SECTION A:	QUALIFICATION DETAILS																		
QUALIFICATION DEVELOPER (S)	University of Botswana																		
TITLE	Bachelor of Science (Computing with Finance)														NCQF LEVEL		7		
FIELD	Information and Communications Technology		SUB-FIELD		Computer Science										CREDIT VALUE		508		
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 proposed qualification, BSc Financial Computing, is geared towards producing graduates capable of filling the skills shortage in organizations with medium to large, computerized finance departments. ICT by its nature is applied in many fields and this trend is even reaching fields that were not anticipated a decade ago. Finance, on the other hand, is one field that has always benefited from advances in computing. The financial industry is a big consumer of advanced computing technologies and mathematical modeling techniques and a primary employer of computer science graduates. It would be a competitive strategy for the country to be both an ICT and finance hub in Southern Africa. Other areas that stand to benefit include Information Systems auditing, financial systems security, and insurance and banking.

This qualification has been designed to meet the growing demand for specifically trained computing professionals to work in the financial sector. The unique advantage of this qualification is that it provides both technical and soft skills of finance and computing, which are complementary to fill the gap between computing and finance. Financial institutions and markets are highly dependent on computerized systems and would

benefit from professionals who understand both the technical solutions and the application domain needs to help find innovative solutions to problems. There is a need, therefore, for strategic curriculum developments within Botswana to align to these developments. This is endorsed in the country's vision 2036 pillar 1 and 2 which aims at achieving sustainable economic and human social development in the country.

By combining technical know-how, analytical and problem-solving skills with finance knowledge graduates of the qualification could contribute more effectively and adapt easily to environments that require exposure to financial concepts and practices.

It is quite apparent from the results of the comprehensive survey conducted by the department that there is a need for computing professionals with more than a passing knowledge of finance. The primary objective of the conducted survey was to determine areas of ICT human resource shortage in organizations, including government departments and ministries, and the type of ICT skills required to accomplish organizational tasks. The result of the survey revealed that a significant number of organizations with large finance departments support a qualification in Computing with Finance. Moreover, the number of financial institutions in the country is increasing significantly.

Lastly, the decline in enrolments in traditional computing qualifications worldwide has led to a soul searching among computing professionals in academia. One international trend that seems to cut across all regions is the attraction of students to interdisciplinary programs instead of traditional programs. The introduction of the B.Sc. Computing with Finance is in keeping with international trends in offering interdisciplinary programs with computing as a subfield.

The departmental national computing skills survey (CS Computing Skills Survey 2017) and HRDC report on Top Occupations in Demand (December 2016) also indicated that there is a need for graduates who can apply broad knowledge of core computing to different sectors. Some of these are Software Engineers, Computer Network Professionals, Database Designers and Administrators, and Applications Qualifications.

In addition, the qualification was developed based on the widely used ACM/IEEE Computing model Curricula 2020 (CC2020) [1] which encourages that developing Computer Science Curricula "must capture future trends and visions from industry, from research, and from across the entire spectrum of society"'. Hence CC2020 has evolved to allow an extension to non-computing discipline using a model referred to as "Computing + X" where 'Computing' represents one of the computing disciplines such as Computer Science and 'X' is a non-computing discipline. While the Computer Sciences component would have a specific focus on developing strong conceptual foundations and computational capabilities, the X would be an application domain area. The "Computing + X" model is designed to integrate computing primarily with business to transform the way businesses and other enterprises operate. Computing + X allows students to discover transformational relationships between computing and non-computing fields, which in this case is Finance.

PURPOSE:

The purpose of this qualification is to produce graduates with specialised knowledge skills and competence to:

- Apply computing theory in practical applications with a focus on the finance application domain.
- Evaluate and select appropriate models, methods, technologies, and tools in the comprehension, manipulation, and development of computer-based financial systems.
- Develop and maintain financial software systems.

ENTRY REQUIREMENTS (including access and inclusion)

For entry to the BSc Financial Computing, the following entry requirements shall apply.

i) Certificate IV, NCQF level 4 (General Education or TVET) or its equivalent.

ii) Candidates with Diploma in a related field may be considered through Recognition of Prior Learning in accordance with applicable policies.

