SECTION A:	QUALIFICATION DETAILS																
QUALIFICATION DEVELOPER (S)	New Era College of Arts, Science and Technology																
TITLE	Diploma in Telecommunications Engineering													NCQF LEVEL	6		
FIELD	Manufacturing, Engineering and Technology		SUB-FIELD		Telecommunication Engineering									CREDIT VALUE	365		
New Qualification		√	Review of Existing 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:

The development of the qualification in Telecommunications Engineering was guided by the findings from the market survey innovations which highlighted the need for this qualification from industry expects. 100% of the respondents agreed that “the qualification meets with the skills demanded in the industry and also meets with technological developments”. The Education and Training Sector Strategic Plan, ETSSP, (2015-2020) was aimed at reforming the education system and addressing issues of poor performance in the sector, National Development Plan 11, NDP11, (2017 -2023, Page 118). The Human Resource Development Council, HRDC, (2016-2021, Page 119), through the 14 HRDC Sector Committees which were established to address the problem of skills mismatch, in order to produce a globally competitive Human Resource. Vision 2036, which is focused on “achieving prosperity for all”, under Pillar 2, *Human and Social Development* is aimed at education and skills development. This would ensure that Botswana society will be knowledge based with relevant quality education that is outcome based, emphasizing on education with production, Vision, (2036, Page 31). Furthermore, Statistics Botswana through its data portal led the 2030 agenda for sustainable development and

refined its mandate through sustainable development goals. Goal number 4 was aimed at leading quality education to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all, (http://botswana.opendataforafrica.org). In tandem with the above, Botswana Qualifications Authority (BQA) in consultation with HRDC Sector Committees developed fields that every qualification developed in the economy of Botswana should meet the sector supply and demands. Therefore, The Diploma in Telecommunications Engineering was developed to meet Field 10: Manufacturing, Engineering and Technology. Therefore, The Qualification Developer in its quest developed a robust home grown qualification that meets the demands of the niche market. The qualification has unique modules that are relevant for ensuring unique skills for Higher Education.

After 2005, The Government of Botswana established Botswana Qualification Authority (BQA) to accredit local institutions both public and private and to ensure that quality qualifications were developed and accredited. Through the department of Curriculum Design and Development, The Qualification Developer developed a robust home-grown Diploma in Telecommunications Engineering that meets with the national and economical needs of Botswana in the training of Telecommunications Engineering and related field.

PURPOSE:

Diploma in Telecommunications Engineering was developed to equip students with dynamic and interdisciplinary field to integrate Architecture for Digital systems, Mobile Computing, Antenna and Propagation, Network and PABX, Optical and Wireless Communication. The graduates should be able to, among other tasks:

- Conduct a practical work on electronics design
- Conduct computer programming using Python as the primary programming language and
- Conduct Telecommunications engineering research.
- Assesses and recognizes workplace skills acquired with the benefit of formal education and training.
- Describe the learning outcomes required to effectively participate in a structured Telecommunications workplace.
- Ensure portability across the Telecommunications Engineering industry. This will allow for future career advancement across the various fields of specialization.

ENTRY REQUIREMENTS (including access and inclusion)

Minimum entry requirement:

- Certificate IV, NCQF Level 4 (General Education or TVET) or equivalent with passes in 6 subjects including English, Mathematics, Physics and Chemistry.

- Access through Recognition of Prior Learning (RPL) and Credit Accumulation and Transfer (CAT) will be provided through ETP policies in line with National RPL and CAT Policies.

SECTION B QUALIFICATION SPECIFICATION

GRADUATE PROFILE (LEARNING OUTCOMES)	***ASSESSMENT CRITERIA***
Describe the data link layer of telecommunications systems and its interface with the physical layer.	• Outline the main features of the OSI model • Describe main properties and limitations of transmission media • Describe basic link layer protocols
Test the transmission of digital signals over analogue links and analogue signals over digital links presented.	• Test analogue transmission over digital lines • Examine digital transmission over analogue lines • Test signal transforms.
Experiment electronics fundamentals for both direct current (DC) and alternating current (AC) circuit.	• Experiment the operation of current, voltage and power sources. • Show how to properly bias diodes and transistors (BJT), and produce equivalent transistor circuits for small signal AC.
Conduct a practical work on electronics design.	• Examine different electronics equipment such as power supplies, signal generators and oscilloscopes. • Experiment on electronics circuit simulation software such as MULTISIM for both analogue and digital design and simulation. • Use the fault detection methods in fixing circuit operations. • Simulate different key parameters for circuit operation.
Conduct computer programming using Python as the primary programming language.	• Prepare the python programming model. • Use the python programming language to control, data and procedural abstraction. • Analyse the behaviour of basic programs that incorporate simple control structures, parameterized functions, arrays, structures and I/O. • Debug programming Language
Apply the Antenna for polarization and bandwidth.	• Describe the important elements of antenna and propagation theory. • Classify antennas and their properties.

