

BQA NCQF QUALIFICATION TEMPLATE

SECTION A: QUALIFICATION DETAILS															
QUALIFICATION DEVELOPER (S)			JOINT TECHNICAL TRAINING SCHOOL												
TITLE		Certificate V in Weapon Control & Instrumentation Engineering								NCQF LEVEL		v			
STRANDS (where applicable)		1. 2. 3. 4.													
FIELD		Manufacturing, Engineering and Technology			SUB-FIELD			Engineering and Engineering Trades			CREDIT VALUE		250		
New Qualification										Legacy Qualification					
SUB-FRAMEWORK		General Education			TVET			√		Higher Education					
QUALIFICATION TYPE		Certificate	I	II	III	IV	V	√	Diploma	Bachelor					
		Bachelor Honours			Post Graduate Certificate			Post Graduate Diploma							
		Masters					Doctorate/ PhD								
RATIONALE AND PURPOSE OF THE QUALIFICATION															
RATIONALE: Instrumentation and Control Engineering plays a huge role in process industries. The technicians are expected to have a sound knowledge of components and devices used. This is to ensure that they can be able to carry out inspection, testing, maintenance, repairs and calibration of equipment for good working order. Accuracy in measurements is one of the major parameters in industrial processes as the ability of control depends upon ability to measure. According to the Botswana Vision 2036, which alludes that it is highly necessary to develop the human capital, the informal sector and also															

the Micro and Small Enterprises (MSES), in ensuring the achievement of the VISION 2036 pillars 1 & 2 namely Sustainable Economic Development and Human and Social Development, respectively. The Botswana Defense Force (BDF) is one of the organizations that require these kinds of technicians, in order to be at par with the fast changing military technology related equipment. There is currently a great shortage of Instrument and Control technicians in the BDF as such it was important to review and upgrade the old syllabus.

The rapid industrialization and globalization has created an environment for free flow of information and technology through fast and efficient means. This has led to shrinking of the world, bringing people from different culture and environment together and giving rise to the concept of world turning into a global village. A shift has taken place from the forgettable years of closed economy to knowledge based and open economy in the last few decades. In order to cope with the challenges of handling new technologies, materials and methods, it is important to develop human resources having appropriate professional knowledge, skills and attitude. Technical education system in Botswana is one of the significant components of the human resource development and has grown phenomenally during all these years. Now it is time to consolidate and infuse quality aspect through developing human resources, in the delivery system. Polytechnics and Technical Training Schools play an important role in meeting the requirements of trained technical manpower for our industries and field organizations. As such, The Botswana Education and Training Sector Strategic Plan (ETSSP 2015-2020) has made impressive performance in efforts to bring our country to be a knowledge based economy, through the careful development of human capital.

In addition, a report concerning Top Occupations of 2016, by the Human Resource Development Committee (HRDC) has clearly regarded Instrumentation and Control as some of the priority skills for the Mining, Minerals, Energy and Water Resources. As a result of the above mentioned thought after points, it was noticeable that indeed a qualification of this magnitude was necessary.

BQA NCQF QUALIFICATION TEMPLATE

PURPOSE: The purpose of this qualification is to produce graduates with broad technical knowledge, skills and competence to:

1. Apply calibration techniques to ensure instruments are in good working order.
2. Analyse engineering drawings for product design and information.
3. Apply diagnostic and troubleshooting skills to existing weapon instruments.
4. Inspect, test, and correctly use equipment.
5. Analyse manuals for maintenance procedures of weapons.

MINIMUM ENTRY REQUIREMENTS (including access and inclusion)

1. Certificate IV, NCQF Level 4 or equivalent.
2. Access through RPL will be provided through ETP policies in line with CAT and RPL national policies.

