

PAMOJA ZANZIBAR VOCATIONAL TRAINING CENTRE



**DEPARTMENT OF AUTO-MECHANICS
CURRICULUM FOR TECHNICAL CERTIFICATE
(LEVEL I AND II)**

CURRICULUM INFORMATION REPORT

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1.0 OVERALL OBJECTIVES OF THE COURSE

- (i) The learner will be able to work as a semi skilled worker.
- (ii) Fulfill the job requirements for an employer.
- (iii) Facilitate new entrants to learn and enter the labor market.
- (iv) Improve the workmanship of existing workers.

1.1 COMPETENCIES GAINED AFTER COMPLETION OF COURSE

1. To apply safety precautions.
2. Select use and handle auto motive, hand tools, workshop tools, safely and efficiently.
3. Identify and use automotive fasteners.
4. Tune up the car.
5. Diagnose and service the engine.
6. Diagnose and service of fuel (Petrol, Diesel, E.F.I., and C.N.G.), lubricating, cooling, ignition, emission and exhaust systems.
7. Diagnose and service the power train components as clutch, transmission, drive shaft, differential and axles.
8. Diagnose and service the suspension, steering and brake systems.
9. Replace battery, self starter and alternator.
10. Do minor repair work of car wiring such as replacing fuses, bulbs and horns etc.
11. Recheck the work done.

1.2 JOB OPPORTUNITIES AVAILABLE IMMEDIATELY AND IN THE FUTURE

- Pass out may be employed in following sectors.
- Car Workshops
- Car Dealerships
- Heavy Duty Workshops
- Private fleets and garages
- Government departments
- Assembly plants
- Generator workshops
- Spare parts stores.
- Self Business.

1.3 OVERVIEW ABOUT THE PROGRAM – CURRICULUM FOR AUTOMOBILE MECHANIC

Module Title and Aim	Learning Units	Theory hours	Workp lace hours
<p>Module 1: Automotive Workshop Basics</p> <p>Aim: Behave as a good automotive technician; use the tools, fasteners safely and efficiently.</p>	<p>Apply:</p> <p>1.1 Safety Precautions 1.2 Measuring tools 1.3 Fasteners, sealants and cleaning liquids. 1.4 Automotive hand tools 1.5 Workshop tools 1.6 Behave safely in workshop</p>	22	72
<p>Module 2: Diagnosing and Servicing the Engine</p> <p>Aim: Perform maintenance, diagnosis and service work on engine efficiently</p>	<p>Service the:</p> <p>2.1 Engine 2.2 Fuel Systems (Gasoline and Diesel injection) 2.3 Lubrication Systems 2.4 Cooling Systems 2.5 Ignition Systems 2.6 Exhaust Systems, Turbocharger and Supercharger</p>	115	602
<p>Module 3: Service of Power Trains and Axles</p> <p>Aim: Diagnose and service the power train components amicably.</p>	<p>Service the:</p> <p>3.1 Clutch Systems 3.2 Manual and Automatic Transmission. 3.3 Propeller Shaft and Transfer Cases 3.4 Differentials and Rear Drive Axles 3.5 Transaxles and Front axles</p>	40	204
<p>Module 4: Servicing Chassis Systems</p> <p>Aim: Diagnose and repair the chassis systems efficiently</p>	<p>Service the:</p> <p>4.1 Suspension Systems 4.2 Steering Systems 4.3 Brake Systems 4.4 Tire, Wheel and Wheel Bearing 4.5 Antilock brake System 4.6 Wheel Alignment</p>	69	272
		20	70

Module 5: Electrical Systems Aim: Perform electrical tasks required for an engine technician	Maintenance and service of the: 5.1 Battery 5.2 Starting Systems 5.3 Charging Systems 5.4 Electrical Components 5.5 Ignition System 5.6 Light Instrumentation, Wipers and Horns, Sound System and Power Accessories	30	120
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1.4 AUTO MECHANIC CURRICULUM CONTENTS (TEACHING AND LEARNING GUIDE)

Module 1 Title: Automotive Workshop Basics

Objective of the Module: Behave as a good automotive technician, use the tools, fasteners safely and efficiently.