	• Estimate the directivity and power radiated from a generic antenna • Describe common paradigms in mobile computing (low power, limited resources, fault tolerance, and persistence) • Use mobile application frameworks and development environments
Build Networking to measure CCNA 3 and 4, where routing and switching, LAN, and WAN technologies as well as optical transmission media are covered.	• Describe OSI model and TCP/IP model • Test the operation of different transmission media and cabling of LANs and WANs. • Configure the router for operation in LANs and WANs. • Configure the router for operation in LANs and WANs. • Demonstrate the competence on the OSI and TCP/IP models
Examine data represented in a digital system to establish conversions between system and human readable forms	• Examine number systems and conversion between number bases. • Apply higher level logic such as counters, shift registers and multiplexers in digital systems • Design serial-serial, parallel-parallel, serial-parallel, and parallel-serial data transmission systems • Select appropriate system parameters for digital representation of analogue signals. • Perform simple manipulations of digital audio and image.
Analyse private automatic branch exchange, to switch an organization.	• Describe operation of the PABX system • Examine integrations of PABX with ACD, IVR and CTI • Distinguish between innovations (including shift from analog to digital transmission and switching), and introduction of stored program controlled PABX systems.
Conduct Telecommunications engineering research.	• Produce a product to make relating to Telecommunications Engineering. • Prepare the project schedule. • Prepare the product for the project. • Get guidance from the supervisor on the project to be done.

	• Investigate the problems. • Assess the result deciding further work necessary to carry the problems to logical conclusion. • Prepare clear report stating the aims and objectives using design and other criteria under supervision. • Develop costing and estimating models. • Assemble the design and frame where necessary. • Draw up conclusion. • Type the report to an acceptable standard. • Bind the report. • Present the report under the supervision of the lecturer or supervisor to accredited audience.
INDUSTRIAL ATTACHMENT Attach to an appropriate Telecommunications Engineering corporation to allow the student to acquire the technical knowledge in the relevant field, and to see thing originally happening	• Find attachment to companies in the relevant field. • Apply their practical knowledge and skills in Telecommunications. • Produce placement report detailing work done and skills acquired • Present on their placement experience • Keep a detailed logbook of work done, with workplace supervisor approvals

SECTION C	***QUALIFICATION STRUCTURE***				
COMPONENT	***TITLE***	***Credits Per Relevant NCQF Level***			***Total (Per** Subject/ Course/ Module/ Units)*
		Level [5]	***Level [6]***	***Level [7]***	
FUNDAMENTAL COMPONENT *Subjects/ Courses/ Modules/Units*	Principles of Telecommunication	15			15
	Information and Computing Skills	15			15
	Engineering Mathematics 1	10			10
	Professional Practice and Communication Skills	10			10
	Fundamentals of Electronics	15			15
CORE COMPONENT *Subjects/Courses/ Modules/Units*	Introduction to Programming		15		15
	Engineering Mathematics 2		10		10
	Electrical and Electronics Workshop		15		15
	Architecture for Digital Systems		15		15
	Computer Networks		15		15
	Private Automatic Branch Exchange **(PABX)** Systems		15		15
	Radio Systems		15		15
	Optical Fibre Systems		15		15

	Antennas and Propagation		15		15
	Digital Electronics		15		15
	Industrial Management		10		10
	Mobile Computing		15		15
	Circuit Theory		15		15
	Advanced Telecommunication Systems		15		15
	Telecommunication Project		20		20
	Industrial Attachment		50		50
ELECTIVE/ 6OPTIONAL COMPONENT *Subjects/Courses/ Modules/Units* ***(Select two)***	C++ Programming		15		15
	Fuzzy Logic and Neural Networks		15		15
	Software Engineering		15		15
	Advanced Radio Systems		15		15
	Totals				**365**

SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL	
TOTAL CREDITS PER NCQF LEVEL	
NCQF Level	***Credit Value***
Level 5	***65***
Level 6	***300***
TOTAL CREDITS	***365***
Rules of Combination: ***(Please Indicate combinations for the different constituent components of the qualification)***	

Rules of Combination:

A candidate to be a qualified graduate in this qualification and be awarded the Qualification must complete 65 Credits of the Fundamental Component, 270 Credits of the Core component and 30 Credits for the Electives. This gives a total of **365 credits.**

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.

Summative assessment

The Final Examination contributes to 60% of the final grade.

Formative assessment

Formative assessments contribute to 40% of the final grade.

