BQA NCQF QUALIFICATION TEMPLATE

SECTION A:	QUALIFICATION DETAILS				
QUALIFICATION DEVELOPER (S)	University of Botswana				
TITLE	Doctor of Philosophy in Engineering			**NCQF LEVEL**	10
STRANDS (where applicable)	1. Civil Engineering 2. Electrical Engineering 3. Mechanical Engineering				
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

Currently, there is limited research capacity in the country, which has been highlighted in NDP 11, and the same strategic document echoed that the current limited research capacity can be addressed by an increase in investment in research. Through the NDP11 document, there is a call by the Botswana government to shift from a resource-based to a knowledge-based economy and quality of life. This can be achieved through research, innovation, knowledge transfer, community engagement, and industry partnership.

The HRDC latest Priority Skills report (Priority Skills 2023/2024) has identified the following engineering areas/occupations for training locally at PhD (NCQF 10): High Voltage engineers; Electrical / Electronic Engineering; Civil Engineering; Geo-technical Engineers; Renewable Energy Engineers; Computer Engineering. These are some of the areas that will be addressed through this qualification.

The Doctor of Philosophy in Engineering qualification is a broad qualification that is made up of three main broad disciplines, namely Civil, Electrical and Mechanical Engineering, with several sub-disciplines from the three main strands being very broad. The Doctor of Philosophy in Engineering is a traditional qualification designed to apply advanced theories and research methodologies to critically analyse open-ended problems in engineering and develop innovative solutions in the priority areas stipulated by Human Resource Development Corporation (HRDC) 2023/24, and beyond.

The PhD in Engineering qualification is in line with the three pillars of Vision 2036 of producing 'sustainable economic development, human and social development, and sustainable environment' and key future imperatives of research, innovation, and sustainability. It also aligns with the AU Agenda 2063, especially with Actions c, d and f:

c. Catalyse education and skills revolution and actively promote science, technology, research and innovation, to build knowledge, human capital, capabilities and skills to drive innovations and for the African century:

d. Transform, grow and industrialise our economies through beneficiation and value addition of natural resources:

f. Act with a sense of urgency on climate change and the environment, implementation of the Programme on Climate Action in Africa,

PURPOSE: (itemise exit level outcomes)

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

- Produce, communicate, and transfer new knowledge within their academic discipline of engineering.
- Participate in economic development and industrialisation through knowledge generation, innovation and technology transfer.
- Train graduates in the scientific approach to conducting independent research, thereby preparing them for research careers in academia, government, scientific institutes, or industry.
- Contribute to the development of highly qualified and competent engineering human resources in Botswana and beyond.
- Develop valuable essential transferrable skills such as team players, problem-solving, presentation and communication skills, analytical skills and perseverance.
- Provide an avenue for candidates who seek greater depth of knowledge in a specific engineering area

MINIMUM ENTRY REQUIREMENTS (including access and inclusion)

- Master's Degree, NCQF Level 9.
- Recognition of prior learning and credit accumulation and transfer shall be considered.

SECTION B	QUALIFICATION SPECIFICATION
GRADUATE PROFILE (LEARNING OUTCOMES)	**ASSESSMENT CRITERIA**
1. Demonstrate advanced skills and professional competence to apply advanced-level knowledge of the general field of engineering.	1.1 Show evidence of highly advanced study and research skills, selection, analysis and evaluation. 1.2 Demonstrate healthy self-esteem and confidence in their knowledge, skills and attitudes as required to complete the Doctor of Philosophy qualification. 1.3 Deal constructively with diversity and display appropriate teamwork and conflict management skills.
2. Undertake original and scholarly research in the field of Engineering at an advanced and international level.	2.1 Identify problems that require solutions through scientific research. 2.2 Propose methods and techniques to undertake identified research and plan research. 2.3 Conduct research following the scientific method and communicate research findings.
3. Contribute to the development of new knowledge, academic skills, techniques, models, methods and methodologies, tools, approaches, ideas, theories, products or materials.	**3.1** Undertake independent research, that leads to new knowledge, techniques, skills, methods etc. 3.2. Interact with their peers locally, nationally, and internationally to share knowledge. **3.3** Interact with government, society, communities, industries etc to share knowledge, innovation and co-create solutions
4. Apply advanced expert knowledge in their field of specialisation.	4.1 Analyse, evaluate and synthesise problems that require engineering solutions. 4.2 Deal effectively with unknown problems and tasks set on the job, in the real world, by drawing upon the skills from the Doctor of Philosophy (critical thinking, problem-solving, conflict resolution, etc.). 4.3 Demonstrate a work ethic that shows responsibility and accountability towards the employer and the client or community.

