QUALIFICATION SPECIFICATION								SECTION A
QUALIFICATION DEVELOPER	MINISTRY OF EMPLOYMENT, LABOUR PRODUCTIVITY AND SKILLS DEVELOPMENT							
TITLE	Certificate IV in Automotive Engineering				**NCQF LEVEL**		4	
FIELD	Manufacturing, Engineering and Technology		**SUB-FIELD**	Automotive Mechatronics				
New qualification		√	Review of existing qualification					
SUB-FRAMEWORK	General Education		TVET	√	Higher Education			
QUALIFICATION TYPE	Certificate	√	Diploma		Bachelor			
	Bachelor Honours		Master		Doctorate/ PhD			
CREDIT VALUE					**60 credits**			

RATIONALE AND PURPOSE OF THE QUALIFICATION

Rationale

The rationale behind the NCQF Level 4 Automotive course is to introduce the students to a broad-based exploratory program that uses standard tools of industry and the trades, resources, and processes to solve problems in the areas of transportation, manufacturing engineering and technology. Basic hand tools, power equipment, and computers are used in this course to make up integrated activity-oriented outcome-based learning. The course combines both auto mechanics and auto electrics and introduces students to all the aspects of automotive mechatronics as demanded by the Motor Industry of Botswana. The Botswana Vision 2036 states that development of the human capital and the informal sector and the micro and small enterprises (MSES) are essential in achieving the VISION 2036 pillars, in particular Sustainable Economic Development and Human and Social Development. Although Botswana has been fortunate to experience unprecedented economic growth since independence, this has not generated enough jobs to reduce unemployment. The most severely hit group amongst the unemployed is the youth, who account for about 51.7 % of the total unemployed, with the 15-19 age group most affected.

The Botswana Education and Training Sector Strategic Plan (ETSSP 2015-2020) marks a significant milestone in our collective efforts as a nation to bring about a more diversified, knowledge-based economy. Through a planned and careful development of human capital, the ETSSP seeks to refocus our education and training towards fulfillment of social and economic aspirations identified in our Revised National Policy on Education (RNPE) 1994, the National Development Plan 11, Vision 2036 and as well as the Millennium Development Goals. In particular, the ETSSP is intended to strengthen the match between qualifications and Labor market requirements, thereby ensuring that education and training outputs are more closely aligned to socio economic development needs of the country. In line with this strategic goal, the Human Resource Development Council (HRDC 2016) report on top occupations in demand has identified mechanics inclusive of heavy plant, hydraulics, diesel and auto electrical as some of the priority skills for Transport and Logistics and Mining Mineral Energy and Water Resources Sectors.

According to Botswana Investment and Trade Center (BITC 2019), The Botswana motor industry is faced with a BQA NCQF Qualification Template DNCQF.FDMD.GD03 Issue No.: 01 01/07-06-2018 Page 2 of 10 growing automotive market. It has a vehicle ownership rate of 206 vehicles per 1,000 people which is far above the African average of 43 vehicles per 1,000 people. Botswana's automotive market is expected to receive a boost in terms of sales growth in the short to medium term due to the development of domestic coal deposits and the unlocking of agricultural opportunities hence this qualification comes to dispel challenges related to the automotive labor market by providing training opportunities that promote knowledge and skills acquisition in the quest to be a knowledge-based economy: Botswana Government transformation agenda.

Purpose

The purpose of the Certificate IV in Automotive Engineering is to:

- Equip candidates with insightful competencies and exposure to automotive systems, engineering drawing, Engine technology, drive train systems and vehicle electrical and electronics systems and vehicle emission and legislations in accordance with established codes of practice and relevant standards.
- Equip candidates with skills in automotive service and repair.
- Introduce candidates to the use of specialized tools, equipment, materials, and processes found in the industry through Theoretical and Practical activities.
- Prepare students for employment or advanced training in the automotive industry.
- Address technological challenges faced by the industry in the advent rise of the use of ICT in the automotive sector by introducing a range of skills and competencies to perform a range of functions including entrepreneurship and Information technology as fundamental modules.
- Equip graduates with skills and competencies to be able to perform routine work under minimum supervision and take some responsibility for own learning and completion of work.

