SECTION A:	***QUALIFICATION DETAILS***																	
QUALIFICATION DEVELOPER (S)	Botswana International University of Science and Technology																	
TITLE	Bachelor of Science in Statistics													***NCQF LEVEL***	*7*			
FIELD	Natural, Mathematical and Life Sciences		***SUB-FIELD***	Statistics										***CREDIT VALUE***	*528*			
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:

1.1.1 Justification for the Qualification

The BSc. degree in Statistics is needed to ensure that Botswana produces highly qualified graduates to play a crucial role in transforming the country to a knowledge-based economy. Tertiary Institutions therefore need to impart mathematical and statistical knowledge by providing rigorous teaching at the highest level, and to advance such knowledge by facilitating faculty research of both academic staff and students.

1.1.2 Needs Assessment Analysis

The government of Botswana through NDP11 (2017) mandated universities to produce graduates with Mathematics and Statistics skills. The Human Resource Development Council (HRDC) research conducted in 2016 has identified professions in Statistics as instrumental in transforming the economy to a knowledge-based economy.

1.1.3 Stakeholders Involvement

The developer of this qualification engaged stakeholders from various sectors in Botswana to form an Industrial Advisory Board (IAB). The IAB's responsibilities are to advise the developer in establishing qualifications that meet the current and future demand in various industrial sectors. In addition, it ensures that qualification as well as research and outreach activities remain relevant to the needs of the industry. To date, the IAB has held several meetings to discuss and provide advice to the developer regarding the proposed curricula for the BSc. in Statistics. The IAB assessed the proposed curriculum and provided suggestions and recommendations on the areas that need corrections and modifications. The IAB input was critical in developing the BSc in Statistics curriculum.

PURPOSE:

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

- Apply the fundamental principles and techniques of mathematics and statistics to solve practical problems in different sectors of the economy such as finance, wildlife, agriculture, health, education and other sectors
- Communicate in technical and non-technical terms, concepts of probability and statistics in different sectors of the economy.
- Analyse and represent various forms of data using ICT skills.
- Create jobs (entrepreneurial skills).

ENTRY REQUIREMENTS (including access and inclusion)

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

2.1.2 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.

(Note: Please use Arial 11 font for completing the template)

SECTION B	***QUALIFICATION SPECIFICATION***
GRADUATE PROFILE (LEARNING OUTCOMES)	***ASSESSMENT CRITERIA***
1. Apply the fundamental concepts and principles of Statistics to real life problems.	1.1 Apply basic statistical concepts and principles to solve real life problems. 1.2 Identify the limitations of basic techniques used in Statistics. 1.3 Exemplify the significance of discovered scientific knowledge in a contemporary context. 1.4 Illustrate how Statistical concepts and ideas become generally accepted.
2. Evaluate, analyse and synthesise Statistical information to make valid inference	2.1 Assess the quality of information using Statistical reasoning. 2.2 Perform data analysis on data arising from a variety of sources. 2.3 Use appropriate statistical procedures to produce valid inference from data. 2.4 Interpret results of statistical analyses correctly.
3. Design and implement statistical tools to produce scientific information.	3.1 Design and apply appropriate procedures for generating relevant information, with due concern for bias and for any ethical or safety considerations. 3.2 Conduct appropriate Statistical procedures such as graphical, computational techniques, and deductive reasoning. 3.3 Analyse data with scientific evidence and present valid arguments and conclusions.
4. Evaluate statistically derived solutions against key scientific reasoning skills.	4.1 Identify naïve and flawed statistical reasoning using logical thinking. 4.2 Evaluate a solution to a statistical problem 4.3 Exemplify statistical thinking and reasoning processes.
5. Communicate scientific understanding orally and in writing using visual, symbolic, graphic and/or other forms of representation to the target audience.	5.1 Formulate scientific report on practical or academic work, by means of coherent written documents, which follow appropriate scientific conventions. 5.2 Present Statistical/Scientific information verbally in front of others.

