SECTION A:	***QUALIFICATION DETAILS***
QUALIFICATION DEVELOPER (S)	Botswana International University of Science and Technology

TITLE	Doctor of Philosophy in Civil and Environmental Engineering	***NCQF LEVEL***	10
STRANDS (where applicable)	*1.* *2.* *3.* *4.*		

FIELD	Field 10: Manufacturing, Engineering and Technology	***SUB-FIELD***	Engineering and Engineering trades	***CREDIT VALUE***	360

New Qualification	*x*	*Legacy Qualification*	

SUB-FRAMEWORK	*General Education*		*TVET*		*Higher Education*	*x*

QUALIFICATION TYPE	*Certificate*	*I*		*II*		*III*		*IV*		*V*		*Diploma*		*Bachelor*		
	Bachelor Honours		*Post Graduate Certificate*		*Post Graduate Diploma*											
	Masters		*Doctorate/ PhD*	*x*												

RATIONALE AND PURPOSE OF THE QUALIFICATION

RATIONALE:

Currently the world is undergoing the phase of economic development using the strategies proposed by the UN Sustainable Development Goals (SDGs) and Goals laid down in the 4th Industrial Revolution (4IR). These in turn have opened doors to development of strategies that can derive economic benefits through the developed human capital, thus contributing towards a knowledge based economy on top of resource based economy.

It is therefore envisaged that, learning through original and scholarly research at the most advanced level will have to be undertaken by the professionals to improve their knowledge, skills and competencies superior to the Master's level (NCQF 9) and be able to provide leadership through the most advanced qualification such as the Doctoral Level (Ph.D.) at NCQF level 10. In fact, to align with the aspirations laid down in the country's Vision 2036, the NDPs and in the SDG 4 (on quality education), the Human Resources Developmental Council (2016; 2023/24) has been able to provide a consolidated list of top occupations for the country that needed development of qualifications in Botswana. In further elaboration, it can be seen that different areas/sub-areas of Civil and Environmental Engineering are associated with activities that eventually contribute to sustainable economic development, sectors such as the Infrastructure Development, Transportation and Logistics services, Construction with Problematic Soils, Water Security, Energy Security, Climate Resilience and Disaster Risk Reduction, Pollution Reduction, Sanitation and Waste management among many others. These will therefore need innovative leadership who are technologically sound and are able to integrate strategic plans and operational activities to achieve sustainable development goals.

The qualification therefore aims to produce civil and environmental engineers whose competencies are of the highest internationally recognised standards. The likely target group will be able to create professionals to train the emerging trainers in academics and industry dealing in the specific areas of Civil & Environmental Engineering.

PURPOSE: (itemise exit level outcomes)

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

1. Provide leadership in the academic pursuits and on research and policy-making teams in Civil and Environmental Engineering;

2. Solve complex problems within the Civil and Environmental Engineering sector, using multi-disciplinary approach, machine learning and innovation;

3. Demonstrate deeper understanding of the developmental ethos and the environmental processes through independent research and critical thinking in making original contributions and

4. Communicate scientific research findings to relevant stakeholders at all levels.

MINIMUM ENTRY REQUIREMENTS (including access and inclusion)

Candidates holding a relevant Master's Degree (at NCQF Level 9) from a recognised University are eligible to apply.

Candidates not meeting the minimum requirements will be considered through Recognition of Prior Learning (RPL) in accordance with National and Institutional RPL policies.

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SECTION B	*QUALIFICATION SPECIFICATION*
GRADUATE PROFILE (LEARNING OUTCOMES)	***ASSESSMENT CRITERIA***
1 Solve multi-structural complex civil and environmental engineering problems creatively and innovatively by application of most advanced knowledge and methods.	1.1 Create and interpret knowledge through original research or other advanced scholarship commensurate to the most advanced level. 1.2 Critically assess and appraise literatures at global, regional and local level to determine their applicability. 1.3 Formulate a research proposal on an identified complex problem in the chosen discipline using the most advanced scholarly research knowledge. 1.4 Interpret research results for design and prediction. 1.4 Defend the findings in the research proposal through an examination by a board of examiners.
2. Synthesize complex research ideas to develop new knowledge and to redefine existing knowledge in an ethical manner/process.	2.1 Undertake data collection procedures to planning and selecting appropriate tools or instruments for conducting experiments. 2.2 Apply appropriate computational methods or models to manipulate and analyse data for estimation and design 2.3 Apply the principles of ethical conduct of research, including avoidance of plagiarism.
3. Develop and implement a strategy for disseminating research findings and defend	3.1 Summarize information, explain the purpose, objectives, conclusions of the research, and