ENTRY REQUIREMENTS (including access and inclusion)

- **Minimum Entry Requirements**

NCQF Level III or equivalent shall be required for candidates to be accepted into Certificate IV in Automotive Engineering.

- **Recognition of Prior Learning/Credit Accumulation Transfer (CAT)**

Applicants who do not meet the above criterion but possess relevant industry experience may be considered using RPL and CATS policies for access.

QUALIFICATION SECTIONB	**SPECIFICATION**
GRADUATE PROFILE (LEARNING OUTCOMES)	**ASSESSMENT CRITERIA**
Organize and manipulate data using ICT.	• Read and analyze data from a prepared database. • Enter and manipulate data using ICT tools. • Display data electronically using charts. • Manipulate and present information through the selection of appropriate spreadsheet tools.
Demonstrate awareness of the basic entrepreneurial concepts associated with business establishment in Botswana.	• Relate the basic entrepreneurial concepts that inform the establishment of a venture. This includes support structures or policies available for entrepreneurs in Botswana. • Identify entrepreneurship or business opportunities in a field of interest making use of brainstorming and environmental and scanning techniques. • Consider the various investment strategies and risks associated with your identified business.
Demonstrate knowledge, skill and competence to engage in vocationally relevant tasks, be it in an organization or vocational context.	• Apply negotiation and communication skills prior to and during work-based learning. • Perform assigned vocation-related tasks to the required standards according to logbook. • Apply effective fundamental and core skills throughout the duration of the work-based learning program. • Adhere to health and safety requirements at all times. • Apply problem solving skills as and when problems are encountered during work process. • Contribute effectively to teamwork initiatives within the work environment. • Evaluate the work-based learning experience to determine its benefits and/or limitations.
Demonstrate knowledge and understanding of Safety health, Environmental and Risk Quality (SHERQ) and exhibit appropriate behaviors for the protection of the	• Interpret and apply legislative requirements, industry standards, and best practices in a variety of workplaces to comply with Safety health and Environmental Risk Quality (SHERQ) standards. • Identify hazards in the workplace that pose a danger or threat to own safety or health, or that of others. • Maintain a register of hazards and accidents in accordance with organizational requirements. • Observe the importance of health and safety in the workplace pertaining

environment, home and workplace as well as personal health and safety	to the responsibilities of workers, managers, supervisors. • Apply appropriate action to control unsafe or unhealthy hazards and propose methods to eliminate identified hazards and risks.
Apply Math and Science problem solving techniques to perform work related calculations.	• Use number operations to carry out work related calculations. • Determine ratios, proportions and percentages as needed for specific purposes. • Apply measurement techniques for length, area, perimeter, volume and mass when performing work related culculations. • Determine the cost of production in relation to labour, materials and overheads in project undertakings. • Identify the main features of work related data and use suitable summary statistics (mean, mode and median) to interpret the data. • Solve work related methametical problems through algebraic expressions. • Solve calculations problems relating to motor vehicle science
Demonstrate knowledge and skill of vehicle electrical and electronic fundamentals.	• Identify vehicle electrical and electronic circuit fundamentals. • Describe vehicle electrical and electronic fundamentals. • Interpret drawings, electrical circuit instructions, and job specifications to establish job requirements. • Examine the job specification to determine the tools and equipment to be used in the service and repair of vehicle electrical circuits. • Select appropriate tools and equipment according to the job specification. • Perform service and repair tests on vehicle circuits in line with the job specification. • Record, and compare results in line with standard and manufacturer specifications. • Perform necessary tests to confirm functionality. • Clean tools and equipment and store them in an appropriate place after use. • Clean and tidy up the work area in accordance with organizational

