

	BQA NCQF QUALIFICATION TEMPLATE	Document No.	DNCQF.P01.GD02
		Issue No.	01
		Effective Date	01.08.2022

SECTION A: QUALIFICATION DETAILS														
QUALIFICATION DEVELOPER (S)			Botswana International University of Science and Technology											
TITLE		Doctor of Philosophy in Geological Engineering								NCQF LEVEL		10		
STRANDS (where applicable)		1. NOT APPLICABLE 2. 3. 4.												
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 or					
		Bachelor Honours			Post Graduate Certificate				Post Graduate Diploma					
		Masters					Doctorate/ PhD			☒				
RATIONALE AND PURPOSE OF THE QUALIFICATION														
RATIONALE:														

	BQA NCQF QUALIFICATION TEMPLATE	Document No.	DNCQF.P01.GD02
		Issue No.	01
		Effective Date	01.08.2022

The Human Resource Development Council (HRDC) report of 2016 lists some specialization areas of Physical and Earth Science, and Mining and Construction among the top occupations that are in high demand in the Mining, Minerals, Energy, Water Resources, and Manufacturing sectors and highlights the need for continuous engagement with industry to produce graduates that are ready to address the ever-changing needs of the industry (HRDC, 2016) for a knowledge-based economy. Keeping in view the country's economic development and sustainability, the need for higher level professionals is realised. The PhD in Geological Engineering qualification aligns with PILLARS 1, 2, and 3 of HRDC Vision 2036 and the mission and vision of the University i.e., the focus on mining, mineral, environment, water resources, and construction engineering which are critical for the sustainable development of Botswana.

The qualification is designed to generate very advanced knowledge through research in the areas of exploration and mining of mineral resources and construction materials in Botswana, SADC region and globally. The qualification seeks to develop skills and competences among Geological Engineers to enhance civil construction, mining, and environmental industries. The qualification is designed to undertake world-class quality research and teaching that is problem oriented, interdisciplinary, and relevant to the needs of Botswana and will contribute towards business development in Botswana and the SADC region.

Geological Engineering is a modern geoscience discipline that deals with the practical application of principles, concepts, and techniques of the earth sciences to provide sustainable engineering solutions to human needs. Geological Engineers determine the best ways to use the earth's resources to solve technological problems in an environmentally sustainable manner. The PhD in Geological Engineering qualification is multidisciplinary and is fundamental to design and construction in areas of civil, mining and petroleum engineering, environment (Gonzalez de Vallejo and Ferrer, 2011), and related industries in Botswana and the southern Africa region. The qualification emphasizes the integration of Geosciences and Engineering with applications in areas such as construction, rock engineering, foundation design, site selection, resource exploration and production, geo-hazard assessment and mitigation, waste disposal, and restoration of pollution sites. The Geological Engineer conducts research in mineral resource exploration and exploitation, designs geotechnical processes, and performs non-destructive investigation of the subsurface environment for engineering purposes.

	BQA NCQF QUALIFICATION TEMPLATE	Document No.	DNCQF.P01.GD02
		Issue No.	01
		Effective Date	01.08.2022

PURPOSE: (itemise exit level outcomes)

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

1. Conduct original and fundamental research in the areas of mineral resource exploration, mining, petroleum engineering, environmental engineering and geotechnical design.
2. Produce innovative solutions and create new knowledge for Geological Engineering-related problems.
3. Play leading roles in addressing societal needs in Geological Engineering and related areas.
4. Exercise high professional standards and integrity in research and professional practice.
5. Supervise postgraduate research in Geological Engineering and related areas.

MINIMUM ENTRY REQUIREMENTS (including access and inclusion)

The minimum admission requirement is a master's degree in Geological Engineering NCQF level 9 or a cognate field of study.

