

BQA NCQF QUALIFICATION TEMPLATE

SECTION A: QUALIFICATION DETAILS															
QUALIFICATION DEVELOPER (S)			University of Botswana												
TITLE		Doctor of Philosophy in Geomatics						NCQF LEVEL		10					
STRANDS (where applicable)		N/A													
FIELD		Manufacturing, Engineering and Technology		SUB-FIELD		Engineering and Engineering Trades		CREDIT VALUE		360					
New Qualification						Legacy 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 Doctor of Philosophy in Geomatics (PhD in Geomatics) qualification has been designed to respond to Botswana's socio-economic needs and that of the region. The rationale and purpose of the qualification are aligned to the key strategic sectors of Engineering, Built Environment, Construction, Mining, Water, and advancing Science and Technology through excellence in Research and Innovation as identified and in congruence with the recommendations of: Human Resource Development Council (HRDC 2016), National Human Resource Development Plan (2009-2022) and NDP 11 (2017), which seeks for a high-level and advanced workforce required to transform Botswana into a knowledge-based and circular economy. As Botswana embraces sustainable development through the implementation of the Sustainable Development Goals (SDGs), the Doctor of Philosophy in Geomatics qualification graduates will															

contribute towards bolstering the relevant high-level trained human resource in support of the Botswana's domesticated SDG targets including: ensuring ownership and control over land and other forms of property (SDG target 1.4); integrated water resources management at all levels (SDG target 6.5); developing quality, reliable, sustainable and resilient infrastructure (SDG target 9.1); ensuring access for all to adequate, safe and affordable housing and basic services and upgrade slums (SDG target 11.1), and to significantly increase the availability of high-quality, timely and reliable geospatial data (SDG target 17.18). The qualification is also in line with Botswana's Vision 2036, transforming the country from an upper middle-income country to a high-income country by 2036, by contributing to the following strategic pillars: Pillar 1 (Sustainable Economic Development), Pillar 2 (Human and Social Development), and Pillar 3 (Sustainable Environment).

The mission of the Doctor of Philosophy in Geomatics is to further provide intensive and advanced training in basic and applied research leading to the highest level of scholarly attainment and enable learners to conduct research independently to address new challenges as innovators. The Doctor of Philosophy in Geomatics graduates will be high-level specialists capable of solving complex societal problems, with lifelong-learning skills through research and other professional developments leading to improvements and innovations for national development. They will also be able to assume high level leadership positions in industry, academia, government, or private sector with consideration to environmental, social and ethical responsibility.

PURPOSE: (itemise exit level outcomes)

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

1. Apply advanced theories and concepts in the area of specialization for conducting high-level research and development of new facts and practical solutions for real-world problems.
2. Develop and advance contemporary theory, methodology and their applications in one or more areas of specializations in Geomatics.
3. Think independently, analytically and innovatively in multidisciplinary and interdisciplinary work and research environments.
4. Provide technical and management contributions in Geomatics and related Engineering and the Built Environment disciplines through national and regional development.

MINIMUM ENTRY REQUIREMENTS (including access and inclusion)

- Master's Degree in Geomatics or related field with minimum of NCQF Level 9 or Equivalent.
- There is provision for access through Recognition of Prior Learning (RPL) and Credit Accumulation and Transfer (CAT). RPL and CAT will be assessed on application to determine the eligibility of the candidates in line with ETP policies.

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SECTION B		QUALIFICATION SPECIFICATION	
GRADUATE PROFILE (LEARNING OUTCOMES)		ASSESSMENT CRITERIA	
1. Systematically review, analyze, assimilate and interpret the body of scientific literature and innovations to identify the knowledge and scientific gaps in the discipline area.		1.1 Conduct comprehensive scholarly literature review to identify scientific knowledge gaps that are significant for further research investigations. 1.2 Adopt advanced philosophical standpoints that fit with own context and within the discipline of Geomatics. 1.3 Developing viable and original research proposals.	
2. Develop new theories and concepts in one or more areas of specializations in Geomatics and conduct independent and high-level research for the development of practical solutions for real-world problems.		2.1 Design and implement a plan of work for an original research study. 2.2 Develop and advance original concepts and ideas to understand, analyze and design intricate solutions in Geomatics. 2.3 Develop advanced research methodologies and philosophical standpoints to contribute to research and knowledge development in Geomatics. 2.4 Generate practical and innovative solutions to problems in the field of specialization.	
3. Uncover and present new knowledge through formulation and discovery of new facts based on empirical data and established ideas for knowledge development and professional practice.		3.1 Design original experiments for the collection of high-quality research data and validate the research data in the research process. 3.2 Analyze, synthesize, interpret and discuss research findings. 3.3 Translate research and evidence-based interventions to actual practice to influence solutions and outcomes. 3.4 Solve problems with versatility through mastery of analytical, critical and innovative thinking methodologies. 3.5 Utilize evidence generated from research to improve Geomatics practice, education and policy.	
4. Communicate effectively (both orally and in writing) with a wide range of audiences, across a range of professional and personal contexts.		4.1 Publish research article(s) in peer-reviewed journals from the findings of the Doctor of Philosophy (PhD) research.	

