

BQA NCQF QUALIFICATION TEMPLATE

SECTION A: QUALIFICATION DETAILS													
QUALIFICATION DEVELOPER (S)				JOINT TECHNICAL TRAINING SCHOOL, BOTSWANA DEFENCE FORCE									
TITLE		Diploma in Line, Radio and Microwave Communications Engineering						NCQF LEVEL		6			
STRANDS (where applicable)		1. 2. 3. 4.											
FIELD		MANUFACTURING, ENGINEERING AND TECHNOLOGY						CREDIT VALUE		361			
SUB FIELD		ENGINEERING AND ENGINEERING TRADES											
New Qualification		✓		Legacy Qualification				Renewal Qualification					
								Registration Code					
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: Line, Radio and Microwave Communication Engineering is an important field in the military and the communication industry. In the military soldiers are expected to have a clear line of communication during operations therefore it is of prime importance that the Botswana Defence Force has competent technicians that can carry out inspection, testing, maintenance, repairs and calibration of													

telecommunication equipment for good working order. The telecommunication industry is a vast evolving industry therefore the technicians have to keep up with the changing military technology. Therefore, there is a need for this qualification to be upgraded to ensure the Botswana Defence Force has capable personnel. This is further supported by the Training Needs Analysis(TNA) survey carried out by JTTS and 5 Corps signals Units. The survey revealed a 60% marginal competency level among technicians in line systems, a 70% competency level in radio systems and 50% in Microwave systems in maintenance, troubleshooting and diagnosis of complex military equipment. The findings further reveal that as an additional cost saving mechanism for the BDF an in house skills training is required to address the identified competency gaps.

Furthermore, according to National Information and Communications Technology (ICT) Policy (Maitlamo, 2004, page 4) which states that “The country has invested heavily in infrastructure and telecommunications and has a high penetration of fibre connectivity running to the urban areas” proves that this qualification will contribute to the achievement of the national goals. The National Development Plan 11 (NDP11, 2017-2023, page 93) states that “The extension of telecommunications infrastructure and services to the rural areas has increased the number of people having access to services”. In this regard, the development of this qualification is important as there is now a great need for technicians that should be maintaining these telecommunications equipment.

The Botswana Education and Training Sector Strategic Plan (ETSSP, 2015, page 30) states that “Excellence in teaching and learning is fundamental to producing skilled artisans and technicians with the attributes that employers are looking for” which is aimed at reforming education system and also to addressing issues of poor performance in the sector. The vision 2036 (vision 2036, Page 16) states that “In contemporary economies, the ICT sector contributes significantly to the economy. It is also a crucial enabler of efficient product and service delivery across all economic sectors including in the delivery of government services”. This shows that this qualification is the building block towards human and social development. This qualification is a response to Human Resource Development Council which addresses the issues of skill mismatch with regards to produce globally competitive human resource.

The JTTS and 5 Corps of Signals Survey through the 2023 Training Needs Analysis questionnaires and meetings proved that there are limitations in the field of Telecommunications and Electronics Engineering in the Unit, hence there is a need for this qualification development. An indispensable condition for modern, knowledge-based socio-economic development is the continuous improvement

and adaptation of employees' skills for a dynamically changing labour market. It is in this context that the graduates are to be competent and well invested in almost every field of Telecommunications Engineering.

References:

1. National Information and Communications Technology (ICT) Policy
2. The Education and Training Sector Strategic Plan
3. Human Resource Development Council of Botswana
4. The National Development Plan 11
5. JTTS-5 COS 2023 Training Needs Analysis Report
6. Vision 2036, Achieving Prosperity for all

PURPOSE: (itemise exit level outcomes)

The purpose of this qualification is to produce graduates with advanced technical knowledge, skill and competence to:

- a. Analyse subscriber requirements and geographical data to perform fiber optic and wireless access network installations.
- b. Execute advanced fault diagnosis, repair, routine performance testing and maintenance on complex telecommunications network infrastructure.
- c. Analyse, construct, and evaluate the performance of complex analog and digital electronic circuits and industrial equipment.
- d. Demonstrate high-level of technical and professional communication competencies in telecommunication sector.
- e. Manage Telecommunication workshop in compliance to quality assurance and industry standards.