MODERATION ARRANGEMENTS

Internal and external moderators to be engaged will be BQA accredited subject specialists in relevant fields with relevant industry experience and academic qualifications. Both internal and external moderation shall be done in accordance with applicable policies and regulations.

RECOGNITION OF PRIOR LEARNING

- Recognition of Prior Learning (RPL) is related to prospective students who had on-the-job Training and assessed by the employer's Human Resources Training and in consultation with Botswana Engineers Registration Board (BERB) to confirm competence and Notional learning Hours gained during the Experiential Period. The Institution would use Evaluation Form to convert the accumulated hours into credits related to the areas covered with equivalence to the modules in the qualification and determine the entry level.

CREDIT ACCUMULATION AND TRANSFER

Credit Accumulation and Transfer CAT policies which is in line with National Policies.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

Horizontal Pathway

Graduates of this qualification may consider pursuing related qualification for the purpose of multi-skilling, retooling and gain expert knowledge in the Telecommunications Engineering field. Credit transfer, module mapping and exemptions can be exercised in the following qualifications:

- Diploma in Telecommunications and Information Technology.
- Diploma in Communications Engineering.
- Diploma in Telecommunication and Cellular Mobiles.
- Diploma in Telecommunications and Satellite Communications. etc.

Vertical Pathway

Graduates may progress to qualifications such as:

- Bachelor of Engineering in Telecommunications.
- Bachelor of Science in Communications Engineering.
- Bachelor of Science in Telecommunication and Cellular Mobiles.
- Bachelor of Engineering in Telecommunications and Satellite Communications.

EMPLOYMENT PATHWAYS

Graduates from the Diploma in Telecommunication Engineering have requisite competencies and attributes to work as:

- Telecommunication Engineer.
- Telecommunications Sales Officer.
- Telecommunications Solutions
- The Qualification Developer and Implementer.
- Call Centre Training and Development Facilitator.
- Wireless Systems Engineer.
- Optic Fibre Network Engineer.
- Unified Communications Engineer.
- Telecommunications Project Manager.
- Field Service Engineer.
- Systems Engineer.
- Telecommunication outside Plant Engineer (OSP).

QUALIFICATION AWARD AND CERTIFICATION

Minimum Standard of achievement for the award of the qualification.

A candidate to be a qualified graduate in this qualification and be awarded the Qualification must complete 65 Credits of the Fundamental Component, 270 Credits of the Core component and 30 Credits for the Electives. This gives a total of **365 credits.**

Certification

Students have to pass all modules for the **Diploma in Telecommunications Engineering** to be awarded the qualification according to the standards prescribed for the award of the qualification applicable policies.

REGIONAL AND INTERNATIONAL COMPARABILITY

Summary of Similarities and Differences Observed

1. Massachusetts Institute of Technology, Diploma in Telecommunications Engineering, NCQF Level 6, 266 Credits, is highly interdisciplinary, combining studies in electrical engineering, computer science and systems analysis. Students begin by taking foundational coursework in math, chemistry, physics and computer programming. From there, they can explore more advanced concepts related to communications systems and apply their knowledge to telecommunications engineering problems. Prior to graduation, students are usually required to complete a senior design project.

2. University of South Africa (UNISA), Diploma in Telecommunication engineering, NCQF Level 6, 250 Credits, is a dynamic field that studies computer sciences and electrical engineering in order to have an understanding of how telecommunication systems work. Coursework can include networks, fiber optics, routing and circuit design as well as the political, managerial and ethical ramifications of these systems.

3. Other Qualifications offered in countries such as New Zealand and Switzerland (Europe) generally emphasis on development of competencies in local and global Telecommunication Engineering can be synthesized to bring the best of Telecommunications Engineering Skills and Competencies. Market trends signify that Telecommunications Industry has high skills demand; labour market Observatory confirms the same through HRDC Sector committees on Occupations on demand. Although the qualifications examined generally follow similar structures and standards, there are differences, though not significant, in that their niche market and programme layout are focusing in certain sectors of the economy which is different from the other.

Comparability and articulation of the proposed qualification with the ones examined

The proposed qualification generally compares well with all the qualifications studied since the exit outcomes cover similar scope and depth and are aligned to exit-level descriptors typical to this level and type of qualification as done within the region and beyond as well as competencies required for registration

and accreditation with professional bodies such as ERB – Engineering Registration Botswana and Botswana Communications Regulatory Authority (BOCRA. However, what sets it apart from the qualifications examined is that there is provision for development of attributes such as Electrical, Networks and professionalism of Telecommunications Engineering, the communication system, which are crucial for the Telecommunications industry. The programme for The Qualification Developer is outcome based and is anchored on a competency and credit-based qualification framework.

REVIEW PERIOD

The qualification will be reviewed after 5 years.