	5.3 Use appropriate referencing conventions in which plagiarism is avoided and intellectual property is respected.
6. Formulate statistical quantitative models to solve real-world as well as abstract statistical problems.	6.1 Identify, formulate, and analyse both concrete and abstract statistical problems. 6.2 Apply Statistical theories, concepts, and principles to solve real-world problems. 6.3 Use statistical knowledge to solve certain scientific problems from various disciplines.
7. Utilise high-level computational methodology to tackle complex real-life events.	7.1 Develop computer programs for implementation of statistical models. 7.2 Find patterns and relationships in high dimensional and complex data sets. 7.3 Identify appropriate statistical computational techniques for different types of data sets.
8. Apply sophisticated stochastic modelling (e.g., in financial planning, agricultural research, wildlife management, weather forecasting, epidemiology).	8.1 Explain the general principles of stochastic processes, and their classification into different types for problems that arise from different application areas. 8.2 Explain what is meant by the Markov property in the context of a stochastic process and in terms of filtrations. 8.3 Model statistical events arising from different sectors of the economy using Markov Chains. 8.4 Make use of appropriate computational software to simulate Markov Chains in various applications.
9. Utilise appropriate Statistical knowledge to conduct surveys and clinical trials.	9.1 Identify the socio-economic impact of scientific interventions in society. 9.2 Identify and develop Statistical models that offer solutions regarding populations. 9.3 Make ethically and culturally sensitive decisions on the effects of scientifically based activities on the society. 9.4 Apply scientific knowledge for the direct benefit of others.
10. Identify entrepreneurial concepts, evaluate, and appraise their business plans and effectively communicate the result to appropriate audiences.	10.1 Formulate ideas and / or methods that can be transformed into new products or services. 10.2 Evaluate and appraise a given business plan. 10.3 Produce written reports that communicate complex disciplinary and interdisciplinary ideas and information effectively for the intended audience and purpose.

SECTION C		***QUALIFICATION STRUCTURE***				
COMPONENT	***TITLE***		***Credits Per Relevant NCQF Level***			***Total Credits***
		Level [5]	***Level [6]***	***Level [7]***	***Level [8]***	
FUNDAMENTAL COMPONENT *Subjects/ Courses/ Modules/Units*	Mathematical Foundations	***5***				
	Science Foundations I	***5***				
	Computing Foundations	***5***				
	Academic Literacy and Social Sciences I	***5***				
	Science Foundations II		***6***			
	Academic Literacy and Social Sciences II		***6***			
CORE COMPONENT *Subjects/Courses/ Modules/Units*	Calculus		***6***			
	Mathematical Statistics		***6***			
	Algebra		***6***			
	Probability and Inference			***7***		
	Survey Methods			***7***		
	Applied Statistics			***7***		
	Statistical Computing I			***7***		

	Real Analysis			***7***		
	Differential Equations			***7***		
	Work Integrated Learning			***7***		
	Management and Entrepreneurship			***7***		
	Project in Statistics			***7***		
	Probability and Inference				***8***	
	Statistical Computing II				***8***	
ELECTIVE/ OPTIONAL COMPONENT *Subjects/Courses/ Modules/Units*	Biostatistics			***7***		
	Financial Statistics			***7***		
	Spatial Statistics			***7***		
	Dynamical Systems			***7***		
	Analysis			***7***		
	Stochastic Processes			***7***		
	Computing			***7***		
	Science and Engineering			***7***		
	Language and Culture Studies			***7***		
	Management and Entrepreneurship			***7***		

(Note: Please use Arial 11 font for completing the tem7plate)

SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL	
TOTAL CREDITS PER NCQF LEVEL	
NCQF Level	***Credit Value***
5	***84***
6	***114***
7	***294***
8	***36***
TOTAL CREDITS	***528***

Rules of Combination:

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

This qualification will have at least 528 credits and take at least four years to complete.

The credit combination for the qualification is from 102 fundamental components, 348 core components and at least 78 from elective component.

(Note: Please use Arial 11 font for completing the template)

ASSESSMENT ARRANGEMENTS

1.1.1. Formative Assessment

Formative assessment or continuous assessment contributing towards the award of credits should be based on course outcomes.

The contribution to the final mark: the recommended weights of Continuous Assessment should be at least 30% and should not exceed 40%.