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	4.2 Generate and present scientific outputs and reports in conferences, seminars and workshops.
5. Function effectively both as a leader and as a collaborative member of a team to achieve set goals, as well as connecting and interacting socially and effectively with diverse culture.	5.1 Contribute to, cooperate with and respect contributions from fellow researchers and scholars. 5.2 Demonstrate skills and knowledge at a level required for academic responsibility, management or administrative positions.
6. Understand and apply the required social and ethical standards and responsibilities in carrying out research, with appropriate professional conduct within the set guidelines in consideration of the environmental, social, and economical requirements.	6.1 Apply conditions set for intellectual integrity rights and management in research and scholarship. 6.2 Adopt ethical codes and legal guidelines in the conduct of responsible scientific research and implementation of projects. 6.3 Implement projects with sound environmental integrity measures.

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SECTION C		QUALIFICATION STRUCTURE			
COMPONENT	TITLE	Credits Per Relevant NCQF Level			Total Credits
		Level [9]	Level [10]	Level []	
FUNDAMENTAL COMPONENT <i>Subjects/ Courses/ Modules/Units</i>	Research Methods		15		15
	Mathematical Methods for Engineers		15		15
CORE COMPONENT <i>Subjects/Courses/ Modules/Units</i>	Research Proposal		60		60
	PhD Thesis		270		270
STRANDS/ SPECIALIZATION	Subjects/ Courses/ Modules/Units	Credits Per Relevant NCQF Level			Total Credits
		Level []	Level []	Level []	
1.					
2.					

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SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL

TOTAL CREDITS PER NCQF LEVEL

NCQF Level	Credit Value
10	360
TOTAL CREDITS	360

Rules of Combination:

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

Fundamental Level 10 30 Credits
 Core Level 10 330 Credits
 Total Credits: 360 Credits

- 1. Publication:** The candidate's supervisor shall submit written evidence that the candidate has, with the approval of the supervisor, **published** OR **submitted** at least two (2) journal papers in a Journal registered in an Indexed Database.

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ASSESSMENT ARRANGEMENTS

All assessments, formative and summative, leading/contributing to the award of credits or qualifications should be based on learning outcomes and/or sub-outcomes.

- **Examination of Coursework:** There will be TWO forms of assessments:
 - (a) Formative Assessment (Continuous Assessment), and
 - (b) Summative Assessment (End of Semester Final Examinations).
 Formative assessment for taught courses will contribute 40%, and Summative assessment for taught courses will constitute 60% of the overall learning programme.
- **Examination of PhD Thesis:** Assessment is by formal examination of the written Thesis through:
 - (a) Internal Examination.
 - (b) External Examination
 - (c) Scholarly Defence of Thesis.

Assessments shall be carried out by persons with Ph D in Geomatics or related field.

MODERATION ARRANGEMENTS

- The qualification shall have an Internal and External moderator following applicable policies and regulations for quality assurance to ensure fairness, validity, reliability, and consistency of assessments.
- Moderation shall be carried out by persons with Ph D in Geomatics or related field.

RECOGNITION OF PRIOR LEARNING

Learners 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 RPL policy, credit accumulation and transfer system and relevant national-level policy and legislative framework.