the research work and outputs before a diverse audience.	tailor the communication to the needs and knowledge level of a particular audience. 3.2 Apply writing skills to communicate and explain the research to diverse audiences (both specialist and non-specialists). 3.3 Write and publish the research findings to summarise the findings into a thesis or its part in recognized journals or book chapters in the field of study. 3.4 Prepare and present research findings in most advanced international conferences and/or indexed journals.
4. Demonstrate leadership in form of decision making for implementation and management of complex multi-disciplinary problems in civil and environmental engineering through strategic professional practice.	4.1 Lead and make strategic decisions for achievement of set goals that describe leadership at the most advanced level 4.2 Demonstrate an extra-ordinary disposition to function optimally as a professional. 4.3 Demonstrate implementation of solutions for a complex multi-disciplinary problem.
5. Demonstrate the most advanced level of initiative, authority, and autonomy, scholarly and professional integrity in all areas of context	5.1 Work independently (and also with others, if required) in using advanced tools to solve problems. 5.2 Adhere to academic integrity in all scholarly works. 5.3 Demonstrate ethics and professional integrity in all activities.

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SECTION C	***QUALIFICATION STRUCTURE***				
COMPONENT	***TITLE***	***Credits Per Relevant NCQF Level***			***Total Credits***
		Level [10]	***Level [ ]***	***Level [ ]***	
FUNDAMENTAL COMPONENT *Subjects/ Courses/ Modules/Units*					
CORE COMPONENT *Subjects/Courses/ Modules/Units*	Research Thesis in Civil and Environmental Engineering.	360			360
STRANDS/ SPECIALIZATION	*Subjects/ Courses/ Modules/Units*	***Credits Per Relevant NCQF Level***			***Total Credits***

		Level [ ]	***Level [ ]***	***Level [ ]***	
1.					
2.					
Electives					

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)***	
Successful passing of the written research thesis examination followed by satisfactory defence of the viva voce. The student must have attained 360 credits of the core component.	

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ASSESSMENT ARRANGEMENTS
The Doctoral degree in Civil and Environmental Engineering will be conferred to candidates who successfully pass the thesis assessment in accordance with the ETP guidelines. The summative assessment will contribute 100% towards the final assessment. All Assessors must be registered with the Botswana Qualification Authority or any recognised body.
MODERATION ARRANGEMENTS
Internal and external moderation will be done in line with institutional policies on moderation. Both internal and external moderation must be registered with Botswana Qualification Authority or any recognised body.
RECOGNITION OF PRIOR LEARNING
Candidates may submit evidence of prior learning and current competencies and/or undergo appropriate forms of Recognition of Prior Learning (RPL) assessment for the award of credits towards the qualification in accordance with applicable RPL policies and relevant national and institutional-level policies.
CREDIT ACCUMULATION AND TRANSFER
Credit transfer of up to 60 credits–may be allowed in accordance with the University Credit Accumulation and Transfer Policy, provided such credits were awarded by a registered and accredited provider at the same level for the same subfield of learning.
PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

Since this is the most advanced qualification, there is no vertical upward pathway.

Graduates may progress horizontally to one of the following:

a) Doctor of Philosophy in Civil Engineering
b) Doctor of Philosophy in Environmental Engineering
c) Doctor of Philosophy in Water Resources Engineering
d) Doctor of Philosophy in Structural Engineering
e) Doctor of Philosophy in Geotechnical Engineering
f) Doctor of Philosophy in Highway and Transportation Engineering

Employment:

Students completing the proposed qualification have various options as progression pathways through horizontal articulation through employment such as:

a) Structural Engineers,
b) Water Engineers,
c) Water Resources Engineers,
d) Hydrological Engineer,
e) Geotechnical Engineers,
f) Environmental Engineers,
g) Traffic / High way / Transportation Engineers.