SECTION C	QUALIFICATION STRUCTURE				
COMPONENT	TITLE	Credits Per Relevant NCQF Level			Total Credits
		Level [9]	Level [10]	Level [ ]	
FUNDAMENTAL COMPONENT *Subjects/ Courses/ Modules/Units*	Engineering Research Method		15		15
	Mathematical Methods for Engineers		15		15
CORE COMPONENT *Subjects/Courses/ Modules/Units*	*Research Proposal*		60		60
STRANDS/ SPECIALIZATION	*Subjects/ Courses/ Modules/Units*	Credits Per Relevant NCQF Level			Total Credits
		Level [ ]	Level [ ]	Level [ ]	

1.	*Civil Engineering*				
	PhD Thesis		***270***		***270***
2.	*Electrical Engineering*				
	PhD Thesis		***270***		***270***
3	*Mechanical Engineering*				
	PhD Thesis		***270***		***270***
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)

A candidate shall obtain the qualification by:

1. Attaining the following credits:
   1.1 **Fundamental** component – 30 Credits
   1.2 **Core** component – 330 Credits
   Total Credits: 360 Credits

Publication

A candidate will obtain the qualification by:

i. Completing the fundamental coursework (research methods module - 30 credits) and Core coursework (research proposal - 60 credits and a Thesis - 270 credits).

ii. ii. Publishing at least two (2) journal articles in reputable journals recognised by the university (60 credits) Total credits: 360

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 (proposal defense) will contribute 23% towards the award of the final standing.

(b) Summative Assessment will contribute 77% to the final standing

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. The moderator shall be registered and accredited by the Botswana Qualifications Authority and/or equivalent accreditation board.

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

- PhD in Engineering and Built Environment
- PhD in Engineering Sciences and Built Environment
- PhD in Engineering Studies, PhD in Engineering
- PhD in Built Environment
- PhD in Design, PhD in Technology
- PhD in Project Management
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Vertical Learning Pathways

- This is the highest educational qualification, but candidates can proceed to do: Postdoctoral in Engineering

Employment Pathways

- Professional researchers at universities, government, scientific institutes or in industry, Researchers in research and development and innovation, an academic career in higher education research and teaching professionals, etc

- Academics –Lecturers
- Plant maintenance Engineer
- Energy Engineer
- Water Engineer
- Civil Engineer
- Electronic Engineer
- Electrical Engineer

QUALIFICATION AWARD AND CERTIFICATION

To be awarded a Doctor of Philosophy in Engineering, a learner 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 Engineering upon obtaining a minimum of 360 credits.

Certification

For a leaner to be awarded a Doctor of Philosophy in Engineering qualification, he/she should have achieved a minimum of 390 credits. After satisfying all the requirements, a learner will be awarded a Doctor of Philosophy in Engineering certificate.

SUMMARY OF REGIONAL AND INTERNATIONAL COMPARABILITY

A comparative analysis for the qualification under review was conducted against regional and international qualifications. The title of the qualification was found to be the same Doctor of Philosophy in Engineering in all the three universities benched, thus the University of Johannesburg, the university of Cambridge in the UK and Queensland University of Technology in Australia. However, the expected study period for the qualification at the University of Botswana is like the qualification offered at Cambridge and Queensland Universities (3 to 4 yeas full time), while the qualification offered at the University of Johannesburg in South African has shorter duration (2 years full time). The main similarity of the qualification in the four Universities under review is the main exit outcome, which is submission and oral defence of PhD thesis at the end of the study period. The entry requirement for the qualification is Level 9. In all the Universities under review, including the qualification from the university of Botswana, researchers are required to submit detailed research proposal. However, the qualification offered by the University of Botswana requires researchers to take additional two taught courses, thus Engineering

Research Methods and Mathematical Methods for Engineering's, which is not the case for the other three Universities benchmarked.

Assessment strategies for the qualification in Doctor of Philosophy in Engineering is the same in all the Universities benchmarked. These includes submission of research proposal, presentation of seminars, oral defence of final thesis. Qualification rules and minimum standard for the award of the qualification are almost the same. Similarly, education and employment pathways for qualification offered in all the four universities including the University of Botswana are also the same.

REVIEW PERIOD:

The qualification of Doctor of Philosophy in Engineering is designed to be reviewed every 5 years.

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

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**	