SECTION A:	***QUALIFICATION DETAILS***																	
QUALIFICATION DEVELOPER (S)	Botswana International University of Science and Technology																	
TITLE	Bachelor of Science (Honours) in Financial Mathematics														***NCQF LEVEL***		*8*	
FIELD	Natural, Mathematical and Life Sciences			***SUB-FIELD***	Financial Mathematics										***CREDIT VALUE***		*672*	
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 of the Qualification:

Botswana Vision 2036 recognizes 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 Honours in Financial Mathematics is thus in line with this mandate in contribution to the realization 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 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 specialized

financial knowledge and quantitative skills that meet national and international standards. The qualification puts emphasis on developing a range of practical skills and highly specialized 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 highly specialized 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 shortage 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 specialized 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 is required.

Purpose of the Qualification:

This qualification is designed to train financial mathematics concepts including an understanding of modern financial markets, institutions, investments and policies to learners at undergraduate level thus creating a foundation for their entry into the financial analysts and investment management profession. This qualification should also prepare graduates for admission to further postgraduate study.

The purpose of this qualification is to produce graduates who are able to:

- solve real-world financial and business problems.
- forecast the financial effects of both certain and uncertain events.

- carry out decision-making analysis in financial industry, and other related sectors.
- critically analyze and interpret financial information.
- demonstrate intellectual independence, analytical rigour and the ability to understand and evaluate new knowledge and ideas in the financial industry and other closely linked sectors.
- identify topics for original research, plan and conduct research, analyze results, and communicate the findings to the satisfaction of financial experts.

ENTRY REQUIREMENTS (including access and inclusion)

Minimum Entry Requirements

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 or equivalent 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) policies for access.

SECTION B	***QUALIFICATION SPECIFICATION***
GRADUATE PROFILE (LEARNING OUTCOMES)	***ASSESSMENT CRITERIA***
1. Apply the 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 the 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 the 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 Demonstrate the use of relevance of economic theory to the business environment and the links between economic theory and its application in business. 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 risk management of a portfolio of investments.	4.1 Analyse the main principles and techniques of financial management and control that are relevant to the management 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 Demonstrate a good understanding of the standard techniques used in time series analysis as applied in finance. 5.2 Exemplify the ability to 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. Demonstrate knowledge in the application of 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 high-level computational methodology to tackle complex and unpredictable financial events.	7.1 Develop advanced computer programs for implementation of complex 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 complex and unpredictable financial and insurance data.
8.Apply sophisticated stochastic modelling skills within the context of financial markets and other closely linked sectors like the insurance industry.	8.1 Demonstrate the general principles of stochastic processes, and their classification into different types for problems that arise from different application areas.

	8.2 Describe what is meant by the Markov property in the context of a stochastic process and in terms of filtrations. *8.3* Illustrate how Markov chains can be used as a tool for financial modelling and how they can be simulated.
9. Transmit knowledge, skills and ideas underlying the implementation and application of financial risk management in an organisation.	9.1 Articulate the main principles and techniques that are relevant to financial risk management. 9.2 Apply these principles to given situations, for both financial and non-financial organisations. 9.3 Analyse hypothetical scenarios and develop appropriate proposals or recommendations in relation to financial risk management.
10. Demonstrate ability to work effectively with others as a member of a team/group or organisation/community in scientific projects or investigations.	10.1 Participate collaboratively and responsibly in teams' environment and reflect on individual own teamwork. 10.2 Provide evidence of working effectively as a member of a team or group in scientific projects or investigations. 10.3 Demonstrate the capability to initiate, organise and manage group works.
11. Communicate scientific understanding orally and in writing using visual, symbolic, graphic and/or other forms of representation to the target audience.	11.1 Produce written reports that communicate disciplinary and interdisciplinary ideas and information effectively for the intended audience and purpose. 11.2 Produce oral presentations that communicate disciplinary and interdisciplinary ideas and information effectively for the intended audience and purpose.
12. 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.	12.1 Design and implement research work to contribute to the existing body of knowledge. 12.2 Produce research, or other scholarly work, of a quality to satisfy peer review, and to merit publication. 12.3 Use appropriate methodologies to address research question. 12.4 Work collaboratively with other researchers; demonstrate effective communication and problem-solving skills. 12.5 Present research work in a seminar or conference setting.

13. Demonstrate knowledge in business and entrepreneurship	13.1 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. 13.2 Identify and analyse research issues and problems in financial sector and/or businesses and recommend suitable and well justified solutions.
14. Apply a high-level of broad-based knowledge to perform managerial roles and communicating effectively with other players in the financial sector.	14.1 Demonstrate the ability to communicate effectively with individuals from different backgrounds, as well as demonstrate the ability to work in a diverse team as a valued member or as an effective leader. 14.2Demonstrate thorough mastery at an advanced level of extensive knowledge and skills, including soft skills, to plan, conduct, and manage projects and assignments independently.