SECTION B	***QUALIFICATION SPECIFICATION***
GRADUATE PROFILE (LEARNING OUTCOMES)	***ASSESSMENT CRITERIA***
1 Apply appropriate computing technologies for the development of financial systems.	1.1 Formulate technical software solutions for different scenarios. 1.2 Select appropriate architectural designs, platforms, and components for a system. 1.3 Apply basic computing principles to model financial solutions for organizations such as banking, insurance, and finance and investment sectors. 1.4 Develop medium to large scale software systems for the financial sector.
2 Devise new ways to use computing solutions in the financial sector.	2.1 Develop computing applications to address various financial problems. 2.2 Develop entrepreneurial solutions using computing knowledge. 2.3 Apply new ideas, techniques, and tools independently to solve financial related problems. 2.4 Demonstrate computing solutions to complex financial problems such as risk management services, fraud, and compliance.
3 Exhibit self-directed learning through research for the acquisition of lifelong skills.	3.1 Show an understanding of current trends and issues in financial computing. 3.2 Apply research for business entrepreneurial activities involving financial issues. 3.3 Evaluate the organizational and societal impact of financial computing solutions. 3.4 Gather information, critically review, conduct experiments, evaluate, interpret, and compare and present findings and recommendations. 3.5 Make presentation on new technologies in financial computing.

4 Apply strong professional practices in the field.	4.1 Describe legal and ethical standards, protocols, and practices in computing. 4.2 Apply knowledge of professional codes of conduct. 4.3 Apply personal decision-making skills. 4.4 Exhibit team-spirit.

SECTION C	***QUALIFICATION STRUCTURE***				
COMPONENT	***TITLE***	***Credits Per Relevant NCQF Level***			***Total*** ***(Per** Subject/ Course/ Module/ Units)*
		Level 6	***Level 7***	***Level 8***	
FUNDAMENTAL COMPONENT *Subjects/ Courses/ Modules/Units*	Introductory Mathematics		***16***		
	Discrete Structures I		***12***		
	Discrete Structures II		***12***		
	Introductory Mathematics II		***16***		
	Calculus I		***12***		
	Communication and Study Skills	***12***			
	Academic and Professional Communication	***12***			
CORE COMPONENT *Subjects/Courses/ Modules/Units*	Programming Principles		***12***		
	Introduction to Computing		***12***		
	Introduction to Accounting		***12***		
	Object-Oriented Programming		***16***		
	Data Structures		***12***		
	Business Finance		***12***		

	Database Concepts		***12***		
	Financial Accounting I		***12***		
	Business Statistics		***12***		
	Basic Macroeconomics		***12***		
	Auditing I		***12***		
	Financial Planning and Forecasting		***12***		
	Financial Management		***12***		
	Web Technology and Applications		***12***		
	Computer Architecture and Organization		***12***		
	Financial Institutions and Markets I		***12***		
	Algorithms		***12***		
	Operating Systems		***12***		
	Computer Networks		***12***		
	Systems Analysis and Design		***12***		
	Software Design		***12***		
	Introduction to Software Engineering		***12***		
	Databases		***12***		

	International Business Finance		***12***		
	Industrial Attachment		***12***		
	Social Informatics		***12***		
	Project			***16***	
	Information Security Administration		***12***		
	Accounting Information Systems		***12***		
ELECTIVE/ OPTIONAL COMPONENT *Subjects/Courses/ Modules/Units*	Basic Microeconomics		***12***		
	Small Business Management		***12***		
	Foundations of Business Law		***12***		
	Programming Language Translations		***12***		
	Entrepreneurship and New Business Formation		***12***		
	Requirements Engineering		***12***		
	Intelligent Systems		***12***		
	Investment Analysis and Portfolio Management		***12***		
	Financial Institution and Markets II		***12***		

	Software Project Management		***12***		
	Human-Computer Interaction		***12***		
	Web Computing		***12***		

SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL	
TOTAL CREDITS PER NCQF LEVEL	
NCQF Level	***Credit Value***
6	***24***
7	***468***
8	***16***
TOTAL CREDITS	

Rules of Combination:

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

The qualification requires **92** credits of fundamental courses, **356** credits of core courses, and **60** credits of elective courses. The total credit a learner must achieve is **508.**

ASSESSMENT ARRANGEMENTS

Assessment will consist of both formative and summative assessments and should be aligned with learning outcomes and sub-outcomes. Assessment will be carried out by registered and accredited assessors.

1. ***Formative assessment***

Formative assessment or continuous assessment component of each course may include one or more of the following: written assignments, written tests, practical projects, research exercises, and independent study. Continuous assessment shall contribute 60% to the final grade of each course.

