

BQA NCQF QUALIFICATION TEMPLATE

SECTION A: QUALIFICATION DETAILS																			
QUALIFICATION DEVELOPER (S)			Botswana International University of Science and Technology																
TITLE		Doctor of Philosophy in Geological Sciences							NCQF LEVEL		10								
STRANDS (where applicable)		Geology Geophysics Hydrogeology Mineral Resources Management																	
FIELD		Natural, Mathematical and Life Sciences							CREDIT VALUE		360								
SUB FIELD		Earth Sciences																	
New Qualification		✓		Legacy Qualification					Renewal Qualification										
									Registration Code										
SUB-FRAMEWORK		General Education					TVET					Higher Education			✓				
QUALIFICATION TYPE		Certificate		I		II		III		IV		V		Diploma			Bachelor		
		Bachelor Honours					Post Certificate			Graduate					Post Graduate Diploma				
		Masters									Doctorate/ PhD			✓					
RATIONALE AND PURPOSE OF THE QUALIFICATION Botswana's economy is currently driven by the mining sector, which contributes approximately 18% to the gross domestic product (GDP), according to Statistics Botswana (2023/2324). Currently, the country has seven operational mines that produce four key mineral commodities: diamonds, copper-nickel, coal, and soda ash. Although, mining remains an important sector of the economy of Botswana, there is a desire to transform the economy from minerals to knowledge-based and enhance the																			

country's global competitiveness. This presents an opportunity for Botswana universities to develop doctoral degree qualifications that will equip a new generation of geoscientists with in-depth knowledge in the Earth sciences and specialized skills required to drive the demands of knowledge-based- economy.

The proposed qualification aligns with BIUST's mission and vision and consistent with priority skills identified in the 2025 Human Resource Development Council Priority Skills Report. The report recommends future investment in postgraduate education in geoscience fields with especial emphasis on geophysics, geochemistry, hydrogeology and geo-metallurgy. Their findings further indicate that specialized geoscientists play a key role in fulfilling both current and emerging skill needs required to advance our mining sector value chain.

The proposed qualification offers specializations in Geology, Geophysics, Hydrogeology, and Mineral Resources Management which are strategically aligned with national priorities, BIUST's research strengths, and the expertise of collaborative partners.

The qualification is further guided by national strategy policies such as VISION 2036 (pillar 1 and 2) and Tertiary Education Policy (April 2008) goals.

The Doctor of Philosophy degree in Geological Sciences is designed to train researchers, professionals, and future university lecturers. The qualification will equip graduates with the required skills and competencies to prepare them to be new torch bearers of new knowledge in the geological sciences. The graduate will demonstrate a very high level of mastery in the field of specialization and critical thinking skills in assessing information from diverse sources and identify connection between various issues and concepts.

PURPOSE: (itemise exit level outcomes)

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

1. Address complex geological and environmental challenges using ethical, sustainable, and appropriate geological methods.
2. Develop innovative, research-driven solutions that advance knowledge in the geosciences and support the discovery and characterization of mineral deposits.
3. Conduct original and fundamental research in the field of geoscience and related areas
4. Communicate research findings effectively across diverse platforms and demonstrate the ability to collaborate productively within multidisciplinary teams.
5. Demonstrate high standards of professional integrity in both research and practice and succeed in the workforce as competent and ethical geoscientists.

MINIMUM ENTRY REQUIREMENTS (including access and inclusion)

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

The minimum admission requirement is a master's degree at NCQF level 9 or equivalent in Geological Sciences or a related field of study.

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SECTION B		QUALIFICATION SPECIFICATION
GRADUATE OUTCOMES)	PROFILE (LEARNING	ASSESSMENT CRITERIA
Generic Learning Outcomes 1.0 Demonstrating the capacity to think independently and produce original research that contributes to the field of geoscience.		1.1 Conduct, compile, synthesize, relevant literature to support a coherent and original research investigation. 1.2 Apply appropriate and advanced research methodologies to collect, analyze, and interpret data, and produce scientific reports tailored to a professional geoscience audience. 1.3 Demonstrate originality and intellectual independence in the generation and application of new knowledge within the geosciences. 1.4 Apply appropriate referencing conventions, avoid plagiarism, and respect intellectual property.
2.0 Demonstrate advance capacity to communicate scientific knowledge and research findings to various stakeholders		2.1 Communicate research findings effectively to diverse audiences through written work and oral presentation. 2.2. Produce written reports and documents that effectively convey geological and environmental data to both technical experts and non-technical stakeholders.
3.0 Demonstrate professional capabilities, qualities and transferable skills applied in different fields of geoscience.		3.1 Demonstrate intellectual independence and a commitment to ongoing professional and scholarly development 3.2 Critically evaluate field data and integrate it with complementary datasets to formulate and address advanced geological research questions. 3.3 Critically evaluate and organize information to address geological and environmental challenges that have not adequately addressed.

