QUALIFICATION SPECIFICATION SECTION A							
QUALIFICATION DEVELOPER	Botho University						
TITLE	**Bachelor of Science in Computer Networking**			**NCQF LEVEL**	**7**		
FIELD	**Information and Communication Technology**	**SUB-FIELD**	**Computer Networking**				
New qualification	**X**	Review of existing qualification					
SUB-FRAMEWORK	General Education		TVET		**Higher Education**	**X**	
QUALIFICATION TYPE	Certificate		Diploma		**Bachelor**	**X**	
	Bachelor Honours		Master		Doctor		
CREDIT VALUE 480							

RATIONALE AND PURPOSE OF THE QUALIFICATION

Rationale

Botswana, through Vision 2016, envisages having an educated and informed nation by 2016 (Vision 2016). This vision has been reiterated by vision 2036 that aligns the country's goals with the global agenda for sustainable development. Vision 2036 advocates sustainable economic development and human and social development that require educators to attain the necessary skills and competencies to advance in their careers; as facilitators of teaching and learning in Higher Education (HE) and for their personal enrichment, empowerment or growth.

NDP 11 states the need to provide an adequate supply of qualified, productive and competitive human resources policy frameworks. It is to this effect that the BSc in Computer Networking qualification is being developed: to achieve the vision by equipping the participants with the knowledge, skills and competencies of Computer Networking in line with the creation of Knowledge based economy in Botswana.

ideal

Human Resource Development Council (HRDC) of Botswana has published the document, which provides a list of occupations that have been identified by the employers as being in high demand at a national level.

Priority skills in each occupation have been identified and these include both the core skills and soft skills. 'Information and Communication Technology' has been identified as one of the occupations that are currently experiencing shortages in the labour market (short term) and occupations that show relatively strong employment growth (long term). (HRDC, 2016).

This qualification aims to develop the necessary knowledge, skills and practical experience in students to enable them to meet this challenge. The modules building the 'BSc in Computer Networking' qualification aims to provide students with the necessary mix of technical and innovative skills to qualify them as computer networking professionals. This qualification provides knowledge, skills and competencies needed in the industry in emerging economies and thus resonates with the aspirations of self-reliance in Botswana and beyond.

An industrial survey to establish whether the qualification was viable. The responses from the survey were positive with aspiration and conviction that the qualification was contemporary, needed, and sustainable.

The qualification will cover the core areas of BSc in Computer Networking and will also cover most areas of organizational requirements for the networking. There will also be opportunities for specialization, by choosing from alternative elective options that will further develop the skills and knowledge relevant to the computer networking industry.

Purpose of the qualification

This qualification is designed to produce graduates with the theoretical and practical skill set to apply the latest technologies and tools in networks. The graduate can be ready with the necessary skills to build small, mid and large enterprise network solutions for the organizations. In addition, it offers new applications which can be effectively used in Computer Networking.

The qualification in Computer Networking aims to support national manpower building efforts by providing a rigorous, industry ready graduates who have the necessary knowledge, skills and personal attributes to offer an immediate contribution to the economy either through direct employment or entrepreneurship and job creation. Organizations of all sizes struggle to find adequately skilled technical staff with the ability to work on expensive computing equipment with minimal supervision. This skills gap is currently being filled

where affordable with the recruitment of expatriate manpower, however this model cannot be sustained indefinitely and there is an urgent need to empower Botswana citizens.
ENTRY REQUIREMENTS (including access and inclusion)
Entry into this qualification is through any one of the following requirements; 1) The minimum entry requirement is BGCSE or other equivalent with passes in relevant subjects.. 2) Certificate V or Diploma in a related Field, with provisions for exemptions, where applicable, in line with CATS and RPL Policies. 3) Applicants that do not meet the above criteria but possess relevant industry experience will be considered through recognition of prior learning (RPL).