MINIMUM ENTRY REQUIREMENTS (including access and inclusion)

- a. Candidate considered for this qualification should be having any qualification at certificate IV at NCQF level 4 or equivalent.
- b. Access through RPL and CAT will be provided through ETP policies in line national RPL and CAT.

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SECTION B		QUALIFICATION SPECIFICATION	
GRADUATE PROFILE (LEARNING OUTCOMES)		ASSESSMENT CRITERIA	
1. Apply engineering principles to diagnose and troubleshoot to solve existing telecommunication system faults systematically.		1.1 Diagnose faults in telecommunication systems using diagnostic tools (digital multimeter, oscilloscopes). 1.2 Implement troubleshooting techniques to resolve faults in telecommunication equipment's. 1.3 Document the troubleshooting process and outcomes for future reference.	
2. Use mathematics, natural science, and engineering sciences fundamentals knowledge to practical procedures and practices in Telecommunication Engineering.		2.1 Apply mathematical and scientific principles to solve technical problems in telecommunication systems. 2.2 Evaluate the application of theoretical knowledge in practical scenarios. 2.3 Analyse system behaviour using engineering science concepts to predict system performance under varying operating conditions.	
3. Conduct calibration procedures on test and measurement instruments used in telecommunications.		3.1 Demonstrate the ability to calibrate sensors and instruments using appropriate tools and techniques. 3.2 Evaluate the effectiveness of calibration techniques in ensuring equipment functionality. 3.3 Analyse calibration results and implement appropriate correction techniques to ensure compliance with telecommunication operational standards.	
4. Analyse engineering drawings to extract product design specifications and technical information for the assembly and integration of telecommunication systems.		4.1 Extract relevant design information from relevant telecommunications engineering drawings. 4.2 Interpret engineering drawings to guide the assembly and maintenance of telecommunication systems. 4.3 Implement standard Telecommunication symbols, legends, tag numbering systems, to	

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	ensure accurate identification of devices, cables, terminals, and electronics elements.
5. Demonstrate competence in application of appropriate techniques, resources and modern computing, engineering and IT tools to well-defined telecommunication engineering problems.	5.1 Use appropriate electrical tools to measure and record process variables in telecommunication systems. 5.2 Configure and program embedded controllers to implement well-defined signal transmission processes. 5.3 Evaluate telecommunication engineering solution using electronics system simulation platforms.
6. Design solutions for well-defined telecommunication problems and assist with the design of systems, components or processes to meet specified needs.	6.1 Analyse telecommunication problem specifications to formulate functional requirements, performance parameters, and system constraint. 6.2 Integrate system components and validate the performance of designed telecommunication solutions against specified operational needs. 6.3 Evaluate telecommunication design solutions to improve performance, reliability, safety, and compliance with applicable standards.
7. Communicate effectively both orally and in writing within telecommunication and electronics engineering context.	7.1 Prepare inspection reports following standardized templates and forms. 7.2 Complete maintenance logs for specified Telecommunication systems. 7.3 Interpret and convey technical information effectively in both oral and written forms.
8. Demonstrate understanding of engineering management principles and ethics within maintenance of telecommunication systems in electrical environments.	8.1 Apply leadership and management principles during the performance of telecommunication maintenance tasks. 8.2 Implement risk management strategies to ensure conducive telecommunication operations. 8.3 Manage resource to optimize personnel, time and material in telecommunication activities.