Duration: 94 hours Theory: 22 hours Practice: 72 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials/ Tools Required	Learning Place
1.1 Apply the safety precautions	To adopt safety measures, personally, for the tools, job and environment	Describe personal safety Tools and machine safety - Job safety - Environment safety - Demonstrate proper use of the fire extinguishers	6Hrs	Fire extinguishers Vehicle	Class room and Institute workshop
1.2 Measuring	To measure precisely and to compare with standard size	Explain: - Measure units of mass, volume, length and time in Imperial/Metric System - Measure units in	20 Hrs	Steel foot rule Vernier Caliper Micrometer Dial Gauge V – Blocks Required Tools	Measuring Lab

		metric system - Identify and use with: • Steel rules • Vernier Caliper • Micrometer • Dial Gauge			
1.4 Use of Hand Tools	Select use and handle the hand tools properly	-Identify and use fitting tools -Screw Drivers -Spanners -Socket Set -Allen Key -Adjustable Wrench Torque Wrench - Identify and use striking tools -Hammers -Punches - Identify and use pliers - Identify and use pullers -Removing and refitting of bearings - Identify and use cutting tools - Hack saws -Chisels -Shears -Files -Drills - Reamers - Taps and dies - Pipe cutting,	14 Hrs	Various Types of Fasteners Torque Wrench Gaskets Sealants	Class room and Institute workshop

bending and flaring
 - Identify and use general workshop tools for cleaning,

Module 2 Title: Diagnosing and Servicing the Engine

Objective of the Module: Perform maintenance, diagnosis and service work on engine efficiently)

Duration: 717 hours **Theory:** 115 hours **Practice:** 602 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
2.1 Diagnose and Service Engine	<ul style="list-style-type: none"> - Learner will be able to the working of an engine. - Identify Engine components - Dismantle, check and assemble ngi 	Explain: <ul style="list-style-type: none"> - Engine and its types - 4 stroke petrol engine working. - 2 stroke petrol engine working - Working of diesel engine. - Spark Ignition Engine - Describe construction and function of: <ul style="list-style-type: none"> - Cylinder heads - Valve mechanisms -Cylinder blocks -Piston, piston rings and pins - Connecting rod and big end bearings -Crank shaft and main journal bearings - Fly wheels - Remove the engine from the car - Dismantle the engine - Inspect and check the 		<ul style="list-style-type: none"> General mechanics tool kit Lifting equipment Torque wrench Bench Vice Valve seat cutter/Lapping Stick Micrometer Vernier calipers Pullers of different size Straight edge. Valve spring compressor Valve spring tester Cotton Waste Kerosene oil Compression gauge/tester Cleaning equipment Hydraulic press Engine oil and grease Diesel and petrol fuel Metal pans for cleaning tray. 	Class Room and institute workshop