CREDIT ACCUMULATION AND TRANSFER

The Credit Accumulation and Transfer System shall be used for credit transfer between institutions of higher learning.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

Horizontal Learning Pathways

- Doctor of Philosophy in Photogrammetry and Remote Sensing
- Doctor of Philosophy in Geospatial Information Sciences
- Doctor of Philosophy in Geoinformatics
- Doctor of Philosophy in Geomatics Engineering
- Doctor of Philosophy in Engineering Surveying and Space Geodesy

Employment Pathways

- Academic
- Scientist/Researcher
- Engineering and Cadastral Surveyor
- Academic/Professional Manager

QUALIFICATION AWARD AND CERTIFICATION

Qualification Award

- To be awarded a Doctor of Philosophy in Geomatics, a candidate should have satisfied all exit learning outcomes and met the minimum credit requirements (360 credits), Fundamental and Core components as indicated in the qualification structure.
- Candidates shall be awarded a Doctor of Philosophy in Geomatics upon obtaining a minimum of 360 credits.

Certification

- There will be issuance of an official transcript and a certificate at award of degree as follows and in accordance with the area of specialization:

Doctor of Philosophy in Geomatics

SUMMARY OF REGIONAL AND INTERNATIONAL COMPARABILITY

The qualification is compared with similar qualifications regionally at the University of Cape Town (South Africa and Namibia University of Science and Technology (NUST) (Namibia), and internationally Curtin University (Australia) and York University (Canada).

Similarities

- The duration of the Doctor of Philosophy studies is similar and stipulated at a minimum of 3-years of full-time research, with the candidates exiting at National Qualification Level 10 regionally, and at Curtin University. For the same qualification, the exit level credits are

the same for the University of Cape Town (360 credits) and Namibia University of Science and Technology (NUST) (360 credits).

- The exit outcomes emphasize on uncovering and creating new knowledge either by the discovery of new facts, the formulation of new theories to advance research and knowledge in Geomatics, which is presented in a Thesis or Dissertation. The examination and assessment of the Thesis/Dissertation is based on internal and external examination of the Thesis or Dissertation.
- The subfields of specialization within the discipline of Geomatics are generally similar (Geodesy and Navigation; Engineering Surveying; Photogrammetry and Remote Sensing; Land Administration and Development), and the resulting Education and Employability pathways are also largely similar and directed towards being academics, researchers and/or professional managers in Government Departments.
- While both Namibia University of Science and Technology (NUST) and the University of Cape Town have the same National Qualification credits as the proposed qualification, the University of Cape Town and York University shares the same requirement of Journal publication(s) as a condition for fulfilling the requirements for the award of the qualification.
- All the other Universities do not have requisite foundational courses for PhD candidates except York University that requires two Research Evaluation courses, which is similar to the structure of the Doctor of Philosophy in Geomatics qualification. Further, the universities require a proposal, which must be approved before start of the PhD research. Progress reports following from proposal implementation milestones forms part of the examination and assessment process.

Differences

- The Universities compared offer PhD qualifications in Geomatics; however, the specific titles of the qualifications differ. NUST's PhD is titled Spatial Sciences, Curtin University also offers PhD in Spatial Sciences, while York University offers PhD in Earth and Space Science (Geomatics Science and Engineering). The University of Cape Town offers Doctor of Philosophy (Geomatics) which is similar to the proposed qualification. It is noted that the Doctor of Philosophy (Spatial Sciences) and Doctor of Philosophy (Geomatics) are similar qualifications, with the former having PhD work emphasizing more on applied Geomatics research while the latter focusses on both the core theoretical science as well as the applied Geomatics research components.
- The awards of the qualifications have marginal differences in the rules and standards. Mainly, the stipulated study period is 3-4 years, but candidates can graduate earlier after completing 2-years of research provided satisfactory evidence is provided by the supervisor that the candidate has satisfactorily meet all the requirements for the award of the qualification.
- Namibia University of Science and Technology (NUST) does not require publication of Journal article, while at the University of Cape Town publication is optional but is done under a Memorandum of Understanding (MoU) with the supervisor. At Curtin University the Thesis can be presented as a traditional thesis or a compilation of published papers, and at York University, the research results should be publishable.

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Summary

The Doctor of Philosophy qualifications have the same structure taking at least 3-years and emphasises on the creation of new knowledge. The exit level outcomes are similar as well as the pathways for further study and career growth. As there are no significant differences, the Doctor of Philosophy in Geomatics qualification compares favourably with similar accredited qualifications within and outside the continent.

REVIEW PERIOD

The qualification will be reviewed every five (5) years.

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CODE (ID)			
REGISTRATION STATUS	BQA DECISION NO.	REGISTRATION START DATE	REGISTRATION END DATE
LAST DATE FOR ENROLMENT		LAST DATE FOR ACHIEVEMENT	