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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		8		8
	Physics		10		10
	Computer Technology		6		6
	Technical Drawing		8		8
	Workshop Technology		10		10
	Entrepreneurship Skills		5		5
	Technical Communications		6		6
	Mathematics II		8		8
	Basic Electrical Engineering		10		10

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	Basic Electronics Engineering		10		10
	Basic Control & instrumentation Engineering		10		10
CORE COMPONENT Subjects/Courses/ Modules/Units	Introduction to Software Engineering		5		5
	Fluid Power System		10		10
	Workshop Placement I			20	20
	Troubleshooting & Maintenance		10		10
	Communication Technology			10	10
	Antenna & Propagation			10	10
	Advanced Electrical Engineering			10	10
	Principles of Telecommunication			10	10
	PABX System			10	10
	Transmitter & Receivers			10	10
	Computer Networks		10		10
	Optical Fibre Systems			10	10
	Electronics Project		8		8
	Workshop Placement II			20	20
	Advanced Electronics			10	10

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	Introduction to Programming			10	10
	Microprocessors & Microcontrollers			10	10
	Mathematics III			10	10
	Advanced Radio Systems			10	10
	Programming II			10	10
	Microwave Techniques			10	10
	Satellite Communication			10	10
	Principles of Management			6	6
	Mathematics IV			10	10
	Telecommunication Project			10	10
STRANDS/ SPECIALIZATION	Subjects/ Courses/ Modules/Units	Credits Per Relevant NCQF Level			Total Credits
		Level [4]	Level [5]	Level [6]	
1.					
2.					
Electives	Fluid Power System II			10	10
	Mechatronics Systems			10	10

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SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL

TOTAL CREDITS PER NCQF LEVEL

NCQF Level	Credit Value
Level 5	120
Level 6	241
TOTAL CREDITS	361

Rules of Combination:

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

To achieve the qualification, a learner must complete a total of 361 credits comprising 85 credits from Fundamental modules, 266 credits from Core modules and atleast 10 credits from Elective modules.

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BOTSWANA
Qualifications Authority

ASSESSMENT ARRANGEMENTS

ASSESSMENT

Assessment will be integrated, made up of Formative and Summative Assessment. It will be conducted by BQA registered and accredited assessors.

Formative Assessment

Formative assessment will be administered throughout the learning period in the form of written tests and practical and formative assessment shall contribute 50% of the final grade of the course.

Summative Assessment

A summative assessment will be administered at the end of each module. Summative assessment shall contribute 50% to the course final grade. Assessment will be conducted by BQA registered and accredited assessors. Assessors must possess a minimum qualification of Bachelor of Engineering in Telecommunication Engineering or related field with a teaching and assessment qualification (e.g. PGDE, CVET, DVET, PGDHE).

MODERATION ARRANGEMENTS

Both internal and external moderation processes will be carried out by BQA registered and accredited moderators in line with institutional policies. Moderators must possess a minimum qualification of Bachelor of Engineering in Telecommunication Engineering or related field. The moderator should be a highly experienced assessor with a teaching, assessment and moderation qualification.

RECOGNITION OF PRIOR LEARNING

There will be provision of RPL to award this qualification in accordance with ETP policies and national RPL policy.

CREDIT ACCUMULATION AND TRANSFER

Awarding of the qualification through CAT will be applied in the line with ETP CAT policy and national CAT policy.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

Horizontal Articulation

- Diploma in Electronics Engineering
- Diploma in Electrical Engineering

- Diploma in Network Engineering
- Diploma in Information and communication Technology

Vertical Articulation

- Bachelor of Engineering in Telecommunication Engineering
- Bachelor of Engineering in Electronics Engineering
- Bachelor of Engineering in Electrical Engineering

EMPLOYMENT PATHWAYS

- Telecommunication equipment Technician
- Control Technician
- Network Administrator Technician
- Systems Technician
- Telecommunication laboratory Technician
- Telecommunication Technical Support Technician
- Satellite Communications Technician
- Radio Systems Design Technician

QUALIFICATION AWARD AND CERTIFICATION

QUALIFICATION AWARD: To be awarded the qualification of Diploma in Line, Radio and Microwave Communication Engineering, a candidate should satisfy the requirements of the qualification, which is 361 Credits; 85 Credits of Fundamental modules, and 266 Credits of Core modules and 10 credits Elective modules.

CERTIFICATION: Upon successful completion of all requirements of the qualification, the ETP shall issue transcripts and certificates to the graduates.