QUALIFICATION SPECIFICATION **SECTION B**	
GRADUATE PROFILE (LEARNING OUTCOMES)	**ASSESSMENT CRITERIA**
1. Demonstrate advanced and specialized knowledge of concepts, terminology, theories, models, and methods in the field of Computer Networking.	Learner should be able to: • Apply networking concepts by using a network simulator. • Demonstrate advanced techniques in implementation of networking theory, models and methods by using packet tracer simulator. • Create a LAN (Local Area Network) • Develop cross wired and straight through cables through cable by using clamping tools.
2. Apply different principles of Computer Networking and prepare the organizational requirements.	Learner should be able to: • Demonstrate the principles and practices in analysis and design of computer network

	system and be able to prepare the documents which are relevant to needs of the organization. • Apply the principles and create a LAN and WAN.
3. Critically analyze the requirement of Computer networking in an organization and provide an independent evaluation of the data.	Learner should be able to: • Analyze the data transfer in the networks. • Analyze the requirement of computer networks data through Network Interface cards and hard drive access speeds.
4. Develop and systematically test different networking models and manage its day to day functions and processes.	Learner should be able to: • Create Computer Networking business process for the organization. • Design network models using CISCO simulators.
5. Carryout different Computer Networking experiments and critically evaluate their concepts and problems.	Learner should be able to: • Design and configure the network topology by using packet tracer software and distance vector routing protocol. • Apply the network configuration commands
6. Identify, apply and solve the various networking complex and volatile problems in the organization.	Learner should be able to: • Troubleshoot network connectivity problems with a hub, router or switch. • Troubleshoot excessive network collisions by providing a good network plan.
7. Apply advanced methods of network security measures by identifying various	Learner should be able to:

threats which forms the basis for reliability of the career in organization.	• Solve network security measures by implementing a firewall, antivirus systems, Intrusion detection systems. • Use port scanners, network sniffers, vulnerability scanners, and general network tools as security measures for various threats.
8. Administer the network infrastructure responsibility and be accountable for the issues and problems arise in the organization networking environment.	Learner should be able to: • Develop a case for the issue and problems related to network environment including software and hardware platforms. • Create a plan for recovery data in case of network failure.
9. Critically analyze ethical and legal issues in developing computer network solutions for small, mid and large enterprises.	Learners should be able to: • Categorize various ethical and legal issues for computer networks. • Contrast the ethical issues in open networks, closed networks, service provider issues, and backbone site issues.
10. Communicate effectively with a range of audiences and prepare technical documents and make effective oral presentations.	Learners should be able to: • Create technical documents, reports and evidences by using any available Microsoft tools such as word, excel and PowerPoint.

Mapping of Exit learning outcomes of the qualification to NCQF's knowledge, skills and competency

Exit level outcome	Knowledge	Skill	Competency
ELO1	X		
ELO2		X	

ELO3		X	X
ELO4	X	X	
ELO5		X	X
ELO6	X	X	
ELO7		X	X
ELO8	X		X
ELO9		X	X
ELO10		X	

QUALIFICATION STRUCTURE SECTION C			
FUNDAMENTAL COMPONENT Subjects / Units / Modules /Courses	**Title**	**Level**	**Credits**
	Academic Writing for STEM	6	10
	Entrepreneurship and Innovation	8	20
	Professional Issues and Ethics	6	10
CORE COMPONENT Subjects / Units / Modules /Courses	Computer and its Essentials 1	5	10
	Programming Logic and Design	5	10
	Mathematics	5	10
	Operating Systems and Hardware	5	20
	Networking Fundamentals	6	20
	Computer and its Essentials 2	6	10
	Computer System Architecture	6	10
	Database Concepts	6	10
	Programming using C++	6	20
	Network Security	6	10
	Routing and Switching	6	10
	Routing and Switching Lab	6	10
	Web Design and Development	6	10
	Web Design Practice Lab	6	10
	Essentials of Linux	6	10
	Wireless Networks	6	10
	Scaling Networks	6	20
	Managing Business Desktops using Windows	6	10