4.0 Apply advanced technological principles to critically analyse spatial and compositional data, generating innovative solutions to complex problems in geology and environmental science.	4.1 Critically evaluate the strengths and limitations of existing models of geological processes and apply advanced analytical reasoning to refine these models or develop new models. 4.2 Apply geospatial technologies and new analytical techniques (e.g., GIS, remote sensing, geochemical modeling software) to collect, process, and interpret data.
Geology strands 5.0 Demonstrate mastery of advanced knowledge in methodologies, principles, and applications of appropriate geological techniques in solving environmental and geological challenges at local, national, and global levels.	5.1 Demonstrate the application of advanced geological techniques to critically analyze and address environmental and geological challenges at local, national, and global scales. 5.2 Critically apply established exploration methodologies in the design, execution, and evaluation of mineral exploration projects.
6.0 Apply most advanced knowledge from a wide range of geological techniques and principles to locate mineral deposits and solve environmental geoscience problems	6.1 Demonstrate comprehensive knowledge of advanced geological methodologies and theoretical principles in the evaluation, classification, and assessment of mineral deposits 6.2 Apply scientifically rigorous methods and advanced principles of geological science to analyze and solve complex geological and environmental problems. 6.3 Critically evaluate geological processes responsible for the formation of various rock types and the genesis of ore deposits
Geophysics strands 7.0 Demonstrate mastery of geophysical principles, methodologies and their applications in addressing environmental and geological challenges.	7.1 Independently apply advanced geophysical techniques to analyze and solve complex environmental and geological problems at local, national, and global scales. 7.2 Critically apply established exploration geophysical methods in the design, execution, and evaluation of mineral exploration projects.

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8.0 Apply most advanced knowledge from a wide range of geological techniques and principles to locate mineral deposits and solve environmental geoscience problems	8.1 Exhibit comprehensive knowledge of advanced geophysical methodologies and theoretical principles in the evaluation, classification, and assessment of mineral deposits 8.2 Apply rigorous methods and advanced geophysical principles to analyze and solve complex geological and environmental problems. 8.3 Critically evaluate tectonic hazards in populated areas
Hydrogeology strands 9.0 Demonstrate mastery of theoretical principles, methodologies of hydrogeology and their applications in addressing water challenges in both natural and managed environments.	9.1 Independently apply advanced hydrogeological techniques to analyze and solve groundwater problems at local, national, and global scales. 9.2 Critically apply established exploration geophysical and hydrogeological methods in the design, execution, and evaluation of mineral exploration projects.
10.0 Apply most advanced knowledge from a wide range of geological techniques and principles to locate ground water sources and solve environmental geoscience problems	10.1 Exhibit comprehensive knowledge of advanced geophysical methodologies and theoretical principles in the evaluation, classification, and assessment of mineral deposits 10.2 Apply rigorous methods and advanced hydrogeological principles to examine groundwater contamination. 10.3 Critically evaluate geological processes responsible for groundwater systems
Mineral Resource Management strands 11.0 Demonstrate expert-level knowledge in ore deposit characterization, resource estimation, extraction technologies and sustainable strategies associated with mineral resources challenges at local and national levels.	11.2 Critically apply established extraction technologies and sustainable strategies in the design, exploitation, and beneficiation of mineral exploration projects. 11.2 Integrate advanced concepts and principles of sustainable resource utilization into the optimization of mining processes and the development of effective waste management strategies.

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SECTION C		QUALIFICATION STRUCTURE			
COMPONENT	TITLE	Credits Per Relevant NCQF Level			Total Credits
		Level []	Level []	Level [10]	
FUNDAMENTAL COMPONENT Subjects/ Courses/ Modules/Units	Not applicable				
CORE COMPONENT Subjects/Courses/ Modules/Units	Doctoral Thesis in Geological Sciences	N/A	N/A		360
STRANDS/ SPECIALIZATION	Subjects/ Courses/ Modules/Units	Credits Per Relevant NCQF Level			Total Credits
		Level []	Level []	Level[10]	
1. Geology	Independent, original research in geology leading to a dissertation and peer-reviewed publications	N/A	N/A		360
2. Geophysics	Independent, original research in geophysics leading to a dissertation and	N/A	N/A		360

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	peer-reviewed publications				
3. Hydrogeology	Independent, original research in hydrogeology leading to a dissertation and peer-reviewed publications	N/A	N/A		360
4. Mineral resource management	Independent, original research in mineral resource management leading to a dissertation and peer-reviewed publications	N/A	N/A		360
Electives	Not applicable				

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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)

This qualification consists of one core components: Doctoral Thesis in Geological Sciences (360 credits). The research proposal is an important element which determines the area of specialization. It must clearly outline the intended field of study. For example, to graduate with PhD in Geological Sciences (Geophysics), a student must complete independent, original research in geophysics, culminating in a dissertation and peer-reviewed publications.

