student to identify proper handling and use of selected tools in a workshop setting	Magnetic puller, timing gun, digital tachometer, indicator tester, multimeter, magnet base plate, valve compressor

	• Cutting Tools (Hacksaws, Utility Knives, Chisels) 1.3 Explain safety tips for Hand tools usage in motorcycle and tricycle repair and maintenance 1.4 Explain Power Tools motorcycle and tricycle repair and maintenance 1.5 List some common power tools and their uses: • Electric Drill and Drill Bits • Angle Grinder • Impact Wrench • Power Screwdriver • Bench Grinder. • Heat Gun. 1.6 Explain safety tip for Power tools usage in motorcycle and tricycle repair and maintenance 1.7 List Special Tools for motorcycle and tricycle repair and maintenance 1.8 List some common special tools and their uses: • Torque Wrench • Valve Spring Compressor • Piston Ring Expander and Compressor • Chain Breaker and	• Measuring Tools (Rulers, Calipers, Micrometers, Feeler Gauges). • Cutting Tools (Hacksaws, Utility Knives, Chisels) 1.3 Discuss safety tips for Hand tools usage in motorcycle and tricycle repair and maintenance 1.4 Describe Power Tools motorcycle and tricycle repair and maintenance 1.5 Explain some common power tools and their uses: • Electric Drill and Drill Bits • Angle Grinder • Impact Wrench • Power Screwdriver • Bench Grinder. • Heat Gun. 1.6 Describe safety tip for Power tools usage in motorcycle and tricycle repair and maintenance 1.7 Explain Special Tools for motorcycle and tricycle repairs and maintenance				

	Riveting Tool • Chain Breaker and Riveting Tool • Timing Light • Carburettor Synchronizer • Compression Tester 1.9 Explain safety tips for Special tools usage in motorcycle and tricycle repair and maintenance	1.8 Explain some common special tools and their uses: • Torque Wrench • Valve Spring Compressor • Piston Ring Expander and Compressor • Chain Breaker and Riveting Tool • Chain Breaker and Riveting Tool • Timing Light • Carburettor Synchronizer • Compression Tester 1.9 Describe safety tips for Special tools usage in motorcycle and tricycle repair and maintenance				
	GENERAL OBJECTIVE 2.0: Know Magnetic Puller and Magnetic Base Plate.					
Week	**Specific Learning Outcome**	**Teacher Activities**	**Learning Resources**	**Specific Learning objectives**	**Teacher Activities**	**Learning Resources**
4-8	2.1 Define Magnetic puller 2.2 Explain the importance of magnetic puller in motorcycle and tricycle repair and maintenance. 2.3 State Safety precaution when using magnetic puller in	2.1 Explain Magnetic puller 2.2 Describe the importance of magnetic puller in motorcycle and tricycle repair and maintenance. 2.3 Explain Safety precaution when using magnetic puller	Marker, white board, charts, CD, projector, relevant textbooks, Slides	2.2 Remove bearings or gears using magnetic puller	2.2 Demonstrate to students how to remove bearings or gears using magnetic puller	Magnetic Puller, Magnet Base Plate

	motorcycle and tricycle repair and maintenance. 2.4 Define Magnet base plate 2.5 Explain the uses of Magnet base plate in motorcycle and tricycle repair and maintenance. 2.6 State Safety precaution when using Magnet base plate in motorcycle and tricycle repair and maintenance.	in motorcycle and tricycle repair and maintenance. 2.4 Explain Magnet base plate 2.5 Describe the uses of Magnet base plate in motorcycle and tricycle repair and maintenance. 2.6 Explain Safety precaution when using Magnet base plate in motorcycle and tricycle repair and maintenance.		2.5 Use Magnet base plate with dial indicator in motorcycle and tricycle repair and maintenance.	2.5 Demonstrate to student how to use Magnet base plate with dial indicator.	
	GENERAL OBJECTIVE 3.0: Know Ignition Timing gun and digital tachometer.					
Week	**Specific Learning Outcome**	**Teacher Activities**	**Learning Resources**	**Specific Learning objectives**	**Teacher Activities**	**Learning Resources**
9-12	3.1 Explain Engine timing 3.2 Explain Ignition timing 3.3 Explain the functions of Timing gun in engine tuning 3.4 List the types of timing Guns (Analog and Digital)	3.1 Discuss Engine tuning 3.2 Describe Ignition timing 3.3 Describe the functions of Timing gun in engine tuning 3.4 Explain the types of timing Guns (Analog and Digital)	Marker, white board, charts, CD, projector, relevant textbooks, Slides	3.1 Use timing gun on a motorcycle engine. 3.2 Adjust ignition timing.	3.1 Demonstrate timing gun usage on a motorcycle engine. 3.2 Guide student to adjust ignition timing.	Timing Gun, Digitals Tachometer

	3.5 Explain the importance of proper ignition turning 3.6 Explain Digital Tachometer and its importance 3.7 Explain the usage of digital tachometer in diagnosing engine performance.	3.5 Discuss the importance of proper ignition turning. 3.6 Describe Tachometer and its importance 3.7 Describe the usage of digital tachometer in diagnosing engine performance.		3.7 use digital tachometer in diagnosing engine performance	3.7 guide student in using digital tachometer in diagnosing engine performance	
	GENERAL OBJECTIVE 4.0: Know Indicator Tester, Multimeter, and valve compressor					
Week	**Specific Learning Outcome**	**Teacher Activities**	**Learning Resources**	**Specific Learning objectives**	**Teacher Activities**	**Learning Resources**
	4.1 Explain Indicator Tester in motorcycle and tricycle electrical systems. 4.2 Explain how to use indicator tester to diagnose faults in Indicators and lighting system of motorcycle and tricycle 4.3 Explain the function of Multimeter 4.4 List types of Multimeter (analog & Digital)	4.1 Discuss indicator Tester in motorcycle and tricycle electrical systems. 4.2 Discuss the use of indicator tester to diagnose faults in Indicators and lighting system of motorcycle and tricycle 4.3 Describe the function of Multimeter 4.4 Discuss types of Multimeter (analog & Digital)	Marker, white board, charts, CD, projector, relevant textbooks, Slides	4.1 use indicator tester on motorcycle and tricycle indicator. 4.2 Diagnose indicator faults of motorcycle and tricycle. 4.3 Use multi-meter on motorcycle and tricycle. 4.5 Use valve compressor in	4.1 Demonstrate the use of indicator tester usage. 4.2 Guide student to diagnose indicator faults. 4.3 Guide student in the usage of multi-meter. 4.5 Guide the student to use valve compressor in	Indicator tester, multimeter, valve compressor

	4.5 Explain the function of a valve compressor in engine maintenance 4.6 State the importance of valve clearance in engine performance	4.5 Discuss the function of a valve compressor in engine maintenance 4.6 Explain the importance of valve clearance in engine performance		engine maitenance	engine maintenace.	
	ASSESSMENT CRITERIA					
	Coursework	Course Test 20%	Practical 60%	Other: Examination/Project 20%		

PROGRAMME:

NATIONAL TECHNICAL CERTIFICATE IN MOTORCYCLE AND TRICYCLE ASSEMBLY, REPAIR AND MAINTENANCE

MODULE: **CMT 113: HISTORY OF MOTORCYCLE AND TRICYCLES**

DURATION: 72 Hours

GOAL: This module provides students with a historical perspective on the development of motorcycles and tricycles, focusing on the evolution of 4-stroke and 2-stroke engines. Students will learn about key milestones, inventors, and technological advancements that have shaped the motorcycle and tricycle industry.

