SECTION A:	***QUALIFICATION DETAILS***																	
QUALIFICATION DEVELOPER (S)	Botswana International University of Science and Technology																	
TITLE	Bachelor of Science in Financial Mathematics														***NCQF LEVEL***	*7*		
FIELD	Natural, Mathematical and Life Sciences		***SUB-FIELD***	Financial Mathematics											***CREDIT VALUE***	*480*		
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

Botswana Vision 2036 recognises education and skills development as the foundation for human resource development. In line with the nation's Vision 2036 Pillar1 and Pillar2, the tertiary education providers are mandated to provide quality training opportunities for the increasing number of school leavers. A qualification in Bachelor of Science in Financial Mathematics is thus in line with this mandate in contribution to the realisation of Vision 2036's National Development Plan (NDP 11). This qualification is also supported by the Tertiary Education Policy, as approved by the National Assembly on the (2008:10).

The service sector and in particular the financial and business services have been identified as one of the most important drivers in the transition from highly resource-based economy to knowledge-based service economy in Botswana. Therefore, this qualification is founded on the belief that graduates should be equipped with a highly specialised financial knowledge and quantitative skills that meet national and international standards. The qualification puts emphasis on developing a range of practical skills and specialised knowledge required by the modern finance and investment management industry and the increasingly quantitative and ever-changing finance sectors in general. The qualification is strengthened by work-integrated learning that gives students opportunities to apply their specialised knowledge, skills and competencies in different workplace environment.

The Human Resource Development Council (HRDC) research and publishes reports on occupations that have been identified by the employers as being in high demand at a national level. In December 2016, the HRDC published a report that indicates Botswana is currently experiencing a huge shortage of human capital in Finance and Investment industry. The HRDC (December 2016:p.32) further indicates there is shortage of Investment appraisal and financial analysis experts in the Manufacturing Sector's top 20 occupations in high demand. This qualification is thus designed to equip graduates with required skills competences to prepare them to fill the gaps identified in the HRD 2016 report. This is in line with the national priorities as outlined in the Vision 2036 NDP 11.

Stakeholders from various specialised sectors in Botswana have been consulted and remained actively engaged in the design of this qualification. The invaluable input from the industry stakeholders also helped the qualification developers to have an insight on the current and future needs in the areas where graduate of this qualification are required.

PURPOSE

This qualification aims to produce graduates with specialised knowledge, skills, and competences to be able to:

- Solve real-world financial and business problems.
- Forecast financial effects of both certain and uncertain events.
- Carry out decision-making analysis in financial industry, and other related sectors.

- Critically analyse and interpret financial information.
- Conceptualise, design, and implement research to contribute to the existing body of knowledge in the financial industry and other closely linked sectors.

ENTRY REQUIREMENTS (including access and inclusion)

Entry into this qualification is through any one of the following requirements.

(i) Certificate IV, NCQF level 4 (General Education or TVET) in a related field with provisions for exemptions, where applicable, in line with Credit Accumulation and Transfer (CAT) policy.

(ii) Applicants who do not meet the above criteria but possess relevant industry experience may be considered through Recognition of Prior Learning (RPL) and Credit Accumulation and Transfer (CAT) in accordance with institutional and national policies on RPL and CAT.

SECTION B	***QUALIFICATION SPECIFICATION***
GRADUATE PROFILE (LEARNING OUTCOMES)	***ASSESSMENT CRITERIA***
1. Apply principles of financial mathematics as applied to real-world problems.	1.1. Use the basic principles of finance and theories on interest rates in financial valuations. 1.2. Illustrate how to consider time value of money using the concepts of simple interest, compound interest and discounting. 1.3. Compare and distinguish between nominal and effective rates of interest and discount. 1.4. Interpret the mathematical finance techniques used to model and value simple financial cashflows.
2. Use statistical techniques to access, interpret and analyse statistical data relevant to the financial services industry.	2.1. Classify the essential features of statistical distributions as applied in financial analysis. 2.2. Summarise financial data using appropriate statistical analysis, descriptive statistics, and graphical presentation. 2.3. Apply the principles of statistical inference to make financial decisions.
3. Apply fundamental concepts of economics to interpret financial events that affect the economic system.	3.1. Demonstrate a systematic knowledge and critical awareness of economic theory in the areas of finance. 3.2. Use a range of mathematical techniques to solve economic problems in the financial industry. 3.3. Apply the economic theory to the business environment. 3.4. Analyse and apply basic microeconomic and macroeconomic theory to business problems.
4. Demonstrate knowledge on key principles of evaluating and selection of investments and advise on the effective	4.1. Analyse the main principles and techniques of financial management and control that are relevant to the management of investments.

