

BQA NCQF QUALIFICATION TEMPLATE

SECTION A:	QUALIFICATION DETAILS												
QUALIFICATION DEVELOPER (S)	Botswana International University of Science and Technology												
TITLE	Master of Engineering in Computer Engineering						NCQF LEVEL		9				
STRANDS (where applicable)	N/A												
FIELD	Manufacturing, Engineering and Technology						CREDIT VALUE		240				
SUB FIELD	Engineering and Engineering Trades												
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 Graduate Certificate				Post Graduate Diploma					
	Masters						√	Doctorate/ PhD					
RATIONALE AND PURPOSE OF THE QUALIFICATION													
RATIONALE:													
<p>The Master of Engineering in Computer Engineering qualification is developed to contribute vis a vis human capital development and to fulfil the demand gap as per HRDC 2019 report. It is against this background that this qualification has been developed to address the urgent need for adequately trained manpower to manage the area of Computer Engineering in</p>													

various sectors of the economy (HRDC 2019, Vision 2036, National Development Plan 11).

This qualification helps to build the human capital in the areas of:

- Designing advanced computer systems and control
- Designing and developing microprocessors, personal computers, and supercomputers
- Designing advanced computer systems for communications systems for communication and mobile phone companies,
- Developing and writing software and firmware for embedded microcontrollers, and designing VLSI chips, analogue sensors, mixed signal circuit boards, and operating systems
- Developing advanced computer systems, and mobile applications and phones
- Designing intelligent distributed systems to serve their operations for banks and businesses,
- Designing advanced computer games, for game companies

These are HRDC – Priority Skills and Employment Trends

To determine the viability of computer engineering master's program in Botswana, a Market Needs Analysis was conducted (Appendix 1). The results from the market needs analysis from prospective students and employers were positive, proving that the qualification is needed by stakeholders hence it is sustainable. We also looked at the requirements for human capital development essential for achieving the VISION 2036 pillars : Pillar 1 and Pillar 2

It is to this effect that the M.Eng Computer Engineering qualification is necessary. This is one of the vital engineering qualifications particularly in developing countries like Botswana^{7,8}. It provides strong theoretical foundation, practical skills, professional conduct, and critical thinking in Computer Engineering^{9,10}.

Additionally, this qualification, MEng in Computer Engineering contributes towards Vision 2036's realization by equipping prospective graduates with the necessary skills and

competencies for sustainable economic growth. The qualification equips the learners with the knowledge, skills and competencies in line with the creation of a knowledge-based economy in Botswana, in order to achieve the vision.

PURPOSE:

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

1. Conduct independent research to solve complex and unpredictable computer engineering problems.
2. Demonstrate understanding of advanced computer engineering, signal processing, digital system design, embedded systems, and VLSI design.
3. Design complete and complex systems, from simulation to final realization, and to propose innovative solutions for improving existing systems.
4. Execute engineering projects and develop functional products effectively.

MINIMUM ENTRY REQUIREMENTS

Entry Requirements

Minimum entry qualification

- i) Bachelor's degree, NCQF level 7 or equivalent in the same field.
- ii) Credit Accumulation and Transfer (CAT) and Recognition of Prior Learning (RPL) can be considered for entry according to ETP CAT and RPL policies.

SECTION B QUALIFICATION SPECIFICATION	
GRADUATE PROFILE (LEARNING OUTCOMES)	ASSESSMENT CRITERIA
<p>1. Demonstrate advanced knowledge of fundamental engineering theories in mathematics, science, and engineering applicable to computer engineering and apply this knowledge to solve real-world problems.</p>	<p>1.1. Apply core engineering theories and principles in computer systems.</p> <p>1.2. Use mathematical models to analyze and solve engineering problems.</p> <p>1.3. Apply theoretical knowledge to develop practical engineering solutions.</p>
<p>2. Identify, formulate, and solve complex engineering problems in computer engineering using advanced and innovative methods, ensuring practical implementation and impact.</p>	<p>2.1. Identify and define complex engineering problems in computer engineering.</p> <p>2.2. Use of innovative and advanced methodologies to solve engineering problems.</p> <p>2.3. Implement of practical solutions in a real-world context.</p> <p>2.4. Evaluate the effectiveness and efficiency of the implemented solutions.</p>
<p>3. Manage complex technical or professional activities or projects, take responsibility for decision-making in unpredictable work or study contexts, and demonstrate leadership in practical settings.</p>	<p>3.1. Implement projects engineering projects within scope, time and budget.</p> <p>3.2. Make informed decisions in complex and unpredictable situations.</p> <p>3.3. Demonstrate Leadership and teamwork skills in managing technical or professional activities.</p> <p>3.4. Complete projects within set timelines and resources.</p>
<p>4. Demonstrate understanding and commitment to Computer engineering professional and ethical responsibilities, applying them in real-world scenarios to</p>	<p>4.1. Identify and address ethical issues in engineering practice.</p> <p>4.2. Demonstrate professional responsibility in decision-making processes.</p>