SUMMARY OF REGIONAL AND INTERNATIONAL COMPARABILITY

The Diploma In Line, Radio and Microwave Communication Engineering (Botswana) shares a lot of similarities with the Engineering Diploma from New Era College of Arts, Science and Technology (Botswana), UNISA (South Africa) and City and Guilds (United Kingdom, UK).

1. SIMILARITIES

a. Title of Qualification, NQF Level, and Credit Value or Duration

All three qualifications are generally pegged at a Level 6 equivalent on national frameworks and they all fall under engineering trades.

b. Main Exit Outcomes

The qualification shares several key similarities. Firstly, all of them focus on telecommunication technology, encompassing both maintenance and installation procedures. Additionally, each qualification includes training in the analysis and interpretation of engineering drawings. Finally, they are all designed to adhere to both engineering standards, occupational health and safety practices.

c. Domains/Modules/Courses/Subjects:

Fundamental subjects across all qualifications includes: Mathematics, Physics, Basic Electronics Engineering, and Basic Electrical Engineering. The curricula involve practical training and component diagnostics.

d. Assessment strategies and Weightings

The three qualifications employ a combination of theory and practical assessments, integrate workplace experience, and allow for Recognition of Prior Learning (RPL).

f. Education and Employment Pathways

All qualifications provide pathways to higher education and higher employment roles

2. DIFFERENCES

a. Title of Qualification, NQF Level, and Credit Value or Duration

Based on a comparison with other institutions, our Qualification has key structural differences. Firstly, our Qualification title is Diploma in Line, Radio and Microwave Communication Engineering, New Era College of Arts, Science and Technology Qualification is Diploma in Telecommunications Engineering while UNISA qualification is Advanced Diploma in Electrical and Telecommunications, our credit value is 361 credits, which is 4 credits less than the 365 offered at New Era College of Arts, Science and Technology in Botswana. However, it is significantly higher than other institutions, exceeding UNISA's 120 credits by 241 and City and Guilds International's 149 credits by 212. Secondly, our programme

runs for three years, whereas others are completed in two years. This extended duration is necessary to accommodate the program's more extensive military content.

b. Main Exit Outcomes

The most significant distinction lies in the area of specialization. While the other qualifications cover general telecommunication systems, our program is specifically focused on military communication, equipment, and applications

c. Domains/Modules/Courses/Subjects

JTTS qualification offers modules like Basic Control & instrumentation Engineering, Programming II, Advanced Radio Systems, Microwave Techniques, New Era College of Arts, Science and Technology, Botswana, offers hands-on telecom skills, including modules such as Fuzzy Logic and Neural Networks, Mobile Computing, Optical Fibre Systems, and Architecture for Digital Systems, with a focus on the installation and maintenance of general communication networks. In contrast, UNISA (South Africa) offers an advanced diploma that leans toward engineering science and product development, incorporating elements of design and manufacturing alongside modules like Digital Communications and RF Engineering. Meanwhile, the City and Guilds qualification from the UK is a foundational program focused on basic digital technology and practitioner skills, serving as an entry point into the communications industry and The core module names are different but offer the same overall content.

d. Assessment strategies and Weightings

The qualification structures vary across regions, with the JTTS qualification employing an even split of 50% formative and 50% summative assessment, whereas the South African qualification places greater emphasis on final examinations through a 30% formative and 70% summative weighting, and the United Kingdom qualification adopts an intermediate distribution of 40% formative and 60% summative assessment.

e. Qualification rules and minimum Standards for the award of the qualification

To be awarded the Diploma in Line, Radio and Microwave Communication Engineering, a candidate must complete all 361 credits, comprising 85 fundamental credits and 266 core credits and 10 elective credits with UNISA (South Africa) candidates required to achieve at least 50% in all fundamental and core modules, while City and Guilds, UK candidates must demonstrate competency in all mandatory units and their selected electives.

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REVIEW PERIOD
This qualification will be reviewed after 5 years upon registration.

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CODE (ID)			
REGISTRATION STATUS	BQA DECISION NO.	REGISTRATION START DATE	REGISTRATION END DATE
LAST DATE FOR ENROLMENT		LAST DATE FOR ACHIEVEMENT	

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