1.1.2. Summative Assessment

Candidates may undergo assessment including written final examinations. The end of semester examinations weight will vary from 70% to 60% of the final mark, thus, the CA/Exam ratio will be 30/70 to 40/60.

All summative practical assessments must, as far as possible, be conducted in real work settings.

MODERATION ARRANGEMENTS

3.2.1 Internal **Moderation**: All summative assessment instruments shall be subjected to internal moderation by BQA registered and accredited Assessors and Moderators before administering to ensure fairness, validity, reliability and consistency of assessments.

3.2.2 External Moderation: Exit level assessment instruments 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 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 RPL policy of the ETP which are aligned to BQA / National policies on the same

CREDIT ACCUMULATION AND TRANSFER

Credit transfer will be awarded in accordance with applicable ETP CAT policies and guidelines which are aligned to BQA/national policies on the same.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

1.1. Learning Pathways

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

1.1.1. Horizontal Articulation

The qualification articulates horizontally with various local, regional and international Bachelor of Science degrees. Qualifications of similar level at NCQF Level 7 include;

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

1.1.2. 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 enrol to related postgraduate qualification(s) such as:

- Postgraduate Diploma.
- Bachelor of Science (Honours).
- Master of Science in Statistics.
- Master of Science in Mathematics.
- Master of Science in Data Science.

1.2. Employment Pathways

Statistics graduates apply their problem-solving skills to a wide variety of fields and upon successful completion of the degree, graduates qualify to work in:

- Finance, banking, and insurance.
- Business consultancy and operations research.
- Information technology and computing (coding, cryptography).
- Data sciences and decision sciences.
- Space science and astronomy.
- Environmental modelling (resources, biodiversity, weather, and climate).
- Engineering (fluid mechanics, optimizing industrial processes).

- Defense and military industries.
- Education and research.

QUALIFICATION AWARD AND CERTIFICATION

5.1. Minimum standards of achievement for the award of the qualification

Candidate(s) will be awarded the degree of Bachelor of Science in Statistics after attaining the stipulated total credits (528 credits) inclusive of the fundamental, core and elective components as specified in the rules of combination and credit distribution.

5.2. Certification

A certificate of the award of Bachelor of Science in Statistics will be awarded upon successful completion of the qualification.

REGIONAL AND INTERNATIONAL COMPARABILITY

The qualification compares favourably with other similar Bachelor of Science degree qualifications, regionally and internationally around the world with regards to:

- learning outcomes and assessment criteria.
- number of credits.
- structure and purposes, and

notional learning time/duration.

The qualification was benchmarked with a number of qualifications offered by different academic institutions. The following universities and qualifications were used for the comparisons:

(i) **Regional Institutions**

Bachelor of Science degree in Mathematical and Statistical Sciences, UNISA, South Africa: This degree prepares students to collect, analyse, interpret, and present data, focusing strongly on specialised areas such as statistical inference, descriptive statistics, data analysis, quality control and sampling techniques, complex analysis, and forecasting.

(ii) **International Institutions**

Bachelor of Science degree in Statistics, Department of Statistics and Actuarial Science, University of Iowa, USA: Bachelor of statistics worth a minimum of 120 credits (360 notional hours) produces candidates with the following competence: conceptual understanding of elementary probability and mathematical statistics; skills in data analysis and interpretation; the ability to communicate effectively both orally and in writing; proficiency in statistical computing.

Bachelor of Science degree in Statistics, Department of Statistics, Ohio State University, USA: Bachelor of Statistics worth a minimum of 121 credits (363 notional hours) prepares students for entry level in the areas of pharmaceuticals, finance, consumer science, medicine, environmental science, agriculture, business, education, science and engineering, and the social sciences.

The Bachelor of Science degree offered in USA and South Africa generally emphasizes development of competency in probability, mathematical statistics, data analysis and interpretation at NCQF level 7. The qualification structure is similar and compares well in terms of learning outcomes.

However, the proposed qualification incorporates workplace learning and modules that equip learners to be entrepreneurs.

REVIEW PERIOD

The qualification will be reviewed after 5 years, after running its full cycle. However, ad-hoc reviews might be done in line with Industrial Advisory Board advice and the University changes.