		<p>engine parts</p> <ul style="list-style-type: none"> - Engine timing (valve and ignition) - Assemble the engine - Adjusting tappet clearance - Fit the engine in the car - Start the engine - Perform Compression test 		
2.2 Diagnose and Service Fuel Systems	<p>Learner will be able to identify, service and repair the fuel systems:</p> <ul style="list-style-type: none"> - Carburetor E.F.I. - C.N.G. - Diesel fuel injection 	<p>Describe the purpose of a fuel system</p> <ul style="list-style-type: none"> - Describe Air fuel ratios - Describe construction, function and operation of fuel systems 	<p>General mechanic tools kit</p> <p>Lifting equipment</p> <p>Fuel pressure gauge</p> <p>Torque wrench</p> <p>Oscilloscope multi meter</p> <p>Computer lead box diagnosis systems and interface box</p> <p>Tachometer</p>	<p>Auto mobile workshop</p>
2.3 Diagnose and service the lubricating systems	<p>Trainee will be able to diagnose and repair the lubricating system</p>	<p>Explain the purpose, construction and working of an engine lubricating systems</p> <ul style="list-style-type: none"> - Change oil and filters - Service oil pumps - Checking oil pressure 	<p>General mechanic tool kit</p> <p>Oil filter wrench</p> <p>Sealant</p> <p>Lifting equipment</p> <p>Scarper</p> <p>Oil funnel</p> <p>Recommended oil</p> <p>Waste oil drum</p>	<p>Class room / Institutional workshop and auto mobile workshop</p>
2.4 Diagnose and Service of Cooling Systems	<p>Trainee will be able to diagnose and repair the cooling system</p>	<ul style="list-style-type: none"> - Explain the purpose, construction and working of engine cooling systems - Describe the function of radiator cap 	<p>General mechanic tool kit</p> <p>Multi meter</p> <p>Radiator cap tester</p> <p>Temperature gauge</p> <p>Hoses Clamps</p>	<p>Class room / Institutional workshop a</p>

		<ul style="list-style-type: none"> - Check/ test radiator cap - Test the thermostat valve - Adjust the fan belt - Replace the water pump - Replace the hose pipe -Diagnose for problems 		
2.5 Diagnose and Service of Ignition systems	Trainee will be able to diagnose and service the ignition system	<ul style="list-style-type: none"> - Explain pick up coil ignition, high energy ignition, hall effect switch, optical photodiode distributor, multiple coil distributor less ignition, crank and cam position sensor, direct multiple coil ignition, direct capacitor and discharge ignition. - Triggering test - Retrieve ignition system troubles - Test with a breakout box - Check air gap of pick up coil ignition - Test pick up coil, hall effect switch - Check ignition module 	<ul style="list-style-type: none"> Test lamp Engine analyzer Dwell / tacho meter Condenser Tester Spark plug deep socket set Insulation tester General mechanic tool kit Timing light Plug cleaner and tester Hand vacuum pump Soldering iron SPARES Condensers C.B. Points High tension cables Spark plugs INSTRUCTIONAL DATA Manufacturer's manuals Equipment operational manuals Drawings Circuit diagrams 	Class room / Institutional workshop and auto mobile workshop

2.6 Service and diagnose the emission control systems	Trainee will be able to diagnose and repair the P.C.V. system	<ul style="list-style-type: none"> - Introduction of emission control systems - Explain positive crank case ventilation (P.C.V), evaporative control emission, exhaust gas recirculation, and Catalytic converters. - Service of P.C.V. systems - Service thermostatic air cleaner - Explain safety precautions of catalytic converter 	General mechanic tool kit	Class room / Institutional workshop and auto mobile workshop
2.7 Service of Exhaust system ,Turbocharger And Supercharger	Trainee will be able to diagnose and replace the Exhaust system parts , Turbocharger And Supercharger	<ul style="list-style-type: none"> -Explain the purpose and construction of exhaust systems - Service exhaust systems, Turbocharger And Supercharger 	General mechanic tool kit	Class room / Institutional workshop and auto mobile workshop

Module 3 Title: Service of Power Train

Objective of the Module: Diagnose and service the power train components amicably