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

	BQA NCQF QUALIFICATION TEMPLATE	Document No.	DNCQF.P01.GD02
		Issue No.	01
		Effective Date	01.08.2022

SECTION B		QUALIFICATION SPECIFICATION	
GRADUATE PROFILE (LEARNING OUTCOMES)		ASSESSMENT CRITERIA	
1. Demonstrate most advanced knowledge in methodologies, principles, and applications of Geological Engineering.		1.1. Assess the range and limits of the applicability of the core concepts and principles of Geological Engineering. 1.2. Apply the core concepts and principles of Geological Engineering to solve practical societal and industrial problems. 1.3. Analyse and appraise the limitations of basic techniques used in Geological Engineering. 1.4. Appreciate the limitations of one's own work and discipline. 1.5. Evaluate the complexity of knowledge and the potential contribution of other interpretations, methods, and disciplines. 1.6. Recognise and assess the significance of contested scientific knowledge in a contemporary context. 1.7. Demonstrate an understanding of how engineering information and ideas become generally accepted.	
2. Conduct independent original and scholarly research in Geological Engineering.		2.1. Demonstrate conceptual understanding of Geological Engineering and methodological competence. 2.2. Interpret knowledge in Geological Engineering comprehensively and apply the established techniques of research. 2.3. Evaluate current and advanced research in Geological Engineering. 2.4. Demonstrate professional competence related to Geological Engineering.	

	BQA NCQF QUALIFICATION TEMPLATE	Document No.	DNCQF.P01.GD02
		Issue No.	01
		Effective Date	01.08.2022

	2.5. Evaluate complex issues and provide judgements based on the established principles and techniques of Geological Engineering. 2.6. Demonstrate originality in the generation and application of knowledge. 2.7. Apply appropriate, advanced research techniques to collect and analyse the data, and produce a scientific document/report for Geological Engineering audience. 2.8. Discover new ideas through research.
3. Apply Geological Engineering knowledge to design, analyse and evaluate data.	3.1. Apply the existing body of knowledge in the critical analysis of a new question or problem. 3.2. Design, select, and apply appropriate procedures for generating relevant information with due concern for bias and any ethical or safety considerations. 3.3. Apply standard procedures such as experimental and computational techniques, within the discipline of Geological Engineering to conduct appropriate forms of enquiry and deductive reasoning. 3.4. Search, collect and record data accurately, truthfully and in appropriate formats. 3.5. Analyse and evaluate data and scientific evidence from which valid arguments and conclusions are presented.
4. Demonstrate professional capabilities, qualities and transferable skills applied in Geological Engineering.	4.1. Demonstrate logical thinking to identify naïve and flawed scientific reasoning. 4.2. Apply scientific knowledge to distinguish inductive and deductive reasoning. 4.3. Evaluate cause-effect relations in the face of uncertainty or gaps in the available information.

	BQA NCQF QUALIFICATION TEMPLATE	Document No.	DNCQF.P01.GD02
		Issue No.	01
		Effective Date	01.08.2022

	4.4. Demonstrate the capacity to judge and solve a complex Geological Engineering problem. 4.5. Demonstrate responsibility, and accountability in addressing Geological Engineering related problems. 4.6. Make appropriate decisions in complex Geological Engineering related situations. 4.7. Demonstrate intellectual independence for continuing professional development.
5. Effectively demonstrate utilization of Information and Communication Technology (ICT) skills in solving the problems of Geological Engineering.	5.1. Use ICT to record, retrieve and disseminate information to stakeholders. 5.2. Use, develop and modify as appropriate Geological Engineering software packages (geotechnical, mining, exploration, geological software). 5.3. Apply ICT solutions to design and develop geological, geotechnical, geophysical models.
6. Communicate scientific knowledge in collaborative Geological Engineering projects.	6.1. Clearly communicate ideas, issues, and findings in written and oral work to diverse audience. 6.2. Make appropriate referencing conventions, avoid plagiarism, and respect intellectual property. 6.3. Contribute effectively and participate actively in execution of team projects. 6.4. Effectively communicate the outcomes of teamwork with respect to each member of the group. 6.5. Take initiative as a member of an Engineering team. 6.6. Take personal responsibility as a leader in an Engineering team.