SECTION C		QUALIFICATION STRUCTURE				
COMPONENT	**TITLE**	**Relevant NCQF Level**				**Total Credits (Per** Subject/ Course/ Module/ Units)
		Level [5]	**Level [6]**	**Level [7]**	**Level [8]**	
FUNDAMENTAL COMPONENT Subjects/ Courses/ Modules/Units	Mathematical Foundations	24				24
	Computing Foundations	12				12
	Academic Literacy and Social Sciences I	12				12
	Academic Literacy and Social Sciences II		06			06
	Principles of Risk Management and Insurance		12			12
CORE COMPONENT Subjects/Courses/ Modules/Units	Economics		24			24
	Financial Accounting		24			24
	Computer Programming		30			30
	Calculus		48			48
	Mathematical Statistics		24			24
	Algebra		24			24
	Financial Mathematics			36		36
	Management and Entrepreneurship			06		06
	Real Analysis			12		12

	Numerical Analysis			12		12
	Differential Equations			24		24
	Project in Financial Mathematics			24		24
	Work Integrated Learning			18		18
	Probability and Inference			24		24
	Applied Statistics			24		24
	Stochastic Processes			12		12
	Finance, Investment and Portfolio management			36		36
	Asset Pricing Models			12		12
	Financial Derivatives				24	24
	Financial Time Series				12	12
	Advanced Investment & Portfolio Management				12	12
	Stochastic Differential Equations				12	12
	Honours Project in Financial Mathematics				36	36
ELECTIVE/ OPTIONAL COMPONENT Subjects/Courses/ Modules/Units	Financial Analysis and Valuation			06		06
	Financial Reporting			06		06
	Managerial Finance			06		06
	Financial Modelling			06		06
	Credit Risk Modelling				12	12

	Global Financial Markets			06		06
	Special Topics in Financial Mathematics				12	12
	Financial Mathematics Electives				48	48
	Mathematics Electives I			24		24
	Mathematics Electives II				24	24
	Statistics Electives I			24		24
	Statistics Electives II				24	24
	Humanities and Social Sciences Electives		06			06

SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL	
TOTAL CREDITS PER NCQF LEVEL	
NCQF Level	***Credit Value***
Level 5	***48***
Level 6	***192***
Level 7	***276***
Level 8	***156***
TOTAL CREDITS	***672***

Rules of Combination:

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

This qualification will have at least **672 credits** and take at least five years to complete. The credit combination for the qualification is from **66 fundamental components, 510 core components** and **96 from 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 (weighs more than Summative Assessment) and will include continuous assignments/assessments that will collectively contribute to the final grade.
- Summative assessment (weighs less than Formative Assessment).There shall be integrated assessment procedures to ensure that the purpose of the qualification is achieved. There shall be examinations that shall contribute to the final grade. Assessment will be in accordance with respective ETP's regulations and procedures.

MODERATION ARRANGEMENTS

Both internal and external moderation will be catered for, including the standard for the moderators.

RECOGNITION OF PRIOR LEARNING

There shall be an award of the qualification using Institutional RPL Policy in line with the National RPL Policy.

CREDIT ACCUMULATION AND TRANSFER

There shall be access and award of credits of the qualification using Institutional Credit Accumulation and Transfer (CAT) Policy in line with the National CAT Policy.

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 Honours Degrees. Qualifications of similar level at NCQF Level 8 include:

- Bachelor of Science Honours in Financial Engineering,
- Bachelor of Science Honours in Mathematical Finance,

- Bachelor of Science Honours in Actuarial Science,

The qualification also allows for horizontal progression to a Post-Graduate Diploma or Post-Graduate Certificate (NCQF Level 8) in the same or a cognate field.

Vertical Progression:

The qualification provides vertical articulation to higher level qualifications at NCQF Level 9. The graduate of this qualification can thus progress to enrol to related postgraduate qualification(s) such as 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, Research and Public Policy.

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

- Investment Analyst,
- Risk Manager,
- Credit Risk Analyst
- Financial Regulator,
- Derivatives Analyst,

- Portfolio Manager,
- Corporate Finance Adviser.

QUALIFICATION AWARD AND CERTIFICATION

Qualification award:
The students enrolled in the program will be able to obtain a **Bachelor of Science Honours in Financial Mathematics**. To obtain the **Bachelor of Science Honours in Financial Mathematics** the student must accumulate 672 credits.

Certification:
Candidates meeting prescribed requirements will be awarded a **Bachelor of Science Honours in Financial Mathematics** in accordance with standards prescribed for the award of the qualification and applicable policies.

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 Honours in Financial Mathematics, Heriot-Watt University, Scotland.
- Bachelor of Science Honours in Financial Mathematics, Stellenbosch University, South Africa.
- Bachelor of Science Honours in Mathematics of Finance, University of Pretoria, South Africa.
- Bachelor of Advanced Science (Honours) 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 Chartered Financial Analyst (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.

REVIEW PERIOD

Every five (5) years.