	requirements
Maintain vehicle energy supply and starting systems.	• Identify vehicle energy supply and starting systems. • Describe the operating principles of energy supply and starting systems. • Examine the job specification to determine the tools and equipment to be used in the service and repair of energy supply and starting systems. • Select appropriate tools and equipment according to the job specification. • Conduct tests on energy supply and starting systems. • Perform service repair on energy supply and starting systems in line with the job specification. • Clean tools and equipment and store them in an appropriate place after use. • Clean and tidy up the work area in accordance with organizational requirements.
Demonstrate knowledge and skill of engine technology and repair procedures.	• Identify engine components and assemblies. • Describe procedure for carrying engine overhaul. • Plan and prepare to undertake engine overhaul and its related components. • Interpret data, disassembly and assembly procedures from manuals and publications. • Examine the nature of work to be done and determine the tools and materials to be used. • Perform engine overhaul and repair components as per job specification, adhering to health, safety and quality standard. • Perform quality checks on the job done until specification is met. • Clean tools and equipment and store them in an appropriate place after use. • Clean and tidy up the work area in accordance with organizational requirements.
Maintain engine cooling	• Identify engine cooling and lubrication systems.

and lubrication systems.	• Describe engine cooling and lubrication systems. • Plan and prepare to undertake service and repair on engine cooling and lubrication systems. • Examine the nature of work to be done on engine cooling and lubrication systems to determine service and repair tools and equipment to be used. • Select and use appropriate tools and equipment for specific purposes. • Perform service and repair components as per job specification, adhering to health, safety and quality standard. • Select and apply lubricants and sealants for engine systems and related industry applications. • Perform quality checks on the job done. • Clean tools and equipment and store them in an appropriate place after use. • Clean and tidy up the work area in accordance with organizational requirements
Diagnose and repair vehicle fuel injection systems: Petrol.	• Identify vehicle petrol fuel injection systems. • Describe the operation of petrol fuel injection systems, • Plan and prepare to undertake service and repair on petrol injection systems. • Examine the job specification to determine the petrol injection fuel system tools and equipment to be used. • Select appropriate tools and equipment in line with the job specification. • Diagnose petrol injection fuel system faults in accordance with manufacturer practice and job specification. • Perform service and repair components on petrol fuel injection systems. • Perform quality checks on work done and make improvements where needed. • Clean tools and equipment and store them in appropriate places after use. • Clean/tidy up the work area in accordance with organizational requirements.

Diagnose and repair vehicle fuel injection systems: Diesel.	• Identify vehicle diesel fuel injection systems. • Describe the operation of diesel fuel injection systems. • Plan and prepare to undertake service and repair on diesel injection systems. • Examine the job specification to determine the diesel injection fuel system tools and equipment to be used. • Select appropriate tools and equipment in line with the job specification. • Diagnose diesel injection fuel system faults in accordance with manufacturer practice and job specification. • Perform service and repair components on diesel fuel injection systems. • Perform quality checks on work done and make improvements where needed. • Clean tools and equipment and store them in appropriate places after use. • Clean/tidy up the work area in accordance with organizational requirements.
Diagnose and repair vehicle ignition systems.	• Identify vehicle ignition systems. • Describe the operation of vehicle ignition systems. • Plan and prepare to undertake service and repair on vehicle ignition systems. • Examine the vehicle ignition system and nature of work to be done to determine materials, tools and equipment to be used. • Select appropriate materials, tools and equipment to carry out the vehicle ignition tasks. • Identify parts and components of the ignition system to be serviced and repaired. • Perform ignition systems service and repairs as per job specification, adhering to health, safety and quality standard as well as established codes of practice. • Conduct operational checks on the job done and make improvements as needed.

