BQA NCQF QUALIFICATION TEMPLATE

SECTION A:	QUALIFICATION DETAILS		
QUALIFICATION DEVELOPER (S)	Botswana International University of Science and Technology		
TITLE	Master of Science Materials & Metallurgical 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:

The Master of Science degree is designed to produce graduates with an extended specialist knowledge in a particular area of Materials and Metallurgical Engineering, and is currently the only such programme in Botswana. The **National Human Resources Development Plan (NHRDP) 2028** highlighted that one of the challenges in transition towards a knowledge-based economy in Botswana is the lack of graduates with high level critical thinking skills that generally provide for high order thinking, including problem solving. The report also highlighted the need for graduates that are capable of learning and applying knowledge through creative thinking and critical analysis. **Botswana's Vision 2036** also emphasizes science, technology, and innovation (STI) as drivers of economic transformation, hence the need for this qualification. In addition, Botswana's **National Development Plan (NDP) 12** aims to foster a more robust and resilient economy, moving towards a diversified economic base through initiatives such as beneficiation, cluster development, and the establishment of special economic zones. These national aspirations are reinforced by the **Minerals Policy of 2022**, which calls for increased value addition and downstream beneficiation of Botswana's mineral resources, and the **National Quality Policy (2022)**, which stresses the need for advanced quality assurance and materials testing capabilities to make local products globally competitive. The **Education and Training Sector Strategic Plan (ETSSP)** and the **Human Resource Development Council (HRDC)** further emphasise the development of high-level STEM skills aligned to industry and national economic priorities. Such requirements can only be achieved through producing graduates with higher-level skills in materials and metallurgical engineering to add value to Botswana's mineral resources, capable not only of evaluation and critical analysis, but also of developing entrepreneurship, which is addressed at postgraduate level. Based on a study done in the USA, it has been found that graduate programmes contribute to the development of talent-rich ecosystems that drive global competitiveness and economic growth.

PURPOSE: (itemise exit level outcomes)

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

- Apply such knowledge to generate and analyse information through experimentation, modelling and simulation, driving technological advancements, and support sustainable practices in academia and industry.

- Demonstrate the ability to conduct advanced research and contribute innovative solutions in the fields of mining and metallurgical engineering, energy, water, resources, research and development, process engineering and academia.
- Implement the technical and transferrable skills attained in solving complex engineering problems in industry and academia.
- Investigate the application of physical phenomena on Materials and Metallurgical Engineering processes used in industry and academia.

MINIMUM ENTRY REQUIREMENTS (including access and inclusion)

The normal requirements for admission into the MSc Materials & Metallurgical Engineering degree programme shall be:

- A Bachelor's degree in Materials and Metallurgical Engineering or related discipline (NCQF level 8), from a recognized University.
- Applicants in possession of a Bachelor's Degree in Materials and Metallurgical Engineering or related discipline, from a recognised University with relevant research or work experience may be considered for admission by the Departmental Board.
- RPL and CAT may be considered for admission by the Departmental Board as mentioned in the PG School guidelines.

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SECTION B	**QUALIFICATION SPECIFICATION**
GRADUATE PROFILE (LEARNING OUTCOMES)	**ASSESSMENT CRITERIA** **The graduate should be able to:**
1. Plan and execute a scientific investigation in the discipline of Materials and Metallurgical	1.1 Formulate research questions and hypotheses. 1.2 Compile and evaluate relevant scientific literature in the field of study.

Engineering and/or other closely related disciplines.	1.3 Develop an appropriate research methodology for a scientific investigation. 1.4 Analyse the results of a scientific investigation. 1.5 Develop substantive scientific conclusions and recommendations based on the analysis of scientific results. Produce a written dissertation that demonstrates mastery of the field of study.
2. Work effectively as an individual or team member in multi-disciplinary environments.	2.1 Work independently and display critical thinking. 2.2 Produce outputs that clearly demonstrates personal contribution. 2.3 Leverage on the benefits of team work in solving complex scientific and engineering problems. 2.4 Evaluate possible solutions by taking into consideration technical, socio-economic and environmental aspects. Produce innovative solutions to complex scientific and engineering problems.
3. Apply engineering methods, skills, tools and information technology in diagnosing and solving scientific and engineering problems.	3.1 Use simulation tools to model and predict the behaviour of physical, extractive, metallurgical and biological processes in solving scientific and engineering problems. 3.2 Use statistical tools and packages in analyzing experimental results or simulation data. Use information technology tools for presenting and processing scientific and engineering data.