2. ***Summative assessment***

Summative assessments are conducted in the form of examinations and practical assessments. The practical assessment is mainly on the final year project which comprises of project demonstration and research reports. The summative assessment shall contribute 40% to the final grade of each course.

MODERATION ARRANGEMENTS

In accordance with relevant policies and regulations, internal and external moderations are conducted at the end of each semester by registered and accredited moderators.

1. *Internal moderation requirements*

Internal moderation is carried out by BQA accredited moderators in the department whose area of expertise is in line with the courses to be moderated and by the staff members of the course clusters.

2. *External moderation requirements*

External moderation is carried out by BQA accredited moderators from other institutions recruited for this purpose.

RECOGNITION OF PRIOR LEARNING

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 applicable institutional RPL policies and relevant national-level policy and legislative framework.

CREDIT ACCUMULATION AND TRANSFER

Credit Accumulated transfer will be administered according to the Institutional policy

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

Horizontal Articulation (related qualifications of a similar level that graduates may consider)

Learners will have the following options for horizontal articulation.

- BSc Information Technology,
- BSc Computer Science
- BSc Software Engineering
- BSc Financial Computing

Vertical Articulation (qualifications to which the holder may progress to)

Graduates of this qualification will have the following options for vertical articulation.

- MSc Computer Science
- MSc Software Engineering
- MSc Financial Computing
- MSc Information Technology
- MSc Information Systems

EMPLOYMENT PATHWAYS

Graduates of this qualification could be employed in a wide variety of positions including:

- Software Developer
- Web Developer
- Business Analyst
- Systems Analyst
- Investment Analyst
- Data and Risk Analyst
- Data Scientist

QUALIFICATION AWARD AND CERTIFICATION

1. *Minimum standards of achievement for the award of the qualification*

To be awarded a BSc Computing with Finance qualification, a candidate must satisfy the appropriate provisions of the institution. A candidate is expected to complete a minimum of **508** credits with a duration of **8** semesters

where at least two-thirds of the total credits must come from core and fundamental courses prescribed for the qualification, and the total number of credits from elective courses shall not exceed one-third of the total credits. A candidate should attain a minimum cumulative GPA of 2.00 to be considered for graduation.

2. *Certification*

Candidates meeting prescribed requirements will be awarded the qualification **Bachelor of Science in Computing with Finance** in accordance with standards prescribed for the award of the qualification and applicable policies of the institution.

REGIONAL AND INTERNATIONAL COMPARABILITY

A comparison was made for the proposed qualification internationally. Unfortunately, there are no similar qualifications offered regionally. Therefore, the comparison presented here is only with three qualifications from three universities in the UK. The universities and corresponding qualifications are:

.

i. B.Sc. Computing with Accounting and Finance, University of Buckingham [2]
ii. BSc (Hons) Financial Computing, University of Liverpool [3]
iii. BSc (Hons) Finance and Technology, University of Sussex [4]

Generally, the proposed qualification is similar to the international qualifications studied for comparison in terms of the core areas of computing and finance covered and the emphasis of the qualifications. The proposed qualification equips learners with knowledge, skills, and competencies on how to specify, design, develop and operate efficient and innovative computer-based financial systems. The proposed qualification provides a strong mathematical background which supports the qualification both on the Computing and the Finance side. Moreover, this qualification provides a variety of electives from other areas such as Business and Management.

The difference is in that durations are not following the same system and credit systems are slightly different though communicating the same emphasis on the core of the qualification which is computing combined with knowledge in Finance. It is important to note that the proposed qualification is unique in that it brings computing and finance together to address the challenges in designing and maintaining financial systems. As a result, there are not many qualifications to compare with. Moreover, the proposed qualification provides a strong mathematical background which is essential for a deeper understanding of the techniques and models commonly used in Computer Science and Finance. Moreover, this qualification also provides a variety of electives from other areas such as business and management.

REVIEW PERIOD

5 years

[1] Computing Curricula 2020, https://www.acm.org/binaries/content/assets/education/curricula-recommendations/cc2020.pdf

]2] University of Buckingham: https://www.buckingham.ac.uk/sciences/bsc/computing-accountingandfinance

[2] University of Liverpool; https://www.liverpool.ac.uk/study/undergraduate/courses/e-finance-bsc-hons/overview/

[3] University of Sussex: https://www.sussex.ac.uk/study/undergraduate/courses/finance-and-technology-fintech-bsc