	• Clean tools and equipment and store them in an appropriate place after use. • Clean and tidy up the work area in accordance with organizational requirements
Maintain Vehicle electrical circuits.	• Identify vehicle electrical circuit systems. • Describe the operation of vehicle electrical circuit systems. • Examine the job specification to determine materials, tools and equipment to be used in the vehicle electrical circuit. • Select appropriate materials, tools and equipment to be used to design and build vehicle circuits according to the job specification. • Construct vehicle electrical circuits according to established codes of practice and job specification. • Use appropriate electrical testers and measuring instruments to test electrical circuits on vehicle/panel board according to job specification. • Perform fault finding and rectify faults accordingly in electrical circuits. • Clean tools and equipment and store them in an appropriate place after use. • Clean and tidy up the work area in accordance with organizational requirements.
Demonstrate knowledge and skill for repairing brake systems.	• Identify vehicle braking systems. • Describe the operation of vehicle braking systems. • Examine the work to be done on braking system to determine tools and equipment to be used. • Select tools and equipment for braking system to be used in line with the nature of work to be done. • Perform braking system components as per job specification adhering to SHER and quality standard. • Perform fault finding and rectify faults accordingly in braking systems. • Perform quality checks on the work done in line with job specification and make improvements where necessary.

	• Clean tools and equipment and store them in an appropriate place after use. • Clean and tidy up the work area in accordance with organizational requirements.
Demonstrate knowledge and skill of vehicle hydraulic and pneumatic systems.	• Identify vehicle hydraulic and pneumatic systems. • Describe the operation of vehicle hydraulic and pneumatic systems. • Examine the hydraulic and pneumatic system to determine tools and equipment to be used. • Select appropriate materials, tools and equipment required for the task in line with job specification. • Perform fault finding and rectify faults accordingly to hydraulic and pneumatic systems. • Perform service and repair components in hydraulic and pneumatics as per job specification adhering to SHER and quality standards. • Perform quality checks on the work done in line with job specification and make improvements where needed. • Clean tools and equipment and store them in an appropriate place after use. • Clean and tidy up the work area in accordance with organizational requirements.
Service and repair vehicle drive train units and related components: Manual gearbox	• Identify vehicle drive train units and component systems. • Describe the operation of drive train units and component systems. • Examine the work to be done on drive train units to determine tools and equipment to be used. • Select tools and equipment to be used in line with the nature of work to be done. • Perform service and repair components drive train units and components as per job specification adhering to SHER and quality standard. • Perform quality checks on the work done in line with job specification and make improvements where necessary. • Clean tools and equipment and store them in an appropriate place after use.

	• Clean and tidy up the work area in accordance with organizational requirements.
Read, interpret and draw Engineering Drawings for specific purpose.	• Analyze the drawings to be done to determine appropriate drawing equipment to be used. • Select the appropriate drawing equipment to be used. • Produce drawings according to task specification; adhere to health, safety and quality standard. • Perform quality checks on the job done for adherence to quality standard. • Clean tools and equipment and store them in appropriate places after use. • Clean and tidy up the work area in accordance with organizational requirements.
Implement vehicle service and repair schedules in accordnance with manufacturers specification	• Identify and Interpret vehicle service and maintenance data for various models. • Examine the nature of maintenance work to be carried out to determine the materials, tools and equipment to be used. • Adhere to maintenance intervals and manufacturer warranty periods. • Prepare and carry out vehicle maintenance work in accordance with job specifications and adhere to SHERQ. • Perform necessary vehicle tests to confirm adherence to manufacturer standards. • Clean, store and secure tools and equipment in appropriate places after use. • Clean and tidy up the work area in accordance with organizational requirements. • Keep service records and report to immediate supervisor as needed.
Demonstrate knowledge and skill for repairing conventional suspension and steering systems.	• Identify parts and components of the Suspension and Steering system to be serviced and repaired. • Describe the Suspension and Steering system operation for the specified task. • Examine the Suspension and Steering system to be carried out to

	determine the materials, tools and equipment to be used. • Select appropriate materials, tools and equipment for the service and repair of Suspension and Steering chassis for the specified service job. • Interpret electrical drawings and circuits specifications for Suspension and Steering chassis according to the specified service job. • Perform diagnosis, service repair components on suspension and steering system as per job specification adhering to health, Safety and quality standards. • Perform quality checks on work done in line with manufacturer specification and make necessary improvements. • Clean tools and equipment and store them in an appropriate place after use. • Clean or tidy up the work area in accordance with organizational requirements.