	LAN and WAN design	7	10
	LAN and WAN design Lab	7	10
	Linux Network Administration	7	20
	Research Methods for STEM	7	10
	Implementing IP Routing	7	10
	IT Service Management	7	10
	Database Administration and Security	7	20
	Software Defined Network Engineering	7	10
	Professional Practice in Computing	7	40
	IP Switched Networks	7	10
	Research Project 1: Proposal Writing	7	10
	Windows Network Administration	7	10
	IT Infrastructure Management	7	10
	Research Project 2: Dissertation	8	20
ELECTIVE COMPONENT Subjects / Units / Modules /Courses			
	Enterprise and ISP Network Solutions	7	10
	Cloud Computing and Security	7	10
	Security by Design	7	10
	Media and Storage	8	10
	Cybersecurity Operations	8	10
	Troubleshooting Routing and Switching	8	10

Rules of combinations, Credit distribution (where applicable):

- This qualification will have at least 480 credits and take at least four years to complete including a full semester internship under the normal fulltime mode of study.
- The 40 credits internship module, called the Professional Practice module, may typically be done after the student has passed at least 240 credits worth of modules.
- The credit combination for this qualification is from 40 fundamental components, 420 core components and the remaining 20 is from elective components, where candidates will choose any two.

Credit Distribution:

Level and Credits	Compulsory	Elective
Level 5 Credits - 50	50	0
Level 6 Credits - 190	190	0

	Level 7 Credits - 190	180	10	
	Level 8 Credits - 50	40	10	
	Total Credits: 480	460	20	

ASSESSMENT & MODERATION ARRANGEMENTS

This qualification is assessed and moderated as follows:

Integrated Assessment:

Because assessment practices must be open, transparent, fair, valid, reliable, and ensure that no learner is disadvantaged in any way whatsoever, an integrated assessment approach is incorporated into the qualification. Both formative and summative assessment processes are monitored during the qualification and to determine competence at the end of the qualification.

Summative assessment:

Integrated assessment, focusing on the achievement of the exit-level outcomes, will be done by means of a written examination (of at least 3 hours) at the end of every module (per module).

Project: Students need to do a project and submit their project work at the end of the qualification.

Professional Practice: All students will go through the work placement. Tutor assigned to student will visit the intern at workplace and do the evaluation. (15%). A second visit at the intern place is conducted and evaluation is completed (15%). Supervisor evaluates the intern and submits a report to the tutor (20%). At the end of professional practice, student will submit a project report (50%). All the marks from the internship, tutor visits, supervisor evaluation of intern and report will be captured in the form called 'internship report feedback form'. Monitoring of students' during internship is done using weekly logbook.

Formative assessment :

Learners are continuously assessed through:

- Practical test
- Class assignments

- Presentations
- Informal class tests
- Formal modular tests

Pass requirements :

A learner passes a module if he/she obtains a final mark of 50% or more in the module. The final mark is constituted of class participation (5%) the formative assessments (35%) and the summative assessment (60%). A learner qualifies for the B.Sc in Computer Networking degree on NCQF level 7 when he/she passed all required modules individually. The final mark for the qualification is calculated by averaging the marks obtained in the various modules. The student should complete 480 credits to complete the qualification.

Moderation:

Moderation of assessments focuses on:

a) Ensuring the assessment is aligned to the module objectives and the learning outcomes.
b) Ensuring assessment is consistent on all levels within the institution and does not show any bias or academic disregard and that it is immune to all forms of prejudice.
c) Ensuring the level of assessment appropriately matches to students' level of study. This ensures that the assessments remain viable, relevant and provide an accurate judgement of a student's achievements and level of knowledge.
d) Maintaining consistency in the marking process

Pre-assessment Moderation:

This moderation is carried before assessment tasks are given to students. All submitted sets of question papers &marking keys are shared with the moderators. Each assessment pack should be moderated by two Moderators where possible. The question paper moderation report should be filled in for each question paper. Moderator report will be shared with question paper setter so that moderator feedback will be taken into account when finalizing the question paper.

