BOTSWANA Qualifications Authority

BQA NCQF Qualification Template

DNCQF.FDMD.GD03 **Issue No.: 01**

SECTION A:	***QUALIFICATION DETAILS***				
QUALIFICATION DEVELOPER	University of Botswana				
TITLE	Master of Science in Physics			***NCQF LEVEL***	9
FIELD	Natural, Mathematical and Life Sciences	***SUB-FIELD***	Physical Sciences	***CREDIT VALUE***	*240*
New Qualification	√	*Review of Existing 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

The National Policy on Research, Science, Technology and Innovation (RSTI) represents Botswana's commitment to diversify her economy, attain global competitiveness, and enhance the quality of life of Batswana. This is to be achieved through the development, adaptation and application of research, innovation, and technology to produce products and services using local resources. Research, innovation and development will continue to be critical factors in creating and sustaining national competitive advantage and economic growth during NDP 11. One of the pillars of vision 2036 is that sustainable and optimal use of natural resources will have transformed our economy and uplifted our people's livelihoods. The use of science research (physics in particular) has the potential to innovate and create employment skilled, unskilled and semi-skilled segment of the population and thereby improve their quality of life. Physics through research has the capability of developing new technologies that can be utilized to protect the environment and minimize the severity of global warming and through science new frontiers in research can be developed.

The master of science (Physics) qualification provide excellence in the delivery of learning to ensure society is provided with talented, creative and confident graduates, advanced knowledge and understanding through excellence in research and its application, Improve economic and social development by high impact engagement with business, the professions, and civil society. Application of physics-dependent knowledge and technology is important to the development of a society through the application of research, technologies, innovation and development, hence the need to have graduates in physics who could be absorbed by different scientific, engineering and related fields.

PURPOSE: The purpose of this qualification is to produce graduates with advanced knowledge, skills and competencies to: • model and solve physics related problems. • conduct independent research in physics, analyse data using advanced scientific tools and communicate findings appropriately.
ENTRY REQUIREMENTS (including access and inclusion)
completion of NCQF level 7 and recognition of prior learning as per university guidelines.

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SECTION B QUALIFICATION SPECIFICATION	
GRADUATE PROFILE (LEARNING OUTCOMES)	***ASSESSMENT CRITERIA***
LO1: Apply advanced knowledge and skills to model and solve physics related problems through research.	1.1 Demonstrate proficiency in mathematics and physics concepts and an understanding of theories and principles of physics. 1.2 Develop new knowledge and approaches and redefine existing knowledge in physics. 1.3 Disseminate research finding using appropriate tools and professional integrity. 1.4 Apply acquired knowledge to undertake innovative research that contribute to the advancement of Physics as well as address emerging societal issues in industry and academia
LO2: conduct independent research in physics, analyse data using advanced scientific tools and communicate findings appropriately.	2.1 Demonstrate adequate laboratory skills and research ethics to conduct scientific investigations and draw sound conclusions. 2.2 Demonstrate knowledge in proposal writing to attract research funding in physics projects. 2.3 Critically study, interpret and analyse literature from different sources in their chosen physics subfield. 2.4 Apply appropriate theoretical and/or experimental tools to formulate hypothesis to make contribution to science knowledge. 2.5 Complete an original research project that demonstrate knowledge of physics and appropriate methodologies in their physics subfield 2.6 Compile dissertation and publish in peer reviewed journals, and present papers in

	conferences and be able to collaborate with other researchers.

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SECTION C				
Core courses *Subjects/ Courses/ Modules/Units*	***TITLE***			***Total (Per Subject/ Course/ Module/ Units)***
		Level [9]		
	Classical mechanics and fluid mechanics	***12***		***12***
	Electrodynamics	***12***		***12***
	Quantum mechanics]	***12***		***12***
	Thermal and statistical physics	***12***		***12***
	Research	***120***		***120***
Optional courses *Subjects/ Courses/ Modules/Units*	Physics of the environment	***12***		***12***
	Agricultural physics	***12***		***12***
	Atmospherics physics	***12***		***12***
	Radiation physics	***12***		***12***