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<p>ensure societal and environmental well-being.</p>	<p>4.3. Apply ethical standards to ensure societal and environmental well-being.</p> <p>4.4. Critically evaluate the impact of engineering solutions on society and the environment.</p>
<p>5. Engage in continuous learning and professional development, acquiring new knowledge and skills relevant to Computer engineering to address evolving industry challenges.</p>	<p>5.1. Participate in professional development activities and continued education.</p> <p>5.2. Apply acquired knowledge and skills to current engineering practices.</p> <p>5.4. Commit to self-improvement and lifelong learning through ongoing professional development.</p>
<p>6. Conduct independent research that addresses current challenges in computer engineering, contributing to advancing knowledge and developing practical solutions.</p>	<p>6.1. Identify and formulate significant research problems in computer engineering.</p> <p>6.2. Apply of rigorous research methodologies to investigate problems and propose solutions.</p> <p>6.3. Analysis and interpretation of research data to derive meaningful conclusions.</p> <p>6.4. Disseminate of research findings through publications and presentations.</p>
<p>7. Function effectively as a team member in scientific projects, demonstrating leadership and collaboration skills in multidisciplinary and practical settings.</p>	<p>7.1. Effectively collaborate with team members to achieve project goals.</p> <p>7.2. Demonstrate leadership skills in guiding team activities and decision-making.</p> <p>7.3. Contribute to a positive and productive team environment.</p> <p>7.4 Complete team projects, reflecting effective teamwork and leadership.</p>

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SECTION C	QUALIFICATION STRUCTURE				
COMPONENT	TITLE	Credits Per Relevant NCQF Level			Total Credits
		Level []	Level []	Level [9]	
FUNDAMENTAL COMPONENT Subjects/ Courses/ Modules/Units	N/A				
CORE COMPONENT Subjects/Courses/ Modules/Units					
	Computer Engineering MEng Dissertation - Thesis			240	240
STRANDS/ SPECIALIZATION	Subjects/ Courses/ Modules/Units	Credits Per Relevant NCQF Level			Total Credits
		Level []	Level []	Level []	

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1.					
2.					
Electives					

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SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL

TOTAL CREDITS PER NCQF LEVEL

<i>NCQF Level</i>	<i>Credit Value</i>
9	240
TOTAL CREDITS	240

Rules of Combination:

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

To graduate with a Master of Engineering (MEng) in Computer Engineering, students pursuing the research path must complete 240 credits. The qualification structure for the research path includes the following components:

- **Core Component (240 credits):**
 - Master Thesis

The primary focus of the research path is completing a substantial piece of original research that will demonstrate the student's ability to conduct independent research in computer engineering.

- **Credit Distribution:**
 - The Research Dissertation/Thesis component is assigned 240 credits.

ASSESSMENT ARRANGEMENTS

All assessments leading to the award of credits are based on the qualification's exit-level outcomes.

- **Formative Assessment:0%**

Learners are continuously assessed through:

- Progress reports

- **Summative Assessment: 100%**

Learners need to complete a dissertation and submit at the end of the qualification.

MODERATION ARRANGEMENTS

There shall be a provision for both internal and external moderation by BQA accredited moderators in line with ETP policies. Moderation shall be conducted by persons with a doctoral degree in computer engineering or related field.

RECOGNITION OF PRIOR LEARNING

There will be no provision for award of credits towards the qualification since this research based and all credits are obtained via thesis assessment.