Duration: 244 hours **Theory:** 40 hours **Practice:** 204 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
3.1 Diagnose and Service the Clutch Systems	Trainee will be able to diagnose and service the clutch system	<ul style="list-style-type: none"> - Explain the purpose, construction and operation of a clutch - Explain the types of clutch - Explain the clutch linkages - Remove, check and reinstall the clutch assembly - Clutch master cylinder service and bleeding. - Adjust clutch pedal free play - Trouble shooting. 	59 Hrs	Mechanic's tool kit Clutch aligning tool Mechanic's tool kit Clutch aligning tool Emery paper Grease Clutch plate Pressure plate Thrust bearing Clutch cable Brake oil Steel rule Fly whirlpool Emery paper Grease Clutch plate Pressure plate Thrust bearing Clutch cable Brake oil Steel rule Fly wheel	Class room / Institutional workshop and auto mobile workshop
3.2 Diagnose and service of Manual and Automatic Transmission	Trainee will be able to diagnose and repair the Manual and Automatic Transmission	Explain: <ul style="list-style-type: none"> - Define gear ratio - Purpose, construction and function of 4 speed synchromesh gearbox / transaxle - Introduction to automatic gears - Remove input shaft, output shaft assembly and countershaft 	88 Hrs	Mechanic's tool kit Transmission oil Pan for dismantling Transmission/Transaxle	Class room / Institutional workshop and auto mobile workshop

3.3 Service the drive line	Trainee will be able to check & service the drive line	<ul style="list-style-type: none"> - Checking and inspection of parts - Reassembly - Trouble shooting <p>Explain:</p> <ul style="list-style-type: none"> - The purpose of a propeller shaft <p>Construction and function of universal joint and slip joints</p> <ul style="list-style-type: none"> - Remove, check and install a propeller shaft - Trouble shooting 	88 Hrs	<p>Mechanic's tool kit Transmission oil Pan for dismantling Transmission/Transaxle</p>	<p>Class room / Institutional workshop and auto mobile workshop</p>
3.4 Diagnose & service the differential and axle assembly	Trainee will be able to check & service differential and axle assembly	<p>Describe:</p> <ul style="list-style-type: none"> - The purpose, function and construction of differential and axles (rear and front) - Remove, dismantle, check and assemble the differential - Adjust back lash - Remove, check and refit front drive axle - Refit front drive axle - Adjust wheel bearings - Trouble shooting 	68 Hrs	<p>Mechanic's tool kit Shims, Bearing Differential oil Boot & boot-clips Grease (silicon base) Sealant & Gaskets Cleaning liquids Oil seals Jack & stands Rags</p>	<p>Class room / Institutional workshop and auto mobile workshop</p>

Module 4 Title: Servicing Chassis Systems

Objective of the Module: Diagnose and repair of chassis systems efficiently

Duration: 341 hours **Theory:** 69 hours **Practice:** 272 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
4.1 Diagnose and Service the suspension system	Trainee will be able to diagnose and service the suspension system	<ul style="list-style-type: none"> - Explain the purpose of suspension systems - Explain the types of suspension system - Check and replace shock absorbers/refill - Remove and refit leaf springs - Remove and refit of Mc-Pherson strut 	46 Hrs	Mechanics tool kit Garage Jacks Trolley Jack Coil spring compressor Safety stands	Class room / Institutional workshop and auto mobile workshop
4.2 Diagnose and Service the steering systems	Trainee will be able to diagnose and service the steering systems	<ul style="list-style-type: none"> - Explain: - The purpose, construction and types of steering systems (Mechanical & Power) - The steering linkages - Explain wheel balance and steering geometry - Service steering gear boxes - Adjust steering wheel free plate - Check and replace the tie rods - Wheel balance - Check Toe in camber, caster, steering axis inclination (S.A.I) toe-in & toe-out on turn - Adjust angles - Trouble shooting 	175 Hrs	Mechanics tool kit Garage Jacks Safety stands Wheel balancing machine Wheel alignment equipment	Class room / Institutional workshop and auto mobile workshop

<p>4.3 Diagnose and Service the brake system</p>	<p>Trainee will be able to diagnose and service the brake systems and Antilock Braking System</p>	<ul style="list-style-type: none"> - Explain the purpose of brakes and Antilock Braking System - Describe the construction, function & types of brakes - Explain the function of parking brakes - Replace and adjust the brake shoes - Check and replace the disc pads - Check the brake servo unit - Service the master cylinders - Service the wheel cylinder - Bleeding the brakes - Adjust parking brakes - Trouble shooting 	<p>120 Hrs</p>	<p>Mechanics tool kit Vehicle Lifting Jacks & Safety stands MATERIALS Brake oil Grease Repair kits (Master and wheel cylinder) Brake pads Brake shoes Brake hoses and pipes Vinyl tube and container Emery paper</p>	<p>Class room / Institutional workshop and auto mobile workshop</p>
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Module 5 Title: Servicing Automotive Electrical Components