GENERAL OBJECTIVES:

On completion of this module, the trainee should be able to:

1. Understand the origins and early history of motorcycles and tricycles.
2. Understand the differences between 4-stroke and 2-stroke engines in terms of design and function.
3. Know technological advancements and modern applications in motorcycle/tricycle

PROGRAMME: NTC IN MOTORCYCLE AND TRICYCLE ASSEMBLY, REPAIR AND MAINTENANCE						
MODULE: HISTORY OF MOTORCYCLE AND TRICYCLES				**COURSE CODE: CMT 113**		**Contact HOURS: 72**
YEAR: 1	**TERM: 1, 2 & 3**	**PRE: REQUISITE:**		**Theoretical:** 72 Hours		
GOAL: This module provides students with a historical perspective on the development of motorcycles and tricycles, focusing on the evolution of 4-stroke and 2-stroke engines. Students will learn about key milestones, inventors, and technological advancements that have shaped the motorcycle and tricycle industry.						
Theoretical Content				**Practical Content**		
GENERAL OBJECTIVE 1.0: Understand the general layout and the working principle of an internal combustion engine						
week	**Specific Learning Outcome**	**Teacher Activities**	**Learning Resources**	**Specific Learning objectives**	**Teacher Activities**	**Learning Resources**
1-2	1.1 Explain the origins of motorcycle and tricycles 1.2 Explain early engine designs and their application 1.3 List key inventors of motorcycle/tricycle and their contributions e.g. Gottlieb Daimler, Karl Benz, and Sylvester Roper. 1.4 Explain the role of the internal combustion engine in the development of motorcycles and	1.1 Discuss the origins of motorcycle and tricycles 1.2 Describe early engine designs and their application 1.3 State key inventors of motorcycle/tricycle and their contributions e.g. Gottlieb Daimler, Karl Benz, and Sylvester Roper. 1.4 Discuss the role of the internal combustion engine in the	• White Board • CDs • Projector • Slides • Relevant textbooks, • Diagrams • Charts			

	tricycles	development of motorcycles and tricycles				
	GENERAL OBJECTIVE 2.0: Understand the differences between 4-stroke and 2-stroke engines in terms of design and function.					
3-4	2.1 Explain the working principle of 4-stroke engine 2.2 Explain the working principle of 4-stroke engine 2.3 Explain the differences between 4-stroke and 2-stroke engines 2.4 List the Advantages and disadvantages of 4 & 2 stroke engines .	2.1 Describe the working principle of 4-stroke engine 2.2 Describe the working principle of 4-stroke engine 2.3 Discuss the differences between 4-stroke and 2-stroke engines 2.4 State the Advantages and disadvantages of 4 & 2 stroke engines .	• White Board • Projector • Shoe • C.D. • Diagrams • Charts • Relevant textbooks			
5-6	**GENERAL OBJECTIVE 3.0:** Know technological advancements and modern applications in motorcycle/tricycle					
	3.1 Explain the Overview of modern advancements in motorcycle and tricycle engine technology 3.2 Explain The role of electric and hybrid engines in the future of	3.1 Discuss the overview of modern advancements in motorcycle and tricycle engine technology 3.2 Discuss the role of electric and hybrid	• White Board • Projector • Slides • C.D. • Diagrams • Charts • Relevant textbooks			

	transportation 3.3 List some modern motorcycles and tricycles using advanced engine technology 3.4 Explain the future of engine technology in motorcycles and tricycles.	engines in the future of transportation 3.3 State some modern motorcycles and tricycles using advanced engine technology 3.4 Discuss the future of engine technology in motorcycles and tricycles.				

PROGRAMME:

NATIONAL TECHNICAL CERTIFICATE IN MOTORCYCLE AND TRICYCLE ASSEMBLY, REPAIRS AND MAINTENANCE

MODULE: **CMT 214: MATERIALS AND WORKSHOP PROCESSES**

PRE-REQUISITE:

DURATION: 144 HOURS

GOAL: This module designed to provide the trainee with good knowledge of workshop tools and materials used in construction and Maintenance of motorcycle/tricycle and to enable the student carry out repairs on motorcycle/tricycle.

GENERAL OBJECTIVES:

On completion of this module, the trainee should be able to:

1.0 Know the importance of safety at workshop.

2.0 Understand the properties of different types of metals and non-metals, their uses, advantages and disadvantages.

3.0 Know the use and storage of tools used in repairs of motorcycle/tricycle equipment.

4.0 Know the use and maintenance of tools used in different types of sheet metals works.

5.0 Understand the principles and operations of Soldering, brazing, welding and forging of simple implements

PROGRAMME: NTC IN MOTORCYCLE AND TRICYCLE ASSEMBLY, REPAIR AND MAINTENANCE					
MODULE: MATERIAL AND WORKSHOP PROCESSES			**COURSE CODE:** CMT 214	**CREDIT HOURS:** 144	
YEAR: 2	**TERM:** 1 and 2	**PRE: REQUISITE:**	**Theoretical:** 44 Hours	**Practical:** 96 Hours	
GOAL: This module designed to provide the trainee with good knowledge of workshop tools and materials used in construction and Maintenance motorcycle/tricycle and to enable him carry out repairs on motorcycle/tricycle.					
Theoretical Content			**Practical Content**		
GENERAL OBJECTIVE 1.0: Know the importance of safety at workshop.					

week	**Specific Learning Outcome**	**Teacher Activities**	**Learning Resources**	**Specific Learning objectives**	**Teacher Activities**	**Learning Resources**
1-2	1.1 List safety precautions in motorcycle/tricycle workshop 1.2 List sources of hazards in the workshop e.g. handling and using hand tools, portable power tools and machine - Obstructions left on the floor and benches - Loose fitting clothing - Using inflammable or corrosive liquid or gases etc. 1.3 Explain first aid applications in case of minor injuries, electric shocks and burns.	State safety precaution in motorcycle/tricycle workshop State sources of hazards in the workshop as listed in 1.2 Describe first aid applications in case of minor injuries, electric shocks and burns. Describe artificial	• Marker • White Board • Relevant textbooks, • Projector • Slides • Diagrams • Charts	Use first-Aid application in case of minor injuries, electric shocks and burns	Guide the student to apply first-Aid in case of minor injuries, electric shocks and burns.	- Overall protective wear - Safety Boots - Hand gloves - First Aid box containing plaster, bandage, etc.

	1.4 Explain artificial respiration.	respiration.				
	GENERAL OBJECTIVE 2.0: Understand the properties of different types of metals and non-metals, their uses and their advantages and disadvantage.					
3-4	**Properties of Metals** 2.1 State the properties of metals – thermoplastic and other non-metals as used in motorcycle/tricycle equipment. 2.2 State the properties and uses of alloys. 2.3 State the advantages and disadvantages of steels and alloys. 2.4 State the causes and effects of corrosion on metals and possible preventive measures 2.5 Explain how metals are	Explain the properties of metals – thermoplastic and other non-metals as used in motorcycle/tricycle equipment. Explain the properties and uses of alloys. Explain the advantages and disadvantages of steels and alloys Explain the causes and effects of corrosion on metals and possible preventive measures. Describe how metals are	• Charts • Marker • White Board • Relevant textbooks, • Projector • Slides • Diagrams • Charts	Prevent corrosion of metals by applying protective measures such as inhibition, surface treatment and protection films Identify metals by sound test, appearance, spark test and any other quick test Identify metals by: sound test,	Guide student to carry out the following tasks; Prevent corrosion of metals by applying protective measures such as inhibition, surface treatment and protection films Guide students to identify metals by sound	- Different types of metals such as: round bar etc. - Different alloy materials - Disc ridger - First aid box - Pipes - Benders - Vices - Measuring tapes - Marker - French curves

	identified using the following test: appearance, spark test and sound test. 2.6 Explain cold and hot working operations of metals e.g. bending, twisting and straightening. 2.7 Describe the heat treatment of metals e.g. annealing of aluminum and case hardening of low carbon (mild) steel hardening, tempering normalizing of carbon steel.	identified using test as in 2.5 Describe cold and hot working operations of metals e.g. bending, twisting and straightening. Explain the process of heat treatment of metals.		appearance, and spark test Carryout cold and hot working operations on metals e.g. bending, twisting and straightening. Carry out heat treatment of metals e.g. annealing of aluminum and case hardening of low carbon (mild) steel, hardening, tempering Normalizing of carbon steel.	test, appearance, and spark test Guide the students to carryout cold and hot working operations on metals e.g. bending, twisting and straightening. Guide students to carry out heat treatment of metals e.g. annealing of aluminum and case hardening of low carbon (mild) steel, hardening, tempering Normalizing of carbon steel.	
	GENERAL OBJECTIVE 3.0: Know the use and storage of tools used for the repairs of motorcycle/tricycle equipment					
5-6	3.1 Explain the use and maintenance of common tools like spanners, screw driver, drills, reamers, taps	Describe the various tools used and their maintenance.	• Tool rack • Charts • Marker • White Board • Relevant	Use and maintain common tools like spanners, screw driver, drills,	Guide student to carry out the following tasks; Use and maintain	Tool boxes measuring instruments like steel roll, calipers,