4. Communicate scientific and technical information from academia and industry.	4.1 Prepare articles in scientific journals and publications. 4.2 Develop and present scientific presentations to other experts in academia in the field of specialty in a manner that demonstrates competency in the field of expertise. Produce detailed technical reports and executive summaries for stakeholders in industry.
5. Act professionally and ethically in your field of work, either in academia or industry..	5.1 Apply professional and ethical codes of conduct in the execution of scientific and engineering related work. 5.2 Assume full responsibility of tasks executed in the exercise of the profession. Exercise judgement commensurate with knowledge and experience.
6. Manage scientific research projects within the budgetary and time constraints.	6.1 Plan and execute a scientific research project. Integrate multidisciplinary skills such as management, economics and environmental factors in the execution of scientific projects.

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SECTION C	QUALIFICATION STRUCTURE				
COMPONENT	TITLE	Credits Per Relevant NCQF Level			Total Credits
		Level [ ]	Level [9]	Level [ ]	
FUNDAMENTAL COMPONENT Subjects/ Courses/ Modules/Units					
CORE COMPONENT Subjects/Courses/ Modules/Units	***MSc Materials & Metallurgical Engineering Dissertation***		**240**		**240**

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**
9	**240**
TOTAL CREDITS	**240**

Rules of Combination:

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

The qualification is research based and has no course work component. The MSc learner must submit a dissertation, successfully complete all the dissertation reviewers' comments, and submit the approved dissertation. The candidate then must pass a compulsory oral examination (meet the viva voce defence), to attain all 240 credits.

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ASSESSMENT ARRANGEMENTS

The MSc Materials & Metallurgical Engineering dissertation shall be examined by two (2) examiners-one (1) internal and one (1) external to the University. For the MSc student to be awarded the MSc Materials & Metallurgical Engineering degree, they ought to have published (or paper accepted for publishing) one (1) journal paper, pass a compulsory oral examination (viva voce), and submission of an original approved dissertation (after examination by examiners).

MODERATION ARRANGEMENTS

- Moderation is done by a panel of the examining committee through submission of the approved dissertation.
- The dissertation will be examined by two (2) examiners. Of these examiners at least one (1) must be external and one (1) internal to BIUST.
- If there is no internal examiner with the relevant expertise available within BIUST, then all two (2) examiners shall be external.
- A supervisor shall not be appointed as an examiner.

RECOGNITION OF PRIOR LEARNING

RPL will be considered for the award of this qualification.

CREDIT ACCUMULATION AND TRANSFER

CAT will not be considered for the award of this qualification.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

Vertical Pathway

Possible vertical articulations:

- Direct admission into the PhD, EngD, DSci or DTech programme in Materials and Metallurgical Engineering and closely related field of study.

Horizontal Pathway

Possible horizontal articulations:

- Master of Engineering (MEng) in Materials Engineering
- Master of Technology (MTech) in Metallurgy or Materials Processing
- MSc in Mechanical Engineering
- MSc in Chemical Engineering
- MSc in Mining Engineering
- MSc in Energy Engineering
- MSc in Physics (Materials Science track)
- MSc in Chemistry (Physical Chemistry, Electrochemistry, or Nanomaterials specialisations)
- MSc in Environmental Science (materials for sustainability, waste valorisation, pollution control)
- MSc in Nanotechnology / Nanomaterials
- MSc in Biomaterials / Biomedical Engineering
- MSc in Renewable Energy / Energy Materials
- MSc in Polymer Science and Engineering
- MSc in Industrial Engineering (materials design for manufacturing)
- MSc in Additive Manufacturing or Advanced Manufacturing Systems
- MSc in Metallurgical Process Engineering

  (articulations possible if research/dissertation topics overlap is relevant)

Employment Pathway

Possible employment articulations includes but not limited to:

- Public or private researcher (Senior)
- Lecturer
- Materials and Metallurgical engineer (Senior)
- Process engineer (Senior)
- Safety, health, environmental and quality (SHEQ) engineer
- Research and development (R&D) engineer
- Design engineer
- Project manager
- Foundry metallurgist (Senior)
- Physical metallurgist (Senior)
- Extractive metallurgist (Senior)

- Welding engineer (Senior)
- Metallurgical and quality control supervisor
- Metallurgical inspector analyst
- Materials Engineer
- Process Control Engineer
- Metallurgical Plant Design Engineer
- Corrosion Engineer (Senior)
- Foundry Engineer (Senior)
- Heat Treatment Engineer
- Failure Analysis Consultant
- Tribologist (Senior)
- Materials Consultants (Senior)
- Mineral processing engineer (Senior);

In a number of industries such as materials synthesis, metallurgical industries, and corrosion protection, materials processing, mineral processing, mining industries, consultants, etc.