QUALIFICATION AWARD AND CERTIFICATION

Successful candidates will be awarded Doctor of Philosophy (Civil and Environmental Engineering) upon meeting the minimum of 360 credits as described in the rules of combination.

A certificate will be issued to successful candidates upon award.

SUMMARY OF REGIONAL AND INTERNATIONAL COMPARABILITY

The proposed qualification at NCQF Level 10,viz: Doctor of Philosophy (Civil and Environmental Engineering) compares well with the following qualifications showing similarities and differences:

Titles:

The proposed qualification is titled Doctor of Philosophy (Civil and Environmental Engineering).

The title has been benchmarked against the:

a) University of Birmingham, U.K. whose qualification clearly shows as Doctor of Philosophy (Civil Engineering) and covers all the areas of Civil and Environmental Engineering.
b) Stellenbosch University the qualification title is Doctor of Philosophy (Ph.D.) in Engineering, covering some areas of civil and environmental engineering such as Water and Environmental Engineering, Transportation Engineering, Structural Engineering, Pavement Engineering, Geotechnical Engineering through which research topics can be proposed.
c) Queensland University qualification is Doctor of Philosophy in Engineering and has research areas covering Geotechnical and Construction Engineering, Water and Environmental Engineering, Structural Engineering and Transportation Engineering and research topics are also proposed from these main areas.

The proposed qualification title shows that it is inclined to civil and environmental engineering, while the titles of qualifications benchmarked with are general and allow learners to conduct research in any specialized area within the engineering field.

NQF level:

Doctor of Philosophy at the University of Queensland in Australia offered at AQF Level 10;
Doctor of Philosophy in Civil Engineering at the University of Birmingham in U.K., at Level 8 of the Framework for Higher Education Qualifications (FHEQ) for U.K. (the most advanced level for U.K.); and also the Doctor of Philosophy in Civil Engineering of the University of Stellenbosch in South Africa at SAQA Level 10.

Credits: The proposed qualification is composed of 360 credits. While the University of Stellenbosch covers similar number of 360 credits, the University of Birmingham Qualification also requires 360 credits but could normally require more duration such as 4-5 years (with 120 credits/year =480-600 credits). The qualification offered by the University of Queensland requires completion of 48 units over a period of 3-4 years. Since, the credit equivalent of 48 units at Queensland is not clear, the

credit structure of 360 credits (1 credit = 10 notional hours) followed in the region by the University of Stellenbosch, or in Birmingham, U.K. has been adopted.

Duration:

The proposed qualification which is expected normally to be accomplished with a minimum period of 3 years on a full time basis, compares well with all the qualifications benchmarked with, some of them indicating a slight extended duration of 3-4 years to achieve their credit structure.

Learner exit outcomes

All the qualifications benchmarked with have similar learner exit outcomes to the proposed Doctor of Philosophy (Civil and Environmental Engineering). All the qualifications aim at producing graduates who will be able to conduct the most advanced research independently in the relevant area of Civil and Environmental Engineering by way of developing new and creative approaches that extend or redefine existing knowledge or professional practice. Also the graduates from all these qualifications are expected to be able to communicate research findings and defend ideas in a coordinated and coherent manner.

Structure/modules:

All the qualifications are completely research based.

Assessment:

The mode of progress monitoring of graduates' students is similar to that is stipulated at the University of Birmingham, UK, and in the proposed qualification, through annual graduate students' progress reviews to ensure that students can timely complete their studies on time. At least 3 reviews do take place at the University of Queensland, Australia for monitoring student progress.

In the proposed qualification, the viva voce examination for Ph.D. is obligatory, so does the University of Stellenbosch, while in the University of Birmingham and University of Queensland it is the prerogative of the examiners whether to hold a viva voce examination or not. This is a major point of difference between these Universities.

Pathways

All the qualification lead to similar pathways (qualification and employment) listed earlier in this document. In conclusion, the proposed qualification compares and articulates well other qualifications compared to regionally and internationally.
REVIEW PERIOD
This qualification will be subjected to a review once every five 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**	
REVISION DATE:		**NAME OF PROFESSIONAL BODIES/REGULATORY**	