	and dies, files, saws, chisels, taps and pinches used for typical repair and maintenance work.		textbooks, • Projector • Slides • Diagrams • Charts	reamers, taps and dies, files, saws, chisels, taps and pinches used for typical repair and maintenance work.	common tools like spanners, screw driver, drills, reamers, taps and dies, files, saws, chisels, taps and pinches used for typical repair and maintenance work.	dividers, square, straight edge, promotorcycl e/tricycles, angle gauge, thickness gauge and micro meter. pullers, hydraulic press, different types of jacking and lifting equipment cranes, hydraulic jack, hoists and slings.
	3.2 Discuss the maintenance of measuring instruments like steel roll, calipers, dividers, square, straight edge, promotorcycle/tricycles, angle gauge, thickness gauge and micro meter.	State the importance of maintenance of measuring instruments		Demonstrate how to maintain measuring instruments like steel roll, calipers, dividers, square, straight edge, promotorcycle/tricyc les, angle gauge, thickness gauge and micro meter.	Guide the students how to maintain measuring instruments like steel roll, calipers, dividers, square, straight edge, promotorcycle/tr icycles, angle gauge, thickness gauge and micro meter.	
	3.3 Discuss the maintenance of pullers, hydraulic press, different types of jacking and lifting equipment cranes, hydraulic jack, hoists and slings.	State the importance maintenance of pullers, hydraulic press, different types of jacking and lifting equipment cranes, hydraulic jack, hoists and		Demonstrate how to maintain pullers, hydraulic press, different types of jacking and lifting equipment cranes,	Guide the students how to maintain pullers, hydraulic press, different types of jacking and lifting	

		slings.		hydraulic jack, hoists and slings.	equipment cranes, hydraulic jack, hoists and slings.	
	GENERAL OBJECTIVE 4.0: Know the use and maintenance of tools used in different types of sheet metal works					
7-9	**Sheet metal work:** 4.1 State the use and maintenance of various types of sheet metals e.g. brass sheets, copper sheets, aluminum sheets etc. 4.2 State the use and maintenance of sheet metal tools, e.g. mallet, snipes, grovers, lappers, swages, hammer, riveting tools etc. 4.3 Explain the preparation of sheet metals for welding, soldering, riveting, etc.	Explain the uses and maintenance of the various metals in 4.1 Explain the use and maintenance of sheet metal tools. Describe the preparation of sheet metals for welding, soldering, riveting, etc.	• Marker • White Board • Projector • Slides • Diagrams • Charts • Relevant textbooks	Demonstrate how to use and maintain various types of sheet metals e.g. brass sheets, copper sheets, aluminum sheets etc. Demonstrate how to maintain sheet metal tools, e.g. mallet, snipes, grovers, lappers, swages, hammer, riveting tools etc. Prepare sheet metals for welding, soldering, riveting, etc.	Guide student to identify, use and maintain various types of sheet metals e.g. brass sheets, copper sheets, aluminum sheets etc. Guide students to demonstrate how to maintain sheet metal tools, e.g. mallet, snipes, grovels, lappers, swages, hammer, riveting tools etc. Guide students prepare sheet metals for welding, soldering, riveting,	- Sheet Metals e.g. brass, copper aluminum - Waste cloth - Hammers - Riveting machine mallet, snipes, grovers, lappers, swages, hammer, riveting tools etc.

	4.4 Describe the construction of simple items such as guards and trays from, sheet materials.	Explain the construction of simple items such as guards and trays from, sheet materials.		Construct simple items such as guards and trays from, sheet materials.	etc. Guide students to construct simple items such as guards and trays from, sheet materials.	
	GENERAL OBJECTIVE 5.0: Understand the principles and operations of Soldering, brazing, welding and forging of simple implements					
10-12	5.1 Outline different types of soldering iron; including electrical solders, brazing rods and welding rods fluxes in common use in mechanical and electrical work 5.2 Describe the setup of welding equipment including selecting gas pressure and nozzle sizes for welds of different types of metals.	5.1 Explain the different types of soldering iron. 5.2 Explain the setting up of welding equipment.	• Marker • Slides • Diagrams • White Board • Projector • Charts • Relevant textbooks	Identify the different types of soldering iron; including electrical solders, brazing rods and welding rods fluxes in common use in mechanical and electrical work. Set up welding equipment including selecting gas pressure and nozzle sizes for welds of different types of metals	Guide students to identify different types of soldering iron; including electrical solders, brazing rods and welding rods fluxes in common use in mechanical and electrical work. Guide students to set up welding equipment including selecting gas pressure and nozzle sizes for	- Manual arc welding machine Electrodes - AC, DC welding machine - Oxy-acetylene, welding cylinder and regulators Forging tools

					welds of different types of metals	
	5.3 State the basic principle of oxyacetylene welding including the chemistry of the manufacture of acetylene and oxygen gases.	5.3 Explain the basic principle of oxyacetylene welding				
	5.4 Explain the use of bronze welding for repair work and build worn parts.	5.4 Describe the use of bronze welding for repair work and build worn parts.		Use bronze welding for repair work and build worn parts	Guide students to use bronze welding for repair work and build worn parts	
	5.5 Explain the use of oxy-acetylene flame to cut metal.	5.5 Describe the use of oxy-acetylene flame to cut metal.		Use oxy-acetylene flame to cut metal Carry out common welding of mild steel cast etc.	Guide students to use oxy-acetylene flame to cut metals	
	5.6 Explain the principle of setting voltage in arc welding.	5.6 Discuss the principle of setting voltage in arc welding.		Carry out arc welding voltage and current setting of arc welding.	Guide students to carryout arc welding voltage and current setting.	
	5.7 Describe the common welding of mild steel cast etc.	5.7 Explain common welding of mild steel cast etc.		Carryout common welding of mild steel cast	Guide students to carry out common welding of mild steel cast etc.	

	5.8 State the effect of inadequate penetrating slag inclusion when welding and be able to correct it. 5.9 Differentiate between AC and DC welding systems and be able to apply them safely 5.10 State the advantages and disadvantages of oxy-acetylene welding process on motorcycle/tricycle repairs. 5.11 Explain the application of hard surfacing rod by oxy-acetylene arc process for filling worn part and surface. 5.12 Explain forging tools	5.8 Explain the effect of inadequate penetrating slag inclusion when welding. 5.9 Explain between AC and DC welding systems 5.10 Explain the advantages and disadvantages of oxy-acetylene welding process on motorcycle/tricycle repairs. 5.11 Describe the application of hard surfacing rod by oxy-acetylene arc process for filling worn part and surface. 5.12 Describe forging tools		Identify AC and DC welding systems safely. Apply hard surfacing rod by oxy-acetylene arc process for filling worn part and surface. Identify forging tools.	Guide students to identify AC and DC welding systems safely. Guide students to apply hard surfacing rod by oxy-acetylene arc process for filling worn part and surface. Guide students to identify forging tools.	
	ASSESSMENT CRITERIA					
	Coursework	Course Test	Practical	Other: Examination/Project		

PROGRAMME:

NATIONAL TECHNICAL CERTIFICATE IN MOTORCYCLE/TRICYCLE EQUIPMENT AND IMPLEMENT MECHANICS WORK CRAFT PRACTICE.

MODULE: **CMT 235: MACHINING**

DURATION: 72 HOURS

PRE-REQUISITE:

GOAL: This module is designed to provide the trainee with the relevant knowledge and skills to use machines and tools in metal cutting and shaping operation.

GENERAL OBJECTIVES:

On completion of this module, the trainee should be able to:

1.0 Know the tools and machinery used in metal shaping.

2.0 Understand the principles of metal shaping and chip formation.

3.0 Understand the maintenance of machine tools.

PROGRAMME: NTC IN MOTORCYCLE AND TRICYCLE ASSEMBLY, REPAIR AND MAINTENANCE					
MODULE: MACHINING			**COURSE CODE:** CMT 235		**CONTACT HOURS:** 144
YEAR: 2	**TERM:** 3	**PRE: REQUISITE:**	**Theoretical:** 24 Hours		**Practical:** 48 Hours
GOAL: This module is designed to provide the trainee with the relevant knowledge and skills to use machines and tools in metal cutting and shaping operation.					
Theoretical Content			**Practical Content**		
GENERAL OBJECTIVE 1.0: Know the tools and machinery used in metal shaping.					

Week	Specific Learning Outcome	Teachers Activities	Learning Resources	Specific Learning objectives	Teachers Activities	Learning Resources
1-3	1.1 List the machines used in metal shaping operation e.g. lathe, grinding machine, power sawing machine, drilling and milling machines. 1.2 List the tools used in metal shaping operation e.g. files hacksaw, punches, hand drills etc. 1.3 Explain the operational features of the machines and tools used in metal shaping.	Explain the machines and tools used in metal shaping operation. Explain how to use of the machines and tools in 1.1 and 1.2. Discuss the operational features of the machines and tools in 1.1 and 1.2.	Marker, white board, charts, CD, multi-media reassures, slides, projector, relevant textbooks, Slides Tools box, Trolley jack	Identify machining tools; lathe, grinding machine, power sawing machine, drilling and milling machines. Identify types of common hand machine tools e.g. files hacksaw, punches, hand drills etc.	Guide student to identify the machines and tools for metal shaping operations. Guide student to use machines to carry out shaping operations.	lathe, grinding machine, power sawing machine, drilling and milling machines. files hacksaw, punches, hand drills etc.