QUALIFICATION STRUCTURE			**SECTION C**
FUNDAMENTAL COMPONENT Subjects / Units / Modules /Courses	**Title**	**Level**	**Credits**
	Information and Communications Technology (ICT)	4	2
	Entrepreneurship	4	2
CORE COMPONENT Subjects / Units / Modules /Courses	Engineering Drawing	4	3
	Vehicle Engineering Math and Science	4	3
	Vehicle Engine Technology	4	6
	Vehicle Drive Train Systems	4	3
	Safety Health Environment Risk and Quality SHERQ	4	2
	Hydraulic, Pneumatics and Braking Systems	4	3
	Steering and Suspension Systems	4	3
	Vehicle Electrical and Electronic Systems	4	3
	Work based Learning / Projects	4	30
	TOTAL		**60**
ELECTIVE COMPONENT Subjects / Units / Modules /Courses	N/A		

Rules of combinations, Credit distribution (where applicable):

A candidate is required to achieve a minimum of 60 credits inclusive of 4 credits for fundamental and 56 credits for core units. The candidate is also required to complete the required period of Work based learning / Projects and associated portfolio of evidence in line with the stipulated exit outcomes and associated assessment criteria to be eligible for the award of the qualification.

ASSESSMENT AND MODERATION ARRANGEMENTS

ASSESSMENT ARRANGEMENTS

All assessments, formative and summative, leading/contributing to the award of credits or a qualification should be based on learning outcomes and/or sub-outcomes.

Formative assessment

Formative assessment or continuous assessment contributing towards the award of credits should be based on course outcomes. This can include tests, assignments and projects as well as simulated and real clinical practice or care settings. The contribution of formative assessment to the final grade shall be **60%**.

Summative assessment

Learners may undergo assessment including written and practical and simulated projects. The final examination for each course contributes **40 %** of the final mark for that course. To pass a course, a candidate must achieve a minimum of 60%. A candidate who scores between 50 and 59% shall be eligible for one re-assessment. A candidate, who is not eligible for re-assessment or does not meet the minimum requirements on re-assessment, may apply for a re-take. All summative practical assessments must be conducted in simulated or real work settings.

MODERATION ARRANGEMENTS

Internal Moderation

The internal moderation process shall be conducted by moderators accredited with BQA in their specialist areas as moderators.

External Moderation

External moderation shall be performed by an examination unit or awarding body. The examination unit/awarding body shall also perform the quality assurance mandate and be responsible for identifying industry players, partnerships and experts to assist in the moderation processes.

RECOGNITION OF PRIOR LEARNING (if applicable)

Recognition of Prior Learning (RPL)

- Candidates may submit evidence of prior learning and current competence and/or undergo appropriate forms of RPL assessment for the award of credits towards the qualification in accordance with RPL policy, BQA RPL policy and relevant national-level policy and legislative framework. Implementation of RPL shall also be consistent with requirements, if any, prescribed for the field or sub-field of study by relevant national, regional or international professional bodies.
- Candidates with relevant prior learning through formal, informal and non-formal education shall be considered for award and or exemption through Recognition of Prior Learning (RPL).

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

Learning Pathways

Horizontal Articulation develops trainees to acquire basic practical skills and knowledge within areas of Intermediate Certificate in Automotive Engineering NCQF level 4.

- Certificate IV in Heavy Plant Mechanics
- Certificate IV in Auto body repair and refinishing
- Certificate IV in Borehole Mechanics

Vertical Articulation

The holder of these NCQF level 4 qualifications may progress to NCQF level 5 or equivalent on the following fields.