(Note: Please use Arial 11 font for completing the template)

BOTSWANA
Qualifications Authority

BQA NCQF QUALIFICATION TEMPLATE

SECTION B QUALIFICATION SPECIFICATION	
GRADUATE PROFILE (LEARNING OUTCOMES)	ASSESSMENT CRITERIA
1. Apply calibration techniques of instruments to ensure good working order.	1.1 Demonstrate the ability to calibrate sensors and instruments using appropriate tools and techniques. 1.2 Select the calibration process and its impact on the accuracy of measurements in industrial processes. 1.3 Evaluate the effectiveness of calibration techniques in ensuring equipment functionality.
2. Demonstrate understanding of engineering drawings and information.	2.1 Interpret engineering drawings to extract relevant design information. 2.3 Use engineering drawings to guide the assembly and maintenance of weapon control systems.
3. Apply diagnostic and troubleshooting skills to existing weapon instrument faults.	3.1 Identify and diagnose faults in weapon control systems using diagnostic tools. 3.2 Use troubleshooting techniques to resolve faults in weapon instrumentation. 3.3 Document the troubleshooting process and outcomes for future reference.
4. Perform routine instrument inspection to meet operational standards.	4.1 Inspect equipment to ensure it meets operational standards. 4.2 Test equipment functionality using appropriate testing procedures. 4.3 Demonstrate the proper use of equipment in industrial and military settings
5. Analyse manuals for maintenance procedures of weapon instruments.	5.1 Interpret maintenance manuals to identify relevant procedures for weapon systems. 5.2 Apply maintenance procedures outlined in manuals to ensure equipment functionality. 5.3 Evaluate the effectiveness of maintenance procedures in preventing equipment failure

BQA NCQF QUALIFICATION TEMPLATE

6. Use mathematics, natural science, and engineering sciences fundamentals knowledge to practical procedures and practices.	6.1 Apply mathematical and scientific principles to solve technical problems in weapon control systems. 6.2 Practice engineering fundamentals to maintain instrumentation systems. 6.3 Evaluate the application of theoretical knowledge in practical scenarios.
7. Demonstrate adherence to upholding codes and standards.	8.1 Carry out investigations to identify issues in weapon control systems. 8.2 Use relevant codes and standards in the maintenance of weapon systems. 8.3 Conduct standard tests and measurements to ensure system functionality.
8. Demonstrate understanding of engineering management principles and ethics.	8.1 Apply leadership and management principles during the performance of armament maintenance tasks. 8.2 Implement risk management strategies to ensure conducive armament operations. 8.3 Use resource management techniques to optimize personnel, time and material in armament activities.
9. Communicate effectively both orally and in writing within armament engineering context.	9.1 Prepare inspection reports following standardized templates and forms 9.2 Complete maintenance logs for specified weapon systems. 9.3 Covert drawings of weapon components into step-by-step repair guides. 9.4 Interpret and convey technical information effectively in both oral and written forms. 9.5 Develop effective business communication skills.

Note: Please use Arial 11 font for completing the template)

BQA NCQF QUALIFICATION TEMPLATE

SECTION C	QUALIFICATION STRUCTURE				
COMPONENT	TITLE	Credits Per Relevant NCQF Level			Total Credits
		Level [4]	Level [5]	Level [6]	
FUNDAMENTAL COMPONENT Subjects/ Courses/ Modules/Units	Mathematics I		10		10
	Physics		10		10
	Computer Technology		6		6
	Technical Drawing		8		8
	Workshop Technology		10		10
	Entrepreneurship Skills		5		5
	Technical Communications		6		6
	Basic Electrical Engineering		10		10
	Basic Electronics Engineering		10		10
	Basic Control & instrumentation Engineering		10		10
	Introduction to Software Engineering		5		5

BQA NCQF QUALIFICATION TEMPLATE

CORE COMPONENT Subjects/Courses/ Modules/Units	Apprenticeship I			20	20
	Industrial Instrumentation		10		10
	Fundamentals of Measurement Uncertainty		10		10
	Calibrations of sensors and instruments		10		10
	Optronic technologies			10	10
	Navigation devices		10		10
	Microprocessor & peripheral devices		8		8
	Industrial control			10	10
	Digital Electronics		10		10
	Process instrumentation		12		12
	Digital Control Systems		10		10
	Apprenticeship II			20	20

BQA NCQF QUALIFICATION TEMPLATE

STRANDS/ SPECIALIZATION	Subjects/ Courses/ Modules/Units	Credits Per Relevant NCQF Level			Total Credits
		Level [4]	Level [5]	Level [6]	
1.					
2.					
Electives	Military-grade Sensor Technology		10		10
	Circuit Testing in Defence Equipment		10		10
	Mechatronics Systems		10		10