	1.4 State the use of the machines and tools listed in 1.1 and 1.2.	Explain the use of the machine and tools listed in 1.1 and 1.2				
	GENERAL OBJECTIVE 2.0: Understand the principles of metal shaping and chip formation.					
Week	**Specific Learning Outcome**	**Teacher Activities**	**Learning Resources**	**Specific Learning objectives**	**Teacher Activities**	**Learning Resources**
4-8	**Metal shaping:** 2.1 Explain the principle of metal cutting. 2.2 Explain the principle of metal shaping and chip formation. 2.3 Explain the use of different types of machining tools in metal shaping, e.g. lathe, grinding machine, power sawing machine, drilling and milling machines. 2.4 Explain the use of different types of common hand machine tools in metal shaping e.g. files hacksaw, punches, hand drills etc.	Discuss the principle of metal cutting Discuss the principle of metal shaping and chip formation. Describe the use of different types of machining tools Describe the use of different types of common hand machine tools	Marker, white board, charts, CD, slides, projector, relevant textbooks, various types of metal shaping (cutting, drilling, boring, grinding, milling and turning), files hacksaw, punches, hand drills	Use the different types of machining tools. Use different types of common hand machine tools.	Guide student in the usage of different types of machine tools Guide students in the usage of different types of machine tools.	Marking Tools: Steel rule, Calliper, 'V' Block, Scriber, Surface Plate, Surface Gauge, Angle Plate, files hacksaw, punches, hand drills Chisel, Bench vice, Hammer, Vernier Calliper, Coolant/Lubricants, Lathe machine, Power saw etc.,

	2.5 State the different cutting speed and feed for different metal on a lathe machine. 2.6 Explain the planning of a machine related job. 2.7 Describe the operation of lathe machine and power saw.	Explain the different cutting speed and feed for different metal on a lathe machine. Describe the planning of machine related operation. Explain the operation of lathe machine and power saw.		Carryout cutting on a lathe machine for different metals Carryout plan for a machine related job Operate the lathe machine and power saw.	Guide the students to carryout cutting on a lathe machine for different metals Guide students to plan for a machine related job Guide students to operate the lathe and power saw.	
	General Objective 3.0: Understand the maintenance of machine tools.					
Week	**Specific Learning Outcome**	**Teacher Activities**	**Learning Resources**	**Specific Learning objectives**	**Teacher Activities**	**Learning Resources**
9-12	3.1 State the principle of maintenance and repairs of machine tools. 3.2 Explain the handling and	Explain the principle of maintenance and repairs of machine tools Describe the handling and	Marker, white board, charts, CD, multi-media reassures, slides, projector, relevant textbooks, Slides Tools box,	Identify the various	Guide student how to identify	Tools box, Trolley jack, Waste Cloth, Lubricants,

	maintenance of machine tools 3.3 Explain the handling and maintenance of lathe machine	maintenance of machine tools. Describe the handling and maintenance of lathe machine.	Trolley jack	way of handling machine tools Carryout repairs and maintenance of lathe machine	the various ways of handling machine tools Guide students to carryout repairs and maintenance of lathe machine	

	ASSESSMENT CRITERIA			
	Coursework	Course Test 20%	Practical 60%	Other: Examination/Project 20%

PROGRAMME:

NATIONAL TECHNICAL CERTIFICATE IN MOTORCYCLE AND TRICYCLE ASSEMBLY, REPAIR AND MAINTENANCE.

MODULE: **CMT 216: SUSPENSION, STEERING AND BRAKE SYSTEMS**

DURATION: 216 HOURS

GOAL: This module introduces students to essential workshop tools for motorcycle and tricycle maintenance and repair. It covers tool identification, classification, and proper use, including fasteners, sealants, seals, fitting, measuring, marking, cutting, filing, drilling, and threading tools. Emphasis is placed on safety, tool maintenance, and hands-on application in a workshop setting.

GENERAL OBJECTIVES:

On completion of this module, the trainee should be able to:

1.0 Understand the layout of chassis in relation to fixing of suspension and steering

2.0 Understand the basic principle of steering construction

3.0 Understand the Functions of The Component's Parts in Hydraulic and Mechanical Brakes

PROGRAMME: NTC IN MOTORCYCLE AND TRICYCLE ASSEMBLY, REPAIR AND MAINTENANCE						
MODULE: SUSPENSION, STEERING AND BRAKE SYSTEMS				**COURSE CODE: CMT 2**		**CONTACT HOURS: 216**
YEAR: 2	**TERM:** 1, 2 & 3	**PRE: REQUISITE:**	**Theoretical: 72** Hours **Practical: 144** Hours			
GOAL: This module introduces students to essential workshop tools for motorcycle and tricycle maintenance and repair. It covers tool identification, classification, and proper use, including fasteners, sealants, seals, fitting, measuring, marking, cutting, filing, drilling, and threading tools. Emphasis is placed on safety, tool maintenance, and hands-on application in a workshop setting.						
Theoretical Content				**Practical Content**		
GENERAL OBJECTIVE 1.0: Understand the layout of chassis in relation to fixing of suspension and steering						
Week	**Specific Learning Outcome**	**Teacher Activities**	**Learning Resources**	**Specific Learning Objectives**	**Teacher Activities**	**Learning Resources**
1	1.1 Explain chassis layout and its types. 1.2 State various types of suspension system 1.3 State the basic working principles of various types of suspension system	1.1 Discuss chassis layout and its types. 1.2 Discuss various types of suspension system 1.3 Explain the basic working principles of various types of suspension system,	Marker, white board, charts, CD, projector, relevant textbooks, Slides	Use sketches to identify chassis layout Identify various types of suspension systems	Guide students to sketch chassis layout Guide student to identify various types of suspension system	Leaf spring, Dampers, Coil Spring, Laminated Spring, Torsion bar, independent Front Suspension, Independent Rear Suspension, Complete tool box, Spring compressor Spring grip, Suspension testing, equipment Wheel balancer,

						Tie rod end, Ball joint puller.
General Objective 2.0: Understand the basic principle of steering construction						
Week	**Specific Objectives**	**Teacher Activity**	**Resources**	**Specific Learning Outcomes**	**Teacher Activities**	**Resources**
2-3	2.1 State the principles of steering construction in a motorcycle/tricycle 2.2 State "ACKERMANN" Principle in relation teering linkage 2.3 Explain steering geometry 2.4Explain steering faults and likely remedies.	2.1 Explain the function and mechanism of the steering system of motorcycle/tricycle 2.2 Explain "ACKERMANN" Principle in relation to steering linkage 2.3discuse steering geometry 2.4 describe Steering faults and its likely remedies	Marker, white board, charts, CD, slides, projector, relevant textbooks.	Identify the steering gear layout of: a. beam type b. Independent front suspension Identify steering geometry. Identify steering fault and possible remedies	Guide students to identify the steering gear layout of: beam type, and independent type Guide student to identify steering geometry 2.4 Guide the student to identify steering fault and possible remedies.	Front wheel Alignment Gauge, Engineering drawing equipment, Wheel alignment gauge, Camber gauge, Castor gauge, Steering angle meter, Complete tool box, Special tools; Power steering testing equipment, Steering wheel lock
General Objective 3.0: Understand the Functions of The Component's Parts in Hydraulic and Mechanical Brakes						
Week	**Specific Objectives**	**Teacher Activity**	**Resource s**	**Specific Learning Outcomes**	**Teacher Activities**	**Resources**
	3.1 State the various types of brake systems	3.1 explain the various types' brakes system.	Marker, white	3.1 Draw the Conventional brake	3.1 Guide them to draw the conventional brake	Decelerometer, Tyres, Pressure gauge, Brake

	3.2 Explain the basic concept of friction and its applications on braking system 3.4 Explain the factors that affects brake efficiency	3.2 Discuss the basic concept of friction and its application on braking system 3.4 Discuss the factors that affects brake efficiency	board, charts, CD, slides, projector, relevant textbooks.	system. 3.2 Identify the components of hydraulic brake systems. 3.4 Inspect brake system components for leakages, wear and tear.	system 3.2 Guide students in identify Hydraulic brake system component. 3.4 Demonstrate to students how to inspect for leakage, wear and tear.	fluid, DOT meter, Complete tool box, Special tool box, Engineering drawing equipment, Brake testing equipment, Brake spring pliers, Brake drum adjustment tool

	ASSESSMENT CRITERIA			
	Coursework	Course Test 20%	Practical 60%	Other: Examination/Project 20%

PROGRAMME:

NATIONAL TECHNICAL CERTIFICATE IN MOTORCYCLE/ TRICYCLE EQUIPMENT AND IMPLEMENT MECHANICS CRAFT WORK.