	BQA NCQF QUALIFICATION TEMPLATE	Document No.	DNCQF.P01.GD02
		Issue No.	01
		Effective Date	01.08.2022

7. Use most advanced Geological Engineering knowledge to address socio-economic problems in an ethical and culturally sensitive manner.	7.1. Apply Geological Engineering knowledge ethically to evaluate complex Geological Engineering problems. 7.2. Critically evaluate public information dealing with current industrial and environmental-related issues. 7.3. Appraise ethically and culturally sensitive decisions on the effects of Geological Engineering-based activities on society. 7.4. Identify and assess the socio-economic impact of interventions in society and industry.
8. Manage learning activities responsibly in Geological Engineering.	8.1. Analyze and synthesize the appropriate study skills. 8.2. Apply effective learning strategies which suite personal needs and context. 8.3. Demonstrate effective time management. 8.4. Apply appropriate analytical skills to design Geological Engineering-related works. 8.5. Apply appropriate skills effectively to organize Geological Engineering-related investigations.
9. Apply the principles of entrepreneurship and innovation in Geological Engineering as tools for driving socio-economic development.	9.1. Define research problems pertinent to society. 9.2. Demonstrate application of Geological Engineering knowledge for the benefit of society in the form of recommendation to policy makers, developing solutions that drive socio-economic development. 9.3. Demonstrate application of the principles underpinning entrepreneurship for the exploitation of product /service/ process opportunities. 9.4. Illustrate models of business innovation and entrepreneurship. 9.5. Develop comprehensive and well-structured business innovation plans and monitor and evaluate business plans.

	BQA NCQF QUALIFICATION TEMPLATE	Document No.	DNCQF.P01.GD02
		Issue No.	01
		Effective Date	01.08.2022

10. Apply most advanced knowledge of a wide range of geological materials and processes and design principles in solving infrastructural-related problems. 	10.1. Evaluate the design principles that conform to social, legal, health, safety, and environmental standards and regulations. 10.2. Develop briefs and specifications for Geological Engineering projects and generate possible solutions for Geological Engineering problems. 10.3. Evaluate solutions considering possible external factors. 10.4. Solve problems related to Geological Engineering specifications. 10.5. Evaluate the implementation of recommended solutions. 10.6. Apply current practice and appreciate its limitations to possible new developments. 10.7. Apply Geological Engineering techniques in consonance with commercial and industrial constraints.
---	---

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

	BQA NCQF QUALIFICATION TEMPLATE	Document No.	DNCQF.P01.GD02
		Issue No.	01
		Effective Date	01.08.2022

SECTION C		QUALIFICATION STRUCTURE			
COMPONENT	TITLE	Credits Per Relevant NCQF Level			Total Credits
		Level []	Level []	Level [10]	
FUNDAMENTAL COMPONENT <i>Subjects/ Courses/ Modules/Units</i>					
	NOT APPLICABLE				
CORE COMPONENT <i>Subjects/Courses/ Modules/Units</i>					
	Research Thesis			10	360
STRANDS/ SPECIALIZATION	<i>Subjects/ Courses/ Modules/Units</i>	Credits Per Relevant NCQF Level			Total Credits
		Level []	Level []	Level []	
1.					
	NOT APPLICABLE				
2.					
Electives	NOT APPLICABLE				
SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL					
TOTAL CREDITS PER NCQF LEVEL					
NCQF Level		Credit Value			

	BQA NCQF QUALIFICATION TEMPLATE	Document No.	DNCQF.P01.GD02
		Issue No.	01
		Effective Date	01.08.2022

10	360
TOTAL CREDITS	360

Rules of Combination:

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

PhD (Geological Engineering) constitutes a minimum total number of 360 credits.

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

ASSESSMENT ARRANGEMENTS

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

Formative assessment

Formative assessment or continuous assessment should include concept notes, research proposal developments, term papers, seminars, presentations, regular consultation meetings with supervisors, and feedback as well as progress report presentations. Formative assessment is not credited.

Summative assessment

Assessment will be as per the candidate's work that should demonstrate:

1. Significant contribution to knowledge and scholarship.
2. Capacity for original and critical thought.

	BQA NCQF QUALIFICATION TEMPLATE	Document No.	DNCQF.P01.GD02
		Issue No.	01
		Effective Date	01.08.2022

3. Display an appropriate depth and breadth of knowledge and understanding of the relevant field(s) of study in the thesis and at the viva voce examination.
4. Gained significant expertise with respect to basic and advanced/specialized methodologies and techniques.
5. Must have published a minimum number of journal articles, as defined in Faculty regulations, in internationally recognized peer-reviewed journals prior to submitting the thesis for examination.
6. Oral examination (viva voce) of the thesis material.