QUALIFICATION AWARD AND CERTIFICATION

Minimum standards of achievement for the award of the qualification

Upon successful completion of all the dissertation reviewers' comments and submission of the approved dissertation, the candidate then must pass a compulsory oral examination (viva voce), and attain 240 credits to be awarded a Master of Science Materials & Metallurgical Engineering.

Certification

Candidates meeting prescribed requirements and attaining 240 credits will be awarded the certificate in accordance with standards prescribed for the award of the qualification and applicable policies.

SUMMARY OF REGIONAL AND INTERNATIONAL COMPARABILITY

Similarities Observed:

Title of Qualification, NQF/AQF/QAA Level & Credit Value or Duration (where applicable)

- All universities offer Master's degrees in Materials & Metallurgical Engineering.
- All qualifications are postgraduate degrees at Level 9 (University of Cape Town (UCT) & University of Queensland (UQ)) or Level 7 (University of Birmingham (UoB) QAA) — aligning broadly as master's qualifications.
- Each program awards approximately 180 credits and has a minimum duration of 1 year.

Main Exit Outcome(s)

- Emphasis on developing independent research capabilities, ethical practice, and critical thinking.
- All programs prepare graduates to communicate scientific ideas, use IT and data tools, and understand interdisciplinary and societal impacts.

Domains/Modules/Courses/Subjects covered (Fundamental, core & electives)

- All institutions prioritize independent research work.
- Fundamental and core domains include research methods, data analysis, and scientific writing.

Assessment strategies and Weightings

- Central focus on thesis/dissertation as the key assessment instrument.
- Progress reporting and supervisor evaluation are universal elements.

Qualification rules and minimum Standards for the award of the qualification

- A successful thesis submission is required for all.
- Adherence to ethical standards is a shared requirement.

Education and Employment Pathways

- All qualifications provide pathways to:
- PhD or further academic research
- Employment in industry, research institutions, and academia

Differences Observed:

Title of Qualification, NQF Level & Credit Value or Duration (where applicable)

- UCT and UQ explicitly label the program as “MSc (Eng)” and “MEngSc,” respectively, while Birmingham provides multiple pathways (MSc by Research, MRes, MPhil).
- BIUST offers a 2–3 year research-only program, longer than the others.

Main Exit Outcome(s)

- UCT lists 10 detailed graduate attributes including leadership, environmental awareness, and lifelong learning.
- UQ groups outcomes under “Knowledge,” “Skills,” and “Application,” with a professional practice focus.
- UoB focuses more on academic monitoring, research quality, and alignment with publishing standards.

Domains/Modules/Courses/Subjects covered (Fundamental, core & electives)

- UCT and UoB allow for coursework components in some program variants.
- BIUST does not currently offer coursework-based master’s options.

Assessment strategies and Weightings

- UCT includes an oral presentation and may require ethics approval; allows resubmission only once.

- UQ does not conduct oral exams, but includes milestones and seminar attendance.
- UoB provides multiple assessment forms, including MRes with coursework and research reports; also has a robust system for student monitoring and academic support.

Qualification rules and minimum Standards for the award of the qualification

- UCT allows either full dissertation or a combination of coursework + dissertation.
- UQ mandates completion of candidature milestones and progress reports as conditions for award.
- UoB outlines extensive Codes of Practice for progression, mentoring, and support.

Education and Employment Pathways

- UCT explicitly lists national research institutes like MINTEK, CSIR, NECSA as potential employers.
- UQ focuses on leadership roles in global industry, consulting, and regulatory agencies.
- UoB highlights the value of research degrees for both academic and high-level non-academic roles.

The BIUST MSc in Materials & Metallurgical Engineering is comparable to those at UCT, UQ, and UoB in terms of level, content, and research orientation. BIUST currently offers 100% research-only programs, while comparator institutions offer flexible routes, including coursework-based variants. Exit level outcomes, assessment standards, and graduate capabilities are broadly aligned across all institutions, supporting comparability.

REVIEW PERIOD

The review period for this qualification is 5 years.

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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**	