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ASSESSMENT ARRANGEMENTS

All formative and summative assessments leading to the award of this qualification shall be aligned with the qualification's exit-level outcomes for the relevant specialization.

Formative Assessment

Formative assessment will be administered continuously, and it will be informed by submission of written proposal in area of specialization, semesterly written progress reports and oral presentation to department.

Summative Assessment

Candidates shall undergo a summative assessment to evaluate whether the candidate has met the requirements for the award of the PhD degree in area of specialization. Internal and external examiners who are experts in specialization evaluate whether the candidate PhD dissertation meets the doctoral standards as outlined in the Postgraduate Policy and Guidelines of BIUST. At least one paper published in a peer-reviewed scientific journal, a pass in the oral examination and candidate dissertation are required for the award of the Doctor of Philosophy in Geological Sciences degree in the relevant area of specialization.

MODERATION ARRANGEMENTS

Internal and external moderation will be carried out in accordance with institutional policies. All the moderators and examiners should be registered and accredited by BQA or an equivalent body. The oral examination will be assessed by an examination panel constituted through following existing oral examination guidelines for PhD. All processes and procedures are clearly outlined in the Postgraduate Policy and Guidelines at BIUST

RECOGNITION OF PRIOR LEARNING

There is provision to award part of credits towards Doctor of Philosophy in Geological Sciences qualification in accordance with existing RPL policies at BIUST and the principles that are provided for by BQA/any other national policies.

CREDIT ACCUMULATION AND TRANSFER

Credit Accumulation and Transfer (CAT) will be considered for award of Doctor of Philosophy in Geological Sciences qualification in line with BIUST CAT policy and National policies.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

Learning Pathways

Vertical articulation

Postdoctoral fellowship in Geological Sciences or related areas.

Horizontal articulation

- PhD in Geological Sciences (Geology)
- PhD in Geological Sciences (Geophysics)
- PhD in Geological Sciences (Hydrogeology)
- PhD in Geological Sciences (Mineral Resources Management)

Employment pathways

Upon completion of the qualification in their area of specialization, graduates are expected to take up positions as:

- Geoscientists
- Geophysicist
- Hydrogeologist
- Mineral resource specialist
- Exploration Project specialist

QUALIFICATION AWARD AND CERTIFICATION

Qualification Award

The degree is awarded as Doctor of Philosophy in Geological Sciences, with a designated area of specialization in brackets, upon the successful completion of a minimum of 360 credits as prescribed in the Rules of Combination.

Certification

A candidate who successfully fulfils all the requirements outlined in the institution's Postgraduate Studies Guidelines will be awarded a PhD degree certificate.

SUMMARY OF REGIONAL AND INTERNATIONAL COMPARABILITY

This qualification is comparable with other Doctor of Philosophy in Geological Sciences offered regionally, and globally in terms of main exit outcomes, assessment strategies, duration, and NQF level. Regionally, it was compared with University of Witwatersrand (Wits) in South Africa. At international level it was compared with the one offered by University of South Carolina in the United States of America as well as University College London (UCL) in UK. The proposed qualification has been developed with a strong emphasis on addressing the country's needs and supporting the diversification of the economy. This analysis confirms the qualification is different with specialization in mineral resource management. But demonstrated clear similarities with other qualification at the same NQF10 level, in terms depth of knowledge and working independently to design and carry out a project to address important practical questions

Summary of Similarities Observed

- They all share the core component of research training in Earth Sciences.
- All require a substantial dissertation demonstrating original research and contribution to the field geological sciences.
- It compares favorably with well with the one offered at Wits University and University College London (UCL), in terms of credit values, average duration of three years for completion, and exit-level outcomes.

However, there are apparent differences in terms of research fields and geological regions. Different institutions provide distinct research strengths and perspectives.

- Wits University is situated in a geologically rich region specializing in economic geology and environmental geology.
- South Carolina emphasizes earth system, geochemistry and tectonics. In addition, graduate students are required to complete 3-4 modules from six research areas: Students in this program typically start with coursework that grounds them in core principles of geology, followed by the development of a personalized research project. Ph.D. students in Geological Sciences are required to satisfy a breadth requirement by completing 3-4 courses from distinct categories:
 1. Volcanology-Geochemistry-Petrology (Solid processes)
 2. Geophysics-Tectonics-Basins (Regional tectonics)
 3. Hydrology-Geomorphology (Hydrogeology and Geomorphology)
 4. Organic Geochemistry-Biogeochemistry (Environmental microbiology)
 5. Oceanography (Paleoclimatology)
 6. Data Analysis-Geoscience Education (Modelling for Earth Sciences Applications)
- UCL offers a traditional geology curriculum with a strong focus on practical and field-based learning at NQF level 8

REVIEW PERIOD

This qualification will be reviewed after 5 years upon registration or as and when the need arises.

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For Official Use Only:

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

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