- Certificate V in Automotive Mechatronics
- Certificate V in Heavy Plant Mechanics
- Certificate V in Auto body repair and refinishing
- Certificate V in Borehole Mechanics

Employment Pathways

On completion of the course the candidates can either get employed or become a self-employed Entrepreneur in any one of the following fields.

a) Wage employment
- Spare Parts Sales Assistant / Manufacturer's Representative
- Private Fleet and Garages Attendants
- Workshop Storekeeper

b) Self –employment
- Spare Parts Dealer
- Spare Parts Salesman
- Semi Mechanics

QUALIFICATION AWARD AND CERTIFICATION

Minimum standards of achievement for the award of the qualification

*A candidate is required to achieve the stipulated minimum of **60 credits** inclusive of 4 credits for the fundamental, 26 core credits and 30 credits for work-based learning to be awarded the qualification.*

Certification

Candidates meeting prescribed requirements will be awarded the qualification in accordance with standards prescribed for the award of the qualification and applicable policies.

REGIONAL AND INTERNATIONAL COMPARABILITY

a) **Namibia Training Authority Certificate** in Automotive Engineering (***Level 2***) with compulsory of units worth 42 credits. The main objective of level 2 is to develop competence in components servicing motor vehicle, power trains, hydraulic brakes, basics of electrical and electronics, basic welding, engineering

science, basic of key skills and, HIV and AIDS Awareness. Credit's allocation are various according to unit standard including continuous assessment emphasis on practical demonstration of skills and knowledge based assessment administered in writing or orally. Completion of level 2, learner's progress to level 3 or, may work in industries that do service and repair of motor vehicles under less supervision or be self-employed in the automotive sector.

b) **New Zealand National Qualification Framework Certificate** in Light Automotive Engineering (***Level 4***) Credits worth 200. The programme provides the automotive engineering industry with individuals who have attained the knowledge and skills required to: diagnose and repairing faults on light motor vehicles, braking systems, auto electrics/tronics, suspension system, maintain safely and effective workplace and appropriate high risk light automotive systems. The programmes must be delivered in the context of a workshop operating at a commercially acceptable industry standard and assessed in the actual workplace or in a simulated workplace setting. Graduates for this qualification can lead to light Automotive Engineering (Level 5) or will be able to work in a range of workplaces in positions that involve service and repair of light vehicles.

c) **Ministry of Labour and Human Resource;** Thimphu, Bhutan: National Certificate in Automobile Mechanic (***NC2***). The programme emphasis on competence to perform functions in relation to overhauling of engines, power trains, servicing engine auxiliary, engine tune up and basic auto electronics. Assessment emphasis on practical demonstration of skills and knowledge based administered in writing or orally. Competency may be assessed in the actual workplace or in a simulated workplace setting. Graduates for this qualification can progress to NC 3 or may work in industries that do servicing and repair of light motor vehicles or be self-employed in the automotive sector.

d) **South Africa Qualification Authority (code: 78525)**: Automotive Repair and Maintenance (***Level 4***) credits worth 159, aims to provides learners with the standards and the range of learning to work effectively in various industries. The primary skill in this qualification is to apply the theory of repair and maintenance in order to service vehicles and perform work related to co-ordinate work activities in an automotive context; mechanical systems, electronic systems, communicate and solve problems in an automotive workshop. Theoretical and Practical components should be assessed together and should make use of formative and summative assessment. Graduates who have for this qualification are normally employed in industries that do servicing and repair of light/heavy motor vehicles.

The search has indicated that the proposed qualification for Certificate IV in Automotive Engineering (***NCQF Level 4***) worth 60 credits under the **Ministry of Employment, Labor productivity and Skills Development** compares well in a significant grade of similarities of context. All units and modules are compulsory and continuous assessment contributing towards the award of certificates based on course outcomes as well as simulated and real clinical practice conducted in simulated or real work settings. What sets it apart from the foreign qualifications noted is that the proposed encompasses of Information and Communication Technology, Safety Health and Environmental Risk Quality (SHERQ), Engineering drawing, Maintenance schedules and Work based learning.

REVIEW PERIOD

This qualification shall be reviewed every five **(5)** years.