risk management of a portfolio of investments.	4.2. Apply the main principles and techniques of financial management to given situations within the context of investment management. 4.3. Analyse hypothetical scenarios and develop appropriate proposals or recommendations relating to the management of investments.
5. Model financial time series data and critically evaluate times series developments in the financial sector.	5.1. Apply standard techniques used in time series analysis in finance. 5.2. Perform both descriptive and exploratory analysis of time series data with reference to financial applications. 5.3. Compute forecasts for a variety of linear and non-linear models with respect to modelling volatile financial series. 5.4. Apply principles of statistical inference to evaluate models fitted to time series and forecast volatility in the underlying financial assets.
6. Apply different types of financial derivatives in financial markets.	6.1. Apply principles and techniques used in management of financial derivatives. 6.2. Deduce how financial derivatives are valued based on no-arbitrage pricing arguments and risk-neutral valuation methods. 6.3. Illustrate how to price derivative instruments and hedge market risk based on numerical data and current market settlements. 6.4. Analyse the derivatives embedded in structured financial products.
7. Utilise computational methodology to tackle financial events.	7.1. Develop computer programs for implementation of pricing models. 7.2. Generate patterns in financial market data to support high-frequency trading in automated trading platform.

	7.3. Integrate pricing and hedging models that can be directly used by traders. 7.4. Apply statistical techniques and skills to the analysis of financial and insurance data.
8. Apply stochastic modelling skills within the context of financial markets and other closely linked sectors like the insurance industry.	8.1. Apply general principles of stochastic processes, and their classification into different types. 8.2. Show understanding of Markov property in the context of a stochastic process and in terms of filtrations. 8.3. Simulate and use Markov chains as a tool for financial modelling.
9. Work effectively with others as a member of a team/group or organisation/community in scientific projects or investigations.	9.1. Participate collaboratively and responsibly in teams' environment and reflect on individual own teamwork. 9.2. Provide evidence of working effectively as a member of a team or group in scientific projects or investigations. 9.3. Initiate, organise and manage group works.
10. Communicate scientific understanding orally and in writing using visual, symbolic, graphic and/or other forms of representation to the target audience.	10.1. Produce written reports that communicate disciplinary and interdisciplinary ideas and information effectively for the intended audience and purpose. 10.2. Produce oral presentations that communicate disciplinary and interdisciplinary ideas and information effectively for the intended audience and purpose.
11. Demonstrate the ability to identify topics for research, plan and conduct research, analyse results, and communicate the findings to the satisfaction of the subject experts.	11.1. Design and implement research work to contribute to the existing body of knowledge. 11.2. Produce research, or other scholarly work, of a quality to satisfy peer review, and to merit publication. 11.3. Use appropriate methodologies to address research question. 11.4. Work collaboratively with other researchers through effective communication and problem-solving skills. 11.5. Present research work in a conference setting.

12. Demonstrate knowledge in business and entrepreneurship	12.1. Apply entrepreneurial skills to identify and create business opportunities, and ideas that can be transformed into new products or services that may be commercialised successfully. 12.2. Identify, research and analyse issues and problems in financial sector and/or businesses and recommend suitable and well justified solutions.

SECTION C	***QUALIFICATION STRUCTURE***					
COMPONENT	***TITLE***	***Credits Per Relevant NCQF Level***				***Total (Per** Subject/ Course/ Module/ Units)*
		Level [5]	***Level [6]***	***Level [7]***	***Level [8]***	***Credits***
FUNDAMENTAL COMPONENT *Subjects/ Courses/ Modules/Units*	**Fundamental Component**					**48**
	Mathematical Foundations	24				24
	Computing Foundations	12				12
	Principles of Risk Management and Insurance		12			12
CORE COMPONENT *Subjects/Courses/ Modules/Units*	**Core Component**					**390**
	Economics		24			24
	Financial Accounting		24			24
	Computer Programming		36			36
	Mathematical Statistics		24			24
	Calculus		48			48
	Algebra		24			24
	Financial Mathematics		06	24		30
	Real Analysis			12		12
	Numerical Analysis			12		12
	Differential Equations			24		24
	Project in Financial Mathematics			12		12
	Work Integrated Learning			12		12

	Applied Statistics			12		12
	Probability and Inference			24		24
	Stochastic Processes			12		12
	Finance, Investment and Portfolio management			12		36
	Asset Pricing Models			12		12
	Financial Derivatives				12	12
ELECTIVE/ OPTIONAL COMPONENT *Subjects/Courses/ Modules/Units*	*** Electives Modules**					***42***
	Financial Analysis and Valuation			06		06
	Financial Reporting			06		06
	Managerial Finance			06		06
	Financial Modelling			12		12
	Credit Risk Modelling				12	12
	Global Financial Markets			06		06
	Measure and Integration Theory			12		12
	Linear Programming and Game Theory			12		12
	Optimization and Applications			12		12
	Machine Learning			12		12
	Multivariate Data Analysis			12		12
	Introduction to Technical Communication and Academic Literacy		06			06
	Technical and Professional Communication		06			06
	Writing Process		06			06

	*** elective component is based on selection of at least four modules with at least 42 credits.**

SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL	
TOTAL CREDITS PER NCQF LEVEL	
NCQF Level	***Credit Value***
5	36
6	204
7	216
8	24
TOTAL CREDITS	***480***

Rules of Combination:

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

This qualification has 480 credits and takes four years to complete.