BQA NCQF QUALIFICATION TEMPLATE

SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL

TOTAL CREDITS PER NCQF LEVEL

NCQF Level	Credit Value
Level 5	190
Level 6	60
TOTAL CREDITS	250

Rules of Combination:

(Please Indicate combinations for the different constituent components of the qualification)

This is a two-year qualification. Students will be awarded a certificate after completing and attaining:

Fundamentals: Must complete all (90 credits)

Core Modules: Must complete all (140 credits)

Electives: Choose two (20 credits)

Apprenticeship Training: Mandatory (40 credits)

(Note: Please use Arial 11 font for completing the template)

BQA NCQF QUALIFICATION TEMPLATE

ASSESSMENT ARRANGEMENTS

Assessment will be done by registered and accredited BQA assessors.

MODERATION ARRANGEMENTS

Moderation will be done internally and externally by BQA registered and accredited moderators.

RECOGNITION OF PRIOR LEARNING

Candidates may submit evidence of prior learning and current competence and/or undergo appropriate forms of RPL assessment to award credits towards the qualification by applicable university RPL policies 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 applicable national, regional or international professional bodies.

CREDIT ACCUMULATION AND TRANSFER

CAT will be provided through ETP policies that align with national CAT policies.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

Horizontal Articulation

- Certificate V in Instrumentation and Control Engineering
- Certificate V in Electrical and Electronics Engineering
- Certificate V in Mechanical Engineering
- Certificate V in Mechatronics Engineering

Vertical Articulation

- Diploma in Instrumentation and Control Engineering
- Diploma in Weapon Mechanics Engineering
- Diploma in Electrical and Electronics Engineering
- Diploma in Mechatronics Engineering

EMPLOYMENT PATHWAYS

- Instrumentation Technician
- Control Technician
- Weapon technician

QUALIFICATION AWARD AND CERTIFICATION

BQA NCQF QUALIFICATION TEMPLATE

Minimum Standards of Achievement for the Award of the Qualification

- To be awarded the Certificate V in Weapon Control & Instrumentation Engineering, a candidate must complete 250 credits, including fundamentals (90), core (140), and electives (20) components.
- Graduates will be awarded with Transcripts and Certificates

SUMMARY OF REGIONAL AND INTERNATIONAL COMPARABILITY

The **Certificate V in Weapon Control & Instrumentation Engineering (Botswana)** shares several similarities with the **Engineering Certificates from South Africa, the UK, and Australia**. All qualifications are at **Level 5** in their respective frameworks and focus on **instrumentation, control systems, and engineering fundamentals**. They employ a mix of **theory and practical assessments**, integrate workplace experience, and allow for **Recognition of Prior Learning (RPL)**. Additionally, all provide pathways to **higher education** and roles such as **Instrumentation Technician** or **Control Systems Technician**.

However, there are notable differences. The Botswana qualification is more extensive, with **250 credits over 2 years**, including **apprenticeship training** and specialized modules like **Military-grade Sensor Technology** and **Navigation Devices**, tailored for **military and defence applications**. In contrast, the South Africa, UK, and Australia qualifications are shorter (1 year, 90–120 credits) and focus on **general industrial instrumentation and control**. The Botswana course also has a unique **50/50 theory-practical assessment ratio**, while others vary in their assessment weightings. Overall, the Botswana qualification is more specialized and military-focused compared to the broader industrial focus of the others.

REVIEW PERIOD

Every five years. However, the landscape of engineering is forever changing, so constant updating will be done where applicable.

(Note: Please use Arial 11 font for completing the template)

BQA NCQF QUALIFICATION TEMPLATE

For Official Use Only:

CODE (ID)			
REGISTRATION STATUS	BQA DECISION NO.	REGISTRATION START DATE	REGISTRATION END DATE
LAST DATE FOR ENROLMENT		LAST DATE FOR ACHIEVEMENT	
REVISION DATE:		NAME OF PROFESSIONAL BODIES/REGULATORY	

BOTSWANA
Qualifications Authority