Summative assessment is credited and carry 100% weightage (360 credits).

MODERATION ARRANGEMENTS

1. Internal Moderation – Internal moderation is done by internal examiners who are suitably qualified with PhD in Geological Engineering.
2. External Moderation – The final PhD thesis, outcome of the proposed research shall be moderated by External Examiners.

RECOGNITION OF PRIOR LEARNING

Not Applicable, as the PhD in Geological Engineering is purely research-based, and so no prior learning is applicable.

CREDIT ACCUMULATION AND TRANSFER

Credit Accumulation

PhD in Geological Engineering Qualification is based on full time and part time research, and the credits are calculated on semester basis considering research topic and research-related assignments, like term papers, seminars, progress presentations, etc. Duration of the PhD in Geological Engineering qualification is three

	BQA NCQF QUALIFICATION TEMPLATE	Document No.	DNCQF.P01.GD02
		Issue No.	01
		Effective Date	01.08.2022

years (6 semesters) minimum and 5 years (10 semesters) maximum for full time and 3 years (6 semesters) minimum and seven years (14 semesters) maximum for the part-time program that accumulate to a minimum of 360 credit units, at NCQF level 10.

Credit Transfer

Credits transfer is not applicable for this qualification.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

Horizontal articulation:

Students may articulate horizontally to:

1. Doctor of Philosophy in Civil Engineering
2. Doctor of Philosophy in Environmental Engineering
3. Doctor of Philosophy in Geology
4. Doctor of Philosophy in Earth Sciences

Vertical articulation:

Not Applicable

EMPLOYMENT PATHWAYS

The graduates of this qualifications can be employed as:

1. Geological Engineers
2. Engineering Geologists
3. Geologists
4. Environmental Engineers
5. Materials Engineers
5. Academicians
6. Researchers

QUALIFICATION AWARD AND CERTIFICATION

	BQA NCQF QUALIFICATION TEMPLATE	Document No.	DNCQF.P01.GD02
		Issue No.	01
		Effective Date	01.08.2022

Minimum standards of achievement for the award of the qualification

A candidate is required to achieve pass status for the thesis which is equal to 360 credits. Candidates meeting the prescribed requirements will be awarded the qualification of PhD (Geological Engineering) in accordance with standards prescribed for the award of the qualification and applicable policies.

Certification

A certificate for the award of the degree of PhD (Geological Engineering) will be given upon successful completion of the qualification.

SUMMARY OF REGIONAL AND INTERNATIONAL COMPARABILITY

The proposed qualification is offered by research only with 360 credit hours similar to that of the University of Pretoria, South Africa. Assessment criteria and award of degree procedures are similar to the qualification offered by the University of Pretoria, South Africa. Duration of the proposed qualification is 3 years (full time) similar to that of Kwame Nkrumah University of Science and Technology, Ghana.

The proposed qualification differs from that of the University of Pretoria in terms of duration where it is 2 years in the later and 3 years in the former. Title of the qualification also differs between the proposed qualification and that of the University of Pretoria. The proposed qualification differs in terms of credit hours with the qualification offered by Kwame Nkrumah University of Science and Technology, Ghana. The qualification offered by Kwame Nkrumah University of Science and Technology consists of coursework and thesis unlike the proposed qualification which is offered by research only. Due to this difference, the assessment criteria also differ between the proposed qualification to that of Kwame Nkrumah University of Science and Technology.

The NQF level of the proposed and both benchmarked qualifications are the same (NQF level 10). All the three qualifications are aligned to the Washington accord. The proposed qualification is accredited by Botswana Qualification Authority (BQA). The qualification offered by University of Pretoria is approved by the Council on Higher Education (CHE) and the qualification of Kwame Nkrumah University of Science and Technology by the

	BQA NCQF QUALIFICATION TEMPLATE	Document No.	DNCQF.P01.GD02
		Issue No.	01
		Effective Date	01.08.2022

Ghana Tertiary Education Commission (GTEC). All programs produce graduates who qualify for professional engineering registration by the appropriate boards or organizations in their respective countries.

REVIEW PERIOD

The review period of qualification is five years.

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