	Electronic instrumentation	***12***		***12***
	Independent study course	***12***		***12***
	Mathematical methods for physics	***12***		***12***
	Physics of the earth	***12***		***12***
	Seismology	***12***		***12***
	Exploration geophysics	***12***		***12***
	Geophysics field experiments	***12***		***12***
	Atmospheric physics	***12***		***12***
	Electronic instrumentation	***12***		***12***
	Independent study course	***12***		***12***
	Mathematical methods for physics	***12***		***12***
	Microprocessor systems and applications	***12***		***12***
	Physics of semiconductor devices	***12***		***12***
	Electronic instrumentation	***12***		***12***
	Independent study course	***12***		***12***
	Mathematical methods for physics	***12***		***12***
	Mathematical methods for physics	***12***		***12***
	Field theory	***12***		***12***
	Particle physics	***12***		***12***

	Nuclear structure theory	***12***		***12***
	Condensed matter physics	***12***		***12***
	General relativity and cosmology	***12***		***12***
	Quantum optics	***12***		***12***
	Independent study course	***12***		***12***

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 worth a total of 240 credits per stream and it comprises of the following modules/courses **core=48 credits** **optional=72 credits** **Research = 120 credits**	

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ASSESSMENT ARRANGEMENTS
Formative assessment: contributes a maximum of 50% towards the final grade unless the courses is assessed through continuous assessment only. **Summative assessment**: contributes a maximum of 50% towards the final grade
MODERATION ARRANGEMENTS

There will be internal and external moderation in accordance with the institutional policy and in line with the national policy on assessment and moderation

RECOGNITION OF PRIOR LEARNING (if applicable)

Recognition of prior learning shall be implemented in accordance with the national recognition of prior learning policy.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

1. **Vertical progression:** candidates may progress to:

a) PhD (NCQF level 10) in theoretical physics, experimental physics, instrumentation, astrophysics, environmental physics, space physics, material science, earth sciences and many other related fields

2. **Horizontal progression: candidates may progress to:**
   a) MPhil (NCQF level 9) in Physics,
   b) MPhil (NCQF level 9) in Applied Physics
   c) MPhil (NCQF level 9) Physics and astronomy
   d) MPhil (NCQF level 9) in material science
   e) MPhil (NCQF level 9) in Theoretical physics
   f) MPhil (NCQF level 9) in Electronics
   g) MPhil (NCQF level 9) in Space Physics
   h) MPhil (NCQF level 9) in Biomedical Engineering
   i) MPhil (NCQF level 9) in Renewable energy
   j) MPhil (NCQF level 9) in Cosmology
   k) MPhil (NCQF level 9) in computational Physics
   l) Master of Science Information Technology

EMPLOYMENT OPPORTUNITIES FOR PROGRAMME GRADUATES IN BOTSWANA:

- *Geophysicist/field seismologist,*
- *Higher education lecturer,*
- *Metallurgist,*
- *Nanotechnologist,*
- *Radiation protection practitioner,*
- *Research scientist (physical sciences),*
- *Secondary school teacher,*
- *Meteorologist,*
- *Engineer (nuclear, software, laser, nanotechnology, telecommunications, optics),*
- *Astronomy*
- *Space sciences*
- *Medicine,*
- *Renewable energy,*
- *Agricultural engineer*

QUALIFICATION AWARD AND CERTIFICATION
Master of Science in Physics candidates meeting the prescribed requirements will be awarded the qualification in accordance with the qualification composition rules and applicable policies.
REGIONAL AND INTERNATIONAL COMPARABILITY
The Master of Science in Physics is generally comparable in terms of qualification credits, exit level outcomes, assessment criteria and employment pathways with the regional and international qualifications considered. The qualification facilitates both the vertical and horizontal articulation in the academic progression in theoretical physics, experimental physics, instrumentation, astrophysics, environmental physics, space physics, material science and many other related fields. The MSc (Physics) was bench marked with similar qualifications offered by other Universities regionally and internationally. Regionally, University of Witwatersrand in South Africa was considered and it an MSc qualification at NQF level 9 with a minimum credit of 120. Internationally, University of Edinburgh in the United Kingdom was considered with minimum credits of 180. The proposed MSc qualification will be offered at NCQF level 9 as a 2-year fulltime program (3-year part-time) and it involves course work and research. The minimum credits for this qualification are 240. The proposed qualification has higher credits when compared with regional and international universities.
REVIEW PERIOD
i) External moderation to be done every 5 years

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