CREDIT ACCUMULATION AND TRANSFER

To graduate with a Master of Engineering (MEng) in Computer Engineering, students pursuing the research path must complete 240 credits through submission and assessment of a thesis, therefore there is no CAT.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

Horizontal:

- Master of Eng in Telecommunications Engineering
- MEng in Electrical Engineering
- MEng in Industrial Computer Engineering
- MEng in Control and Instrumentation Engineering
- MEng in VLSI Engineering
- MEng in Embedded Systems Engineering

Vertical:

An MEng Computer Engineering graduate can do the following qualifications:

- Doctor of Philosophy in Electrical Engineering

- Doctor of Philosophy in VLSI Engineering
- Doctor of Philosophy in Embedded Systems Engineering

Employment Pathway:

MEng Computer Engineering graduates can work as the following:

- Computer Engineer
- Design Engineer
- Project Engineer
- VLSI Engineer
- Embedded Systems Engineer
- Circuit Designer
- Project Manager
- Research Engineer
- Network Engineer
- System Design Engineer

QUALIFICATION AWARD AND CERTIFICATION

The learner will be awarded a “**Master of Engineering in Computer Engineering**” after attaining 240 credits as specified in the rules of combination and credit distribution. Certificates will be awarded to the candidates who have met the qualification requirements.

SUMMARY OF REGIONAL AND INTERNATIONAL COMPARABILITY

The proposed qualification is bench-marked regionally against a Master of Science in Computer Engineering offered by University of KwaZulu-Natal, South Africa and internationally against a Master of Science in Computer Engineering offered by University of Essex, United Kingdom.

Titles:

The titles from both regional and international universities are Master of Science (MSc) in Computer Engineering while the proposed is Master of Engineering (MEng) in Computer Engineering. Both qualifications offer graduate-level training in the field, attained through coursework and/or thesis, The MEng is more professionally oriented, while the MSc is more research-focused and offers broader specializations.

NQF Level

The regional qualification is offered at NQF level 9, while the international is at FHEQ Level 7, these are equivalent to the proposed qualification at NCQF level 9.

Credits:

The regional qualification requires 180 credits to graduate, the proposed qualification also requires, 240 credits which is similar to the international benchmark which also requires 240 credits

Main Exit Outcomes:

Systematically identify, evaluate, conceptualize, interpret, and critically analyse engineering research and development challenges, applying advanced problem-solving techniques with creativity and innovation. Utilize fundamental principles of Mathematics, Basic Sciences, and Engineering Sciences relevant to the specific research domain to develop effective and technically sound solutions.

Effectively plan, organize, and manage personal and professional activities with accountability, efficiency, and adherence to ethical and professional standards. Demonstrate responsible decision-making within the bounds of expertise and competence, exercising sound engineering judgment based on domain-specific knowledge and technical proficiency. The goal is to cultivate the competence and confidence required to operate as a professional in the field, demonstrating proficiency in disciplinary conventions and readiness to engage with diverse research areas within Computer engineering. Students will acquire practical experience in addressing complex challenges commonly encountered by researchers in both academic and industrial settings.

Main Modules:

All the qualifications offer the masters research project as the main module.

Assessment.

Assessment strategies are similar for all the three qualifications because they focus primarily on the dissertation, with examinations for students who take elective modules to support their research. To obtain the qualification, students should successfully complete dissertation and VIVA.

Qualification rules and minimum Standards for the award of the qualification:

Regionally, to qualify, students must pass all prescribed modules (if undertaken) and successfully complete their dissertation, while internationally, to qualify the project is continuously evaluated each semester, culminating in the final thesis submission and an oral defence based on the proposed engineering design or solution.

Education and Employment Pathways:

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Further Studies: Graduates may pursue a PhD in Computer Engineering, VLSI, or Embedded Systems at NCQF Level 10.

Career Paths: Computer engineers can pursue careers in computer design, software system design, power system design, and many other fields of this exciting engineering discipline

Comparability and articulation of the proposed qualification with the ones examined

The proposed qualification aims to equip computer engineers with the expertise to develop and advance both existing and emerging technologies. Graduates are expected to apply engineering methodologies to navigate the rapidly evolving technological landscape, transforming research innovations into practical solutions for global challenges while adhering to international standards. A strong emphasis is placed on the research project, which constitutes a substantial component of the final year, fostering advanced problem-solving capabilities.

Graduates of this qualification may pursue a PhD in Computer Engineering or establish careers as computer engineers, telecommunications engineers, project managers, or engineering consultants.

The proposed qualification is comparable to both international and regional benchmarks.

REVIEW PERIOD

5 years in line with the NCQF

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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	