MODULE: **CMT 227: AUTO ELECTRICITY**

DURATION: 144 HOURS

GOAL: This module is designed to provide the trainee with a relevant knowledge of motorcycle/tricycle Auto Electricity to enable him understand, operate and carry out minor repairs on motorcycle/tricycle electrical system

GENERAL OBJECTIVES:

On completion of this module, the trainee should be able to:

1.0 Understand the layout of electrical system of a motorcycle/tricycle

2.0 Understand the theory of cell batteries; their construction and maintenance.

3.0 Know the starting circuit and identify different types of starter motors.

4.0 Understand the working principles of the charging system.

5.0 Understand the working principle of the conventional ignition system.

PROGRAMME: NTC IN MOTORCYCLE AND TRICYCLE ASSEMBLY, REPAIR AND MAINTENANCE						
MODULE: AUTO ELECTRICITY			**COURSE CODE:** CM 21		**CONTACT HOURS:** 144	
YEAR: 2	**TERM:** 2 and 3	**PRE: REQUISITE:**	**Theoretical:** 48 Hours		**Practical:** 96 Hours	
GOAL: This module is designed to provide the trainee with a relevant knowledge of vehicle/Motorcycle/tricycle Auto Electricity to enable him understand, operate and carry out minor repairs on vehicle/Motorcycle/tricycle electrical system						
Theoretical Content				**Practical Content**		
GENERAL OBJECTIVE 1.0: Understand the layout of electrical system of a motorcycle/tricycle.						
Week	**Specific Learning Outcome**	**Teacher Activities**	**Learning Resources**	**Specific Learning objectives**	**Teacher Activities**	**Learning Resources**
1	1.1 Define layout of electrical system 1.2 List the electrical system components of a motorcycle/tricycle 1.3 Explain the functions of the components listed in 1.2 above	Explain electrical system layout Describe the electrical system components of a motorcycle/tricycle Discuss the functions of the components listed in 1.2 above	Marker, white board, charts, CD, slides, projector, relevant textbooks			
	General Objective 2.0: Understand the theory of cell batteries; their construction and maintenance					
Week	**Specific Learning Outcome**	**Teacher Activities**	**Learning Resources**	**Specific Learning objectives**	**Teacher Activities**	**Learning Resources**
2-4	**Battery:** 2.1 Define cell battery 2.2 Explain battery terminal maintenance 2.3 Differential between battery terminals	Explain cell battery Describe battery terminal maintenance Explain the differences between battery terminals	Marker, white board, charts, CD, slides, projector, relevant textbooks, Dry and wet batteries,	Carryout battery terminal maintenance Identify battery terminals	Guide the student to carryout battery terminal maintenance Guide students to identify battery terminals	Dry and wet batteries, Electrolyte, Hydrometer, Battery charger

	2.4 Explain the ratio of electrolyte mixture and fill into the battery 2.5 Explain the construction of a battery. 2.6 Explain how to test specific gravity and voltage of a battery. 2.7 Explain the process of charging battery system 2.8 Explain the process of battery storage.	Discuss the ratio of electrolyte mixture and fill into the battery Describe the construction of a battery. Describe how to test specific gravity and voltage of a battery Discuss the process of charging battery system Describe the process of battery storage.	Electrolyte, Hydrometer, Battery charger	Mix recommended electrolyte in proportion Carryout battery construction Carryout battery specific gravity and voltage test Carryout the process of battery charging Carry out battery storage	Guide student to mix electrolyte in proportion Guide students to carryout battery construction Guide students to carryout battery specific gravity and voltage test Demonstrate to students the process of battery charging Guide the students to carryout battery storage	
	General Objective 3.0 Know the starting circuit and identify different types of starter motors					
Week	**Specific Learning Outcome**	**Teacher Activities**	**Learning Resources**	**Specific Learning Objectives**	**Teacher Activities**	**Learning Resources**
5-8	**Starting system:** 3.1 List the components of a starter motor. 3.2 Explain the process of trouble	Explain the components of a starter motor Describe the process of	Marker, white board, charts, CD, slides, projector,	Identify the components of a starter motor Carryout trouble	Guide student **to** identify starter motor Guide students to	Dry and wet batteries, Starter

	shooting of solenoid, armature, field winding and bendix drive. 3.3 Explain simple electric wiring circuits 3.4 Explain the process of dismantling, service and assembling of a starter motor	trouble shooting of solenoid, armature, field winding and bendix drive. Describe simple electric wiring circuits Describe the process of dismantling, service and assembling of a starter motor	relevant textbooks, Dry and wet batteries, Starter,	shooting of solenoid, armature, field winding and Bendix drive Sketch simple electrical wiring circuit Carryout starter motor servicing	carryout trouble shooting of solenoid, armature, field winding and Bendix drive Demonstrate student how to sketch electrical wiring circuit Guide students to carryout starter motor servicing	
	General Objective 4.0: Understand the working principles of the charging system.					
Week	**Specific Objectives**	**Teacher Activity**	**Resources**	**Specific Learning Outcomes**	**Teacher Activities**	**Resources**
9-10	**Generator and Regulars:** 4.1 Differentiate between alternators and dynamos 4.2 List the components of alternators and dynamos (brushes, field winding armature, commutators). 4.3 Explain the process of trouble	Explain differences between alternators and dynamos Explain the components of alternators and dynamos (brushes, field winding armature, commutators). Desribe the process of trouble shooting on	Marker, white board, charts, CD, slides, projector, relevant textbooks, alternators and dynamos voltage regulator	Identify alternators and dynamos Students should be able to: Identify the various components of alternator and dynamos Carryout trouble shooting on alternator and dynamos	Guide student to identify alternators and dynamos Guide students to identify the various components of alternator and dynamos Guide students to carryout trouble shooting on	Alternators and dynamos voltage regulator

	shooting on alternators and dynamos 4.4 Explain the process minor repairs on alternators and dynamos (Rectify or replace cut out relays and voltage regulators).	alternators and dynamos Describe the process minor repairs on alternators and dynamos (Rectify or replace cut out relays and voltage regulators).		Carryout the process minor repairs on alternators and dynamos (Rectify or replace cut out relays and voltage regulators).	alternator and dynamos Guide students to carry out the process minor repairs on alternators and dynamos (Rectify or replace cut out relays and voltage regulators).	
	General Objective 5.0: Understand the working principle of the conventional ignition system.					
Week	**Specific Objectives**	**Teacher Activity**	**Resources**	**Specific Learning Outcomes**	**Teacher Activities**	**Resources**
11-12	5.1 Explain the ignition system of 2-stroke CI engine 5.2 Explain the operation of ignition coil, and spark plugs 5.3 Explain trouble shooting process on the ignition coil.	Describe the ignition system of 2-stroke CI engine Describe the operation of ignition coil, and spark plugs. Describe trouble shooting process on the ignition circuit.	Marker, white board, charts, CD, slides, projector, relevant textbooks, voltage regulator	Students should be able to: Conduct Trouble shooting on the ignition circuit.	Guide student to: Conduct Trouble shooting on the ignition circuit.	Electrical system of a motorcycle/tricycle/vehicle

ASSESSMENT CRITERIA

Coursework	Course Test 20%	Practical 60%	Other: Examination/Project 20%

PROGRAMME:

NATIONAL TECHNICAL CERTIFICATE IN MOTORCYCLE AND TRICYCLE ASSEMBLY, REPAIR AND MAINTENANCE

MODULE: **CMT 318: INTERNAL COMBUSTION ENGINES**

DURATION: 216 Hours

GOAL: This module provides students with a comprehensive understanding of internal combustion engines (ICE), focusing on their working principles, components, and applications in motorcycles and tricycles.