Post-assessment Moderation:

Moderation of completed assessment tasks is categorized as post-assessment moderation. It is carried out after assessment tasks have been marked. The set of answer scripts and marking

keys are shared with the moderators. At least 10% of the answer scripts in a module should be moderated during post assessment moderation.

RECOGNITION OF PRIOR LEARNING (if applicable)

A clear framework through which students can accumulate learning credits and transfer such credits toward appropriate qualifications helps to validate and recognize learning gained through formal and informal means, provides flexibility to students, and allows students to progress relatively seamlessly through their lifelong learning journey.

Candidates may apply for recognition of prior learning whether such learning has been gained through formal study, through workplace learning, or through any other formal or informal means. Any candidate applying for recognition of prior learning (RPL) will be expected to provide evidence of such learning that must be relevant, sufficient, valid, verifiable, and authentic. In addition, the candidate may be interviewed by a member of staff or have to take a formal test, which may include a live demonstration of skills and competencies, to assess competence.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

Learning Pathway: Those who have achieved the qualification can progress as mentioned below**:**

Vertical:

BSc (Hons) in Computer Networking, at NCQF Level 8.

BSc (Hons) in Network Security, at NCQF Level 8

BSc (Hons) in Network Computing, at NCQF Level 8

Horizontal Pathway:

BSc in Network Security & Computer Forensics, at NCQF Level 7.

BSc in Software Engineering, at NCQF Level 7.

Employment Pathway:

The qualification will produce graduates suitable for positions as

- Network Specialist.
- Network Technician.

- Network Administrator.
- Network Analyst.
- Network Manager.
- Network Engineer.
- Network Solutions Architect.

QUALIFICATION AWARD AND CERTIFICATION

The learner will be awarded 'Bachelor of Science in Computer Networking' after attaining 480 credits as specified in the rules of combination and credit distribution. This qualification does not have exit awards. Therefore, if the candidate does not need the prescribed minimum standards of the qualification the learner will exit with a transcript/ record of learning.

REGIONAL AND INTERNATIONAL COMPARABILITY

This Qualification was compared with various universities running similar qualifications. The following universities and their qualifications were taken for benchmarking:

- **Regional:** The Independent Institute of Education, South Africa -Bachelor of Computer and Information Sciences in Network Engineering

- **International:** Middlesex University, UK **-** BSc Computer Networking
- **International:** The British University in Egypt **-** BSc Computer Networking
- **International:** University of Westminster, UK - BSc in Computer Networking Security

Summary:

Similarities:

The qualification offered by Independent Institute of Education, South Africa consists of modules such as Programming Logic and design, Operating system, Network administration, wireless communication, Database administration, Enterprise architecture, introduction to research and Network engineering are also included in this qualification.

The qualification offered by Middlesex University, UK and this qualification have many common modules like: Computer Systems Architecture, Operating Systems, Computer Fundamentals, Fundamentals of

Science, technology, and Mathematics, Research Methods, Professional Project Development, Individual Project, and Network Analysis and Troubleshooting.

The qualification offered by 'The British University in Egypt' consist of modules such as Introduction to Computing, Mathematics for Computer Scientists, Introduction to Programming and Problem Solving, Principles of Web Programming, Database Systems, Wireless Networks, Computer Systems Security, Entrepreneurship and Innovation, and Graduation Project, which are also offered in this qualification.

The qualification offered by University of Westminster consists of modules such as Programming using C++, Mathematics for Computing, Operating Systems, Professional Engineering Practice, Network Engineering, English for Academic Purposes, Individual Project which are also offered in this qualification.

Differences:

This qualification shares many common modules with the benchmarked qualifications. However, this qualification has additional modules like Professional issues and Ethics, Entrepreneurship and Innovation.

Regarding the assessments this qualification includes practical based and project-based assessments, whereas the others follow the multiple-choice, open book model-based assessments. This qualification has 480 credits, whereas the Middlesex University has only 300 credits and University of West Minister has 360 credits.

REVIEW PERIOD

5 Years