Objective of the Module: Perform important electrical tasks required for an engine technician

Duration: 90 hours **Theory:** 20 hours **Practice:** 70 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
5.1 Maintenance of the automotive electrical components	Trainee will be able to perform maintenance of the automotive electrical components	<ul style="list-style-type: none"> - Describe conductor and insulator - Explain ampere, volt, and resistance - Explain series and parallel circuits - Explain magnet and magnetism - Explain the purpose and function of Battery Self starter Alternator - Connect resistances in series and parallel circuits - Use volt meter and ampere meter - Use of ohm meter - Perform battery maintenance - Cranking motor wiring circuit - Remove and reinstall battery, alternator and self-starter - Replace fuses and bulbs 	90 Hrs	<ul style="list-style-type: none"> Auto wire Thimble Thimble pliers Ampere meter, volt meter, Multi meter Bulbs and holders Soldering iron, paste and wire Hydrometer Battery charger Distilled water Insulation tapes Lamp tester Battery clamps Battery service kit Mechanic tool kit 	Class room / Institutional workshop and auto mobile workshop

5.2 Maintenance of Light System, Wipers, Horn, Sound Systems and accessories	Trainee will be able to perform maintenance of Light System, Wipers, Horn, Sound Systems and accessories	-Explain The Purpose of Lighting, wipers, Horn, Sound Systems -Service Lighting, wipers, Horn, Sound Systems and accessories replacement.	90hrs	Auto wire Thimble Thimble pliers Ampere meter, volt meter, Multi meter Bulbs and holders Soldering iron, paste and wire Hydrometer Battery charger Distilled water Insulation tapes Lamp tester Battery clamps Battery service kit Mechanic tool kit	Class room / Institutional workshop and auto mobile workshop
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5.1 Special Note:

This curriculum information report illustrates all modules that are required to be undertaken by auto mechanic trainees for the entire learning period as described below:

- First year (level I) : module 1, 2 and 3
- Second year (level II) : module 4 and 5
- Third year (level III) : Practical works at the Automobile Workshop

5.2 Learning Materials:

Chalkboard, Overhead Projectors, Power Point projection kit, Flip charts, Audio Visual Workshop equipment, tools and training models.

5.3 References:

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3. J. A. Dolan, Motor Vehicle Technology and Practical Work, Heinemann, London, Latest Edition.
4. W. H. Crouse, Automotive Mechanics, McGraw-Hill Publisher, London, Latest Edition.
5. F. C. Bricker, Automotive Guide, Theodore Andel and Co., Indianapolis, Latest Edition.
6. P. O. Black, Diesel Engine Manual, Theodore Andel and Co., Indianapolis, Latest Edition.
7. Kates et al, Diesel and high Compression Gas Engines, American Technical society, Chicago, Latest Edition.
8. A. L. Martin, Science and Calculations for Motor Vehicle technician, The English University Press, London, Latest Edition.
9. D. Keen, Motor Vehicle Mechanics Part 1, 2, 3 & 4, Heinemann, London, Latest Edition.
10. S. C. Mudd, Technology for Motor Vehicle Mechanics, Edward Arnold, Latest Edition.
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12. Automotive Mechanics, International Technical Education Media Series 'INTEMS', Educabook B. V. Netherlands, Latest Edition.
13. T. R. Banga and N. Singh, Automobile Engineering, Khana Publishers, Delhi, Latest Edition.
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15. Dr. N. K. Giri, Automobile Mechanics (Through Problems), Khana Publishers, Delhi, Latest Edition.
16. Automotive Handbook, Bosch, Latest English Edition.