SECTION A:	***QUALIFICATION DETAILS***																	
QUALIFICATION DEVELOPER (S)	Botswana International University of Science and Technology																	
TITLE	Master of Science in Physics													***NCQF LEVEL***		9		
STRANDS (where applicable)	*1.* Applied Nuclear Physics and Technology *2.* Astronomy and Astrophysics *3.* Complex Systems *4.* Materials Science																	
FIELD	Natural, Mathematical and Life Sciences			***SUB-FIELD***		Physics								***CREDIT VALUE***		*240*		
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

RATIONALE:

The Botswana Vision 2036 recognizes education and skills development as a foundation for human resource development. According to the Botswana Vision 2036 Pillar 1 and Pillar 2, tertiary education and training providers are mandated to provide citizens with quality academic, technical and vocational skills and competencies to attain their full potential, thereby effectively contributing to economic development. Thus, the use of science, technology, and innovation in social, economic and business sectors are critical to transform Botswana into a globally competitive knowledge-based economy. The Master of Science (Physics) qualification has been informed by this

mandate to realize National Development Plan (NDP11) which is aligned with Vision 2036 and the Sustainable Development Goals of the United Nations. This qualification is also informed by the Tertiary Education Policy, as approved by the National Assembly (2008:10). For example, in December 2016, the Human Resource Development Council (HRDC), which conducts research and publishes reports on occupations that employers have identified as being in high demand at a national level, published a report indicating that Botswana is experiencing a shortage of human capital in Physics and related fields. Moreover, several documents have also highlighted the need to produce high caliber graduates with strong problem-solving skills, in-depth scientific knowledge and transferable skills desirable in industry and research, to transform Botswana from a resource-based to a knowledge-based economy and contribute to the Sustainable Development Goals of the United Nations. These documents include the Botswana International University of Science and Technology Academic Shape and Size, National Policy on Research, Science, Technology and Innovation, Ministry of Infrastructure, Science and Technology, 2011; the National Human Resource Strategy (2009-2022): Realizing our Potentials, Ministry of Education and Skills Development, Republic of Botswana, November 2009; Vision 2036: Achieving Prosperity for All, prepared by the Vision 2036 Presidential Task Team, July 2016; National Development Plan 11 (NDP 11, 2017-2023), Ministry of Finance and Development Planning, August 2016.

The shortage of Physicists is not only being experienced in Botswana, but also in South Africa, as pronounced by the Department of Higher Education and Training of South Africa in 2014, which published a report titled “Skills for and through Strategic Infrastructure Projects” and lists Physicists as one of the scarce human resources in the country in Table 1: Executive Summary of Top Occupations in Demand. The latter report outlined the processes to identify the scarce skills for strategic infrastructure projects and steps to be taken if the projected scarcity is to be addressed. Thus, considering this scarcity of human resources in Physics and related fields, the Master of Science (Physics) qualification is designed to fill the shortage gaps identified in these reports, in alignment with the national priorities as outlined in the Vision 2036 and NDP 11.

The Governments of Botswana[10] and South Africa[11] have consequently emphasized the high demand for Physics-based occupations in the region. These occupations will therefore show relatively strong employment growth (long term). The Master of Science (Physics) qualification will comprise both course work and research components; the graduate will have a fundamental understanding of advanced concepts in Physics, as well as practical research experience in terms of conceptualization of a research question, investigation thereof, reporting, solving, and evaluating scientific research. The Master of Science (Physics) graduate will therefore contribute to novel and established research projects and programmes and contribute to policy matters and the creation and establishment of the desired knowledge economy in Botswana. Additionally, the research component of the qualification will expose the graduate to the practical considerations and challenges of undertaking research through guidance and mentorship of an established researcher, thus directly transferring knowledge and experience to the graduates while developing the graduate’s professional interpersonal communication and organizational skills and enabling the graduate to also mentor others.

After obtaining a Master of Science (Physics) qualification, the graduate will possess intensive research experience within a specific field of physics through a supervised project and advanced knowledge in specialization areas of physics, including familiarity with contemporary research within various fields of physics. With regards to

competencies, the graduate will have an excellent understanding of the role of physics in society and sufficient background to consider ethical problems. Moreover, the graduate will successfully carry out advanced tasks and projects, both independently and in collaboration with others and across disciplines and borders on their discipline. The graduate will also possess the skills and experience required to model, analyze, and solve advanced problems in physics, apply advanced theoretical or experimental methods, including the use of analytical, numerical methods and simulations by using appropriate software. Besides combining and using knowledge from several disciplines, the graduate will critically and independently evaluate research methods and results, work on new problem areas that require an analytic and innovative approach and disseminate subject matter and results to specialists and a broader audience. Graduates will be adaptable and be in possession of transferable skills suitable for different types of employment and be able to initiate and implement constructive change in their communities, professions and workplaces.

Physicists are in strong demand in many fields, for instance, aerospace and defense research, nanotechnology, electronics, computer industries, science and telecommunications, meteorology and climate change, energy and renewable energy, education, health and medicine. The analytical and problem-solving nature of Physics, will open a wide range of non-traditional pathways, which include: banking and finance, research at higher specialized education providers; business career path which involves research contracts, process management, project management, patent law, in manufacturing industry, high-level management consultancy services, and financial services; the entrepreneurship career path which involves product development and patents in industrial and commercial ventures by self-employed individuals; the research policy and management career path which involves policy research, development, and synthesis, at government institutions. Moreover, for graduates of this qualification to gain maximum hands-