The credit combination for the qualification is made up of 48 credits from the fundamental component, 390 credits from the core component and 42 credits from the elective component.

ASSESSMENT ARRANGEMENTS

All assessments, formative and summative, leading to the award of credits in this qualification shall be based on module learning outcomes, and the qualification exit-level outcomes.

- Formative Assessment - A formative assessment aligned to the module learning outcomes and exit-level outcomes will be administered continuously throughout the learning period in each module. The recommended weights of the formative assessment should be at least 50% and should not exceed 60% of the final marks for that module.
- Summative Assessment - Learners shall undergo a summative assessment which may include a written examination at the end of learning period in each module. The recommended weights of the summative assessment will vary from 50% to 40% of the final marks for that module. All summative practical assessments must, as far as possible, be conducted in real-work settings.

MODERATION ARRANGEMENTS

- Internal Moderation - All assessment instruments and processes shall be subjected to internal moderation by BQA registered and accredited Assessors and Moderators before to ensure fairness, validity, reliability and consistency of assessments.
- External Moderation – Exit level assessment instruments and processes shall be moderated by an External Moderator to ensure fairness, validity, reliability and consistency of assessments. Qualified external moderators shall be appointed from an accredited Education and Training Providers (ETPs).

RECOGNITION OF PRIOR LEARNING

Recognition of Prior Learning (RPL) will be considered in the award of the qualification in accordance with applicable institutional and national policies on RPL.

CREDIT ACCUMULATION AND TRANSFER

Credit Accumulation and Transfer (CAT) will be considered for the award of Bachelor of Science in Financial Mathematics in accordance with applicable institutional policy and guidelines which are aligned to national policy on CAT.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

LEARNING PATHWAYS

This qualification is intended to provide learners with both horizontal and vertical articulation pathways, nationally, regionally and internationally:

Horizontal Articulation

The qualification articulates horizontally with various local, regional and international Bachelor of Science degrees. Qualifications at NCQF Level 7 or equivalence include:

- Bachelor of Science in Financial Engineering.
- Bachelor of Science in Mathematical Finance.
- Bachelor of Science in Actuarial Science.
- Bachelor of Science in Mathematical Science.
- Bachelor of Science in Statistics.
- Bachelor of Science in Industrial Mathematics.

Vertical Articulation

The qualification provides vertical articulation to higher level qualifications at NCQF Level 8 and 9. The graduate of this qualification can thus progress to enroll to related postgraduate qualification(s) such as Bachelor Honours Degree, Postgraduate Diploma, and Master of Science in:

- Financial Mathematics,
- Financial Engineering,
- Mathematical Finance,
- Quantitative Finance,
- Financial Risk Management,
- Actuarial Science.

EMPLOYMENT PATHWAYS

Financial Mathematics graduates apply their quantitative problem-solving skills to a wide variety of fields and upon successful completion of the qualification; the graduates will have the requisite competencies and attributes to work in the following sectors:

- Financial Services (Finance, Banking, and Insurance).
- Business Consultancy and Operational Research.
- Information Technology and Computing (i.e., FinTech).
- Global Financial System (i.e., Money Market and International Finance Sectors),
- Education and Research.

The graduates will be qualified to hold high-level positions/roles such as:

- Investment Analyst,
- Risk Manager,
- Financial Regulator,
- Derivatives Analyst,
- Portfolio Manager,
- Corporate Finance Adviser.

QUALIFICATION AWARD AND CERTIFICATION

Minimum standards of achievement for the award of the qualification

Candidate(s) will be awarded Bachelor of Science in Financial Mathematics after attaining the stipulated minimum credits of 480 as specified in the rules of combination and credit distribution.

Certification

Candidates meeting prescribed requirements will be awarded the qualification in accordance with standards prescribed for the award of the qualification and applicable policies. A certificate of the award of the degree of Bachelor of Science in Financial Mathematics will be given upon successful completion of the qualification.

REGIONAL AND INTERNATIONAL COMPARABILITY

The qualification was compared with various institutions regionally and internationally offering similar qualifications. The qualification compares very well in terms of learning outcomes, scope of content, level and duration with:

- Bachelor of Science in Financial Mathematics, North-West University, South Africa.
- Bachelor of Science Mathematics of Finance, University of the Witwatersrand, South Africa.
- Bachelor of Science in Financial Mathematics, Heriot-Watt University, Scotland.
- Bachelor of Science in Financial Mathematics Major, Curtin University, Australia.

The qualification was also compared with various institutions offering Bachelor of Science in Financial Mathematics in United States of America and Canada. Although the qualifications examined generally follow similar structures and standards, there are differences, though not significant, in that this qualification responds to the global developments in the field of financial technology through applied statistical learning and computer programming modules, and as well as equips learners with competencies required for enrolment in the CFA Program and membership with various professional bodies. The qualification also equips learners with skills on how to conceptualise, design, and implement research to contribute to the existing body of knowledge in the financial industry. Comprehensive comparability matrix report is presented in the annex below.

REVIEW PERIOD

The qualification will be reviewed every 5 years.