GENERAL OBJECTIVES:

On completion of this module, the trainee should be able to:

1.0 Understand the working principles of an internal combustion engine.

2.0 Understand the working principles of fuel system (S.I)

3.0 Understand the basic working principles of carburetor

4.0 Understand the basic working principles of cooling system

5.0 Understand the working principles of the lubrication system

PROGRAMME: NTC IN MOTORCYCLE AND TRICYCLE ASSEMBLY, REPAIR AND MAINTENANCE				
MODULE: INTERNAL COMBUSTION ENGINES			**COURSE CODE: CMT 318**	**Contact HOURS: 216**
YEAR: 2	**TERM:** 1, 2 and 3	**PRE: REQUISITE:**	**Theoretical:** 72 Hours **Practical:** 144 Hours	
GOAL: This module is designed to provide the trainee with relevant knowledge of the components of a power unit e.g. engine components, carburetor/injector fuel System, cooling system and lubricating system to enable the trainer dissemble, repair and assemble them correctly.				
Theoretical Content			**Practical Content**	
GENERAL OBJECTIVE 1.0: Understand the working principle of an internal combustion engine				

week	**Specific Learning Outcome**	**Teacher Activities**	**Learning Resources**	**Specific Learning objectives**	**Teacher Activities**	**Learning Resources**
1-2	**1.1** Define internal combustion 1.2 List the material and component of an internal combustion 1.3 State reasons for the choice of materials listed in 1.2 above 1.4 Define the following terms - Two Stroke cycle Engine - Four Stroke cycle Engine 1.5 Explain the working principle of two strokes cycle engine. 1.6 Explain the working	Explain internal combustion Explain the material and component of an internal combustion engine Discuss reasons for the choice of materials listed in 1.2 above Explain the following terms - Two Stroke cycle Engine - Four Stroke cycle Engine Discuss the working	White Board, CDs, Projector, Slides, Relevant textbooks, Diagrams, • Charts	Identify the component of internal combustion	Guide students how to identify the component of internal combustion	- Workshop Tools - Spanners - Valves - Complete Engine - Gaskets - Grease moil - Valve refacer - grinding paste - fuel - waste cloth

	principle of four Stroke cycle engine 1.7 Differentiate between two stroke cycle engine and four stroke cycle engine 1.8 Explain C.I engine compression ratio	principle of two Stroke cycle engine Discuss the working principle of four Stroke cycle engine Explain the difference between two stroke cycle engine and four stroke cycle engine Discuss C.I engine compression ratio		Identify two stroke and four stroke cycle engine	Guide student how to identify two stroke and four stroke cycle engine	
	GENERAL OBJECTIVE 2.0: Understand the working principles of fuel system Spark Ignition (S.I) engine					
3-4	2.1 List the various components of fuel system (S.I) engine 2.2 State the various components of fuel system (S.I) engine on motorcycle and tricycle. 2.3 Explain the working principle of the fuel pump, fuel lines, filters, and injectors,	Explain the various components of fuel system (S.I) engine Explain the various components of fuel system (S.I) engine on the motorcycle and tricycle Discuss the working principle of fuel pump, fuel lines, filters, and injectors,	• White Board • Projector • Shoe • C.D. • Diagrams • Charts • Relevant textbooks	Identify the component of spark ignition (S.I) engine Identify the components Of fuel system of (S.I) engine	Guide student to identify the component part of (S.I) engine Guide students to identify the components of fuel system of (S.I) engine	- Liquid flush - Injector Tester - Petrol - Fuel Filter - Engine with a functioning lift pump - Fuel system parts - Tools for carrying out repairs e.g. spanners, screw drivers, injector tester - Fuel gauges - fuel filters

5-6	**GENERAL OBJECTIVE 3.0: Understand the basic working principles of carburetor**					
	3.1 Define carburetor 3.2 Explain the working principle of carburetor 3.3 Describe the different designs of carburetors e.g., solex, zenith, sill Carburetors, etc. 3.4 Define variable and fixed choke carburetors 3.5 Differentiate between variable and fixed choke carburetors, 3.6 Explain the functions of diaphragm in a carburetor	3.1 Explain carburetor 3.2 Discuss the working principle of carburetor 3.3 Explain different designs of carburetors e.g., solex, zenith, S.U carburetors, etc. 3.4 Explain variable and fixed choke carburetors 3.5 Discuss the difference between variable and fixed choke carburetors, 3.6 Discuss the functions of diaphragm in a carburetor	• White Board • Projector • Slides • C.D. • Diagrams • Charts • Relevant textbooks			- Screw Drivers - Spanners - Ring Spanners
	GENERAL OBJECTIVE 4.0: Understand the basic working principles of cooling system					
9-10	4.1 Define the cooling system	4.1 Explain the cooling system	• White Board • Projector			- Holes - Thermostat - Liquid Flush

	4.2 Explain the working principles of motorcycle/tricycle cooling system 4.3 Explain the functions of pressure cap	Discuss the working principles of motorcycle/tricycle cooling system 4.3 Discuss the functions of pressure cap	• Slides • C.D. • Diagrams • Charts • Relevant textbooks			- Soldering iron - Lead
	GENERAL OBJECTIVE 5.0: Understand the working principles of the lubrication system					
11-12	5.1 Define the lubrication system of a motorcycle/tricycle 5.2 State different types of lubricating systems e.g., splash, pump, squash and mix 5.3 Define lubricating oil filters 5.4 State different types of lubricating oil filters 5.5 Explain the effects of oil viscosity on lubrication	Discuss the lubrication system of a motorcycle/tricycle Explain the different types of lubricating system e.g., splash, pump, squash and mix Explain lubricating oil filters Explain different types of lubricating oil filters	• White Board • Projector • Slides • C.D. • Diagrams • Charts • Relevant textbooks			- Oil filters - Hose - Graded oil

	5.6 State the various types of oil and their viscosities 5.7 State the factors affecting oil deterioration – long usage contaminants, etc.	Discuss the effects of oil viscosity on lubrication Explain the various types of oil and their viscosities Discuss the factors affecting oil deterioration – long usage contaminants, etc.				
	ASSESSMENT CRITERIA					
	Coursework	Course Test 20%	Practical 60%	Other: Examination/Project 20%		

PROGRAMME:

NATIONAL TECHNICAL CERTIFICATE IN MOTORCYCLE AND TRICYCLE ASSEMBLY, REPAIR AND MAINTENANCE

MODULE: **CMT 319: TRANSMISSION SYSTEM**

DURATION: 216 HOURS

PRE-REQUISITE:

GOAL: This module is aimed at providing the trainee with the relevant knowledge of motorcycle/tricycle and automobile transmission systems to enable him maintain any motorcycle/tricycle transmission system.

GENERAL OBJECTIVES:

On completion of this module, the trainee should be able to:

1.0 Understand the working principles of clutches and its repair.

2.0 Understand the working principles of transmission drives

3.0 Understand the function and working principles of bearings in a transmission system.

4.0 Know the types of seals used on motorcycles and tricycles.

PROGRAMME: NTC IN MOTORCYCLE AND TRICYCLE ASSEMBLY, REPAIR AND MAINTENANCE					
MODULE: TRANSMISSION SYSTEM			**COURSE CODE:** CMT319		**CONTACT HOURS: 216**
YEAR:	**TERM**	**PRE: REQUISITE:**	**Theoretical: 72** Hours	**Practical:** 144 Hours	
GOAL: This module is aimed at providing the trainee with the relevant knowledge of motorcycle/tricycle and automobile transmission systems to enable him maintain any motorcycle/tricycle transmission system.					
Theoretical Content			**Practical Content**		
GENERAL OBJECTIVE 1.0: Understand the working principles of clutches and its repair.					

Week	**Specific Learning Outcome**	**Teacher Activities**	**Learning Resources**	**Specific Learning objectives**	**Teacher Activities**	**Learning Resources**
1-2	1.1 Explain the principles of clutch operation. 1.2 Describe the following; spring pressure and spring compression 1.3 Explain clutch assembly 1.4 List different types of clutches 1.5 Describe	Discuss the principles of clutch operation. Explain spring pressure and spring compression. Describe clutch assembly. Explain different types of clutches Explain the diagram of clutch components	• Charts • White Board • Slides • Drawings • Projector • Markers • Multimedia	Setup clutch assemble • Set spring pressure and test compression of spring. Identify different types of clutches Make simple sketch of clutch diagram	Guide students in setting up clutch assemble Remove clutch assembly Guide students to identify different types of clutches Guide student to make a simple sketch of clutch	- Clutch Assembly - Motorcycle/tricycle with good transmission system - Complete clutch assembly - Different clutch type - Clutch test bench - Clutch jig

	diagram of clutch components				diagram	
	GENERAL OBJECTIVE 2.0: Understand the working principles of transmission drives					
3-4	2.1 Define transmission system 2.2 List different types of transmission drives of motorcycle/tricycle 2.3 Explain the adjustment of transmission drives	Explain transmission system Explain the different types of transmission drives Describe the adjustment of transmission drives	• Charts • White Board • Slides • Drawings • Projector • Markers • Filler Gauges • Mallet • Soft Hammer • Grease • Oil (SAE 50) • Gear box manual • Gasket • Gasket Marker (gum) • Seals	Identify different types of drives: tabular and solid shaft, universal joints, hubs and driving flanges, gears, sprockets, chain and pulley drives. Adjust transmission drives	Guide student to identify different types of drives, tabular and solid shaft, universal joints, hubs and driving flanges, gears, sprockets, chain and pulley drives. Guide students on adjustment of transmission drives	- Dismantled Gear box and any transmission drive by belt and pulley arrangement - PTO shaft with universal joint coupling • Filler Gauges • Mallet • Soft Hammer • Grease • Oil (SAE 50) • Gear box manual • Gasket • Gasket Marker (gum) • Seals
	GENERAL OBJECTIVE 3.0: Understand the functions and working principles of bearings in a transmission system.					
5-6	3.1 State the functions of bearings in	Explain the functions of bearing in transmission system	• Charts • White Board • Slides		Guide students to identify the different	- Bearings of different types and shapes

	transmission system 3.2 list the different types of bearings 3.3 Explain friction and lubrication effects on bearing. 3.4 Explain the effects of friction and lubrication on moving parts. 3.5 Explain the usage of transmission oil and greases.	State the different types of bearings Describe the effects of friction and lubrication effects on bearing Describe the effects of friction and lubrication on moving parts. Discuss the usage of transmission oil and greases.	• Drawings • Projector • Markers • Multimedia	Identify different types of bearings. Identify components that are not properly lubricated and the consequences of wear Identify the wearing part of grease and that of transmission oil	types of bearing e.g. plain roller bearings, tapper bearings, etc. transmission oil and greases. Guide the students to examine components that are not properly lubricated and the consequences of wear Guide students to identify the wearing part of grease and that of transmission oil e.g inner cup, transmission gear box	- Engine sliding parts e.g. piston, cylinder wall
7-9	**GENERAL OBJECTIVE 4.0:** Know the types of seals used on motorcycle and tricycle.					
	4.1 State the function of seals in the transmission system. 4.2 State the different types of seals	Explain function of seals in the transmission system Explain the different types of seals	• Charts • White Board • Slides • Drawings • Projector • Markers • Gasket gum • Paper	Identify different types of seals	Guide student to identify different types of seals-metallic seals, non metallic, 'O'ring seals, gasket dust excluders, sealing rings and lubricant boots.	• Seals • Gaskets • Tools

	4.3 Explain the function of gasket in the transmission system. 4.4 State different types of gasket materials	Discuss the function of gasket in the transmission system. Explain the different types of gasket materials		Identify different gasket materials and where they are used.	Guide students to identify different gasket materials and where they are used.	
	ASSESSMENT CRITERIA					
	Coursework	Course Test 20%	Practical 60%	Other: Examination/Project 20%		

PROGRAMME:

NATIONAL TECHNICAL CERTIFICATE IN MOTORCYCLE AND TRICYCLE ASSEMBLY, REPAIR AND MAINTENANCE

MODULE: **CMT 310: MOTORCYCLE AND TRICYCLE ASSEMBLY**

PRE-REQUISITE:

DURATION: 216 HOURS

GOAL: This module designed to train students in the complete assembly process of motorcycles and tricycles, including handling components, following assembly guidelines, and ensuring quality control.

GENERAL OBJECTIVES:

On completion of this module, the trainee should be able to:

1.0 Understand Motorcycle and Tricycle Assembly.

2.0 Know Engine Assembling.

3.0 Know Transmission System Assembly.

4.0 Know Suspension and Braking System Assembly.

5.0 Know Final Assembly and Quality Control.

PROGRAMME: NTC IN MOTORCYCLE AND TRICYCLE ASSEMBLY, REPAIR AND MAINTENANCE					
MODULE: MOTORCYCLE AND TRICYCLE ASSEMBLY			**COURSE CODE:** CMT310	**CREDIT HOURS:** 216	
YEAR: 3	**TERM:** 1, 2 **& 3**	**PRE: REQUISITE:**	**Theoretical:** 72 Hours	**Practical:** 144 Hours	
GOAL: This module designed to train students in the complete assembly process of motorcycles and tricycles, including handling components, following assembly guidelines, and ensuring quality control					
Theoretical Content				**Practical Content**	
GENERAL OBJECTIVE 1.0: Appreciate the importance safety while at work.					

week	**Specific Learning Outcome**	**Teacher Activities**	**Learning Resources**	**Specific Learning objectives**	**Teacher Activities**	**Learning Resources**
1-2	1.1 Explain overview of Motorcycle and Tricycle Assembly 1.2 Describe various motorcycle and tricycle components. 1.3 Describe the function of each parts of motorcycle/tricycle 1.4 List the basic tools and equipment used for assembling motorcycle/tricycle	Discuss the overview of Motorcycle and Tricycle Assembly Explain various motorcycle and tricycle components. Explain the function of each parts of motorcycle/tricycle Explain the basic tools and equipment used for assembling motorcycle/tricycle	• Marker • White Board • Relevant textbooks, • Projector • Slides • Diagrams • Charts	Identify components of a tricycle and motorcycle Identify the various components of motorcycle/tricycles Identify the various part of motorcycle/tricycle Identify the basic tools used for assembling motorcycle/tricycle	Guide student to identify various motorcycle and tricycle components. Guide students to identify the various components of motorcycle/tricycles Guide students to identify the various part of motorcycle/tricycle Guide students to identify the basic tools used for assembling motorcycle/tricycle	

	GENERAL OBJECTIVE 2.0: Know Engine Assembling					
3-4	2.1 Describe motorcycle and tricycle engine 2.2 State the components of motorcycle and tricycle engine 2.3 State the procedure for assembling 2-strokes/cycle engine 2.4 State the procedure for assembling 4-strokes/cycle engine 2.5 Explain torque specification and alignment during engine assembly	Explain motorcycle and tricycle engine Explain the components of motorcycle and tricycle engine Explain the procedure for assembling 2-strokes/cycle engine State the procedure for assembling 4-strokes/cycle engine Discuss torque specification and alignment during engine assembly	• Charts • Marker • White Board • Relevant textbooks, • Projector • Slides • Diagrams • Charts	Identify various components of tricycle and motorcycle engine Carryout the assembling of 2-stroke/cycle engine Carryout the assembling of 4-stroke/cycle engine Carryout torque bolts specifications and ensuring proper alignment.	Identify various components of tricycle and motorcycle engine Guide students to carry out the assembling of 2-stroke/cycle engine Guide students to carry out the assembling of 4-stroke/cycle engine Guide student to carryout torque bolts specifications and ensuring proper alignment.	
	GENERAL OBJECTIVE 3.0: Know Transmission System Assembly.					
5-6	3.1 Explain the assembling of transmission system in motorcycle and tricycle 3.2 Explain the assemble	Discuss the assembling of transmission system in motorcycle and tricycle Discuss the assemble components of motorcycle and	• Tool rack • Charts • Marker • White Board • Relevant textbooks,	Carryout assembling of transmission system in motorcycle/tricycle	Guide student to carryout assembling of transmission system.	

	components of motorcycle and tricycle 3.3 State the assemble procedure manual transmission 3.4 State the assemble procedure automatic transmission. 3.5 State the importance of proper lubrication during assembly	tricycle Explain the assemble procedure manual transmission Explain the assemble procedure automatic transmission. Discuss the importance of proper lubrication during assembly	• Projector • Slides • Diagrams • Charts			
	GENERAL OBJECTIVE 4.0: Know Suspension and Braking System Assembly.					
7-9	4.1 Explain the suspension system 4.2 Explain the braking system 4.3 Describe the components of suspension system 4.4 Describe the components of braking system.	Describe the suspension system Describe the braking system Explain the components of suspension system Explain the components of braking system	• Marker • White Board • Projector • Slides • Diagrams • Charts • Relevant textbooks	Identify front and rear suspension systems. Identify disc and drum braking systems. Identify the components of suspension systems. Identify the components of braking system	Guide students to Identify front and rear suspension systems. Guide students to identify disc and drum braking systems. Guide student to identify components of suspension systems. Guide students to identify the components of braking system	

	4.5 State the procedure for assembling suspension system 4.1 State the procedure for assembling braking system	Explain the procedure for assembling suspension system 4.3 Explain the procedure for assembling braking system				
	GENERAL OBJECTIVE 5.0: Know Final Assembly and Quality Control					
	5.1 Explain Final assembly of motorcycle and tricycle. 5.2 State the final assembling procedure for motorcycle 5.3 State the final assembly procedure for tricycle 5.4 Explain operational errors that can occur during motorcycle and tricycle assembling	Discuss Final assembly of motorcycle and tricycle. Explain the final assembling procedure for motorcycle Explain the final assembly procedure for tricycle Discuss operational errors that can occur during motorcycle and tricycle assembling	• Marker • Slides • Diagrams • White Board • Projector • Charts • Relevant textbooks	Carryout assembling procedure of motorcycle Carryout assembling procedure of tricycle	Guide students to carryout assembling procedure of motorcycle Guide students to carryout assembling procedure of tricycle	

	5.5 Explain Quality control measures in motorcycle and tricycle assembly 5.6 List inspection checklists during quality control	Discuss Quality control measures in motorcycle and tricycle assembly Discuss inspection checklists during quality control		Perform Quality control checks and final inspection	Guide students to Quality control checks and final inspection. Guide students to rectify common assembly errors	
	ASSESSMENT CRITERIA					
	Coursework	Course Test	Practical	Other: Examination/Project		

CRAFTSMAN COURSE IN MOTORCYCLE AND TRICYCLE ASSEMBLY, REPAIR AND MAINTENANCE TOOLS REQUIRED

S/NO	TOOLS/EQUIPMENT	MINIMUM QUANTITY REQUIRED
A	**ENGINE MAINTENANCE AND REPAIR TOOLS**	
1	Sets of Open-End Spanners – 6mm-32mm	10Set
2	Big Open-End Spanners	10Set
3	Ring Spanners – 6mm-32mm	10Set
4	Sets of Pocket Spanners – 6mm-32mm	10Set
5	Pre-adjustable torque wrenches	60
6	Small, medium and big adjustable spanner	15sets
7	Pipe Wrenches (assorted sizes)	15sets
8	Vice grip wrench	15sets
9	Set of Allen keys	15sets
10	Feeler gauges	5sets
11	Pressure gauges	5sets
12	Micrometer	10
13	Steel Rule	30
14	Straight Edge	30
15	Wing Dividers	20
16	Scribers	30
17	Inside and Outside Callipers	30
18	Hydrometer	10
19	Set of Clutch Alignment Gauge	10
20	Clutch Set – screw gauge	10
21	Oil cans	10
22	Plug Gauge	5
23	Gap Gauge	5
24	Ring Gauge	5
25	Engineer’s Compass	10
27	Vacuum Tester	10
28	Air Compressor	10
29	Grease Guns	10

30	Fire Extinguishers	5
31	Portable Hoist	3
32	Hydraulic Jack	5
33	Pillar Drill Bits	10
34	Assorted Grinders	5
35	Work Bench (1mx2m)	15
36	Power Hacksaw	5
37	Engine Stands	5
38	Creepers	5
39	Ramps	5
40	Dust Bin	5
41	First Aid Box	3
42	Battery Charging Equipment	3
43	Set of Pullers	3
44	Stand by Generators	1
45	Hydraulic Press	3
46	Valve Grinder	5
47	Wheel Alignment Gauge	3
48	Injector Testing Machine	2
49	Injector Needle service Kit	2
B	**Measuring Tools**	
1	Inside caliper	10
2	Outside caliper	10
3	Micrometer Gauge	10
4	Thread pitch gauge	10
5	Venial Calliper	10
6	Steel tape	10
7	Steel Rule	5
8	Cutter bit gauge	5Set
9	Radius Gauge	5Set
C	**EQUIPMENT AND OTHER ACCESSORIES**	
1	Grinding wheel	3

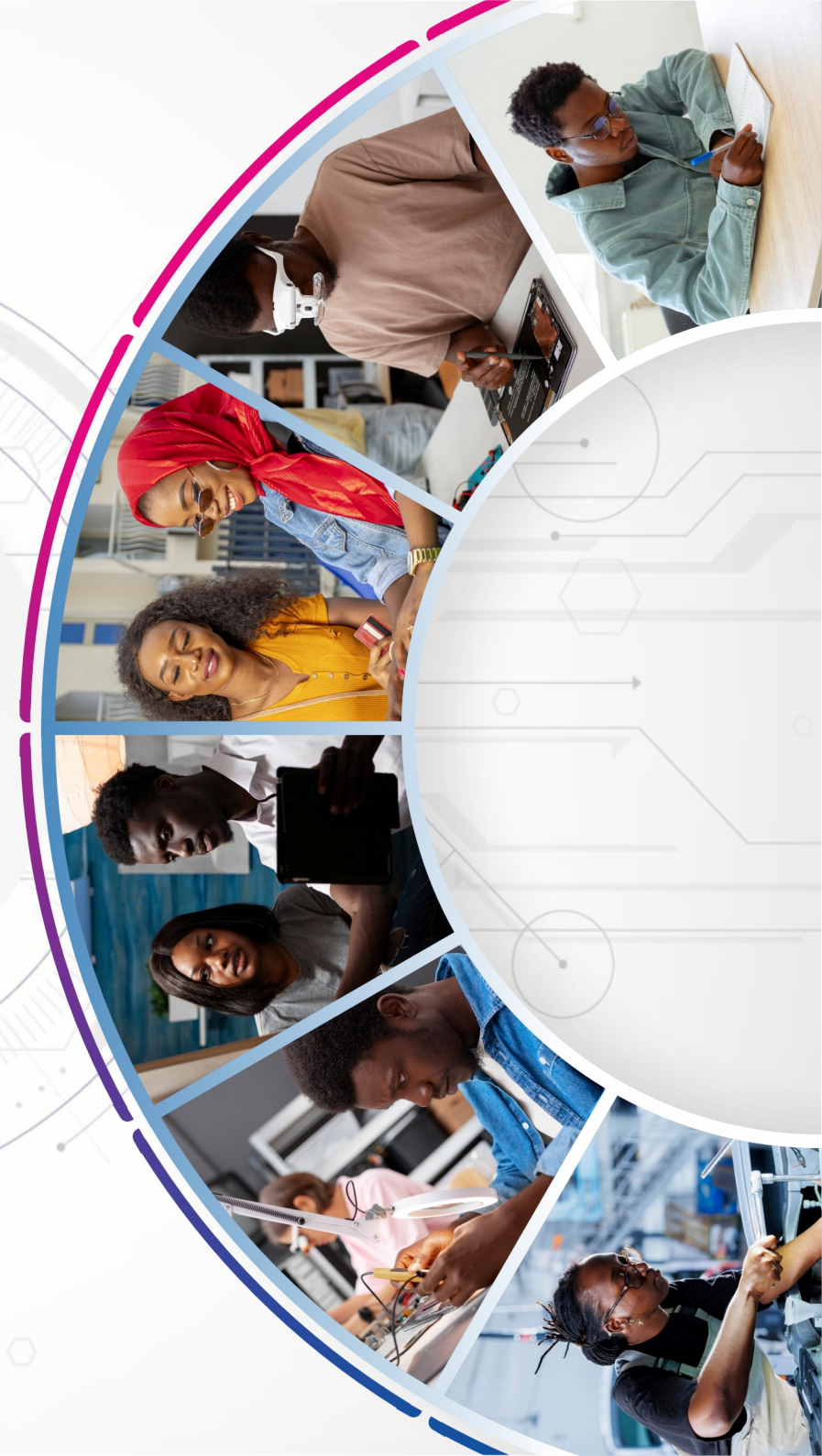
2	Drilling Machines	3
3	Punches	5Set
4	Storage Cabinet	10
5	Tap and dies	5Set
6	Machine Wrench	3
8	Hammer	10
9	Knock-out bar	5
10	Drill bits	5Set
11	Countersink bit	5set
14	Counter bore bit	5Set
16	Lathe Oil	20litres
17	Side Table	10
18	Broom	15
19	Brush	20
20	Scrappers	10
21	Wheelbarrow	2
26	Milling machine	2

WORKSHOP RECOMMENDATIONS FOR MOTORCYCLE/TRICYCLE ASSEMBLY, REPAIR AND MAINTENANCE

- The workshop space should be large enough to accommodate and permit free workshop space per student, approximately $3m^2$ per student.
- The workshop space/entrance should be large enough to accommodate big machines.
- The workshop should be equipped with at least a workbench per student.
- The workshop should be equipped with a convenience facility and cloak room.
- The workshop should be provided with adequate illumination and ventilation.

PARTICIPANTS LIST FOR NATIONAL CURRICULUM CRITIQUE WORKSHOP ON NTC MOTORCYCLE AND TRICYCLE ASSEMBLY, REPAIR AND MAINTENANCE

S/N	NAME	E-MAIL	ORGANIZATION
1	Engr. ADK Muhammad	adkmuhammad@gmail.com	Project manager, IDEAS Project
2.	Aminu Abdullahi Getso	Aminugetso6@gmail.com	Kano State Polytechnic School of Technology
3	Ephraim Bitrus Esku	B0806502@gmail.com	Wing commander Abdullahi Ibrahim Vocational technology Institute Lafia
3.	Mr. Balogum Stephen	Balogunstephen45@gmail.com	NABTEB, Benin City, Edo State
4.	Shehu Usman Abdu	Shehuwa1@gmail.com	NBTE, Kaduna



World Bank – National Board
for Technical Education, Nigeria
Project on Innovation Development
and Effectiveness in the Acquisition
of Skills (IDEAS)

Plot B, Bida Road, PMB 2239,Kaduna
ideasworldbankproject@nbte.gov.ng
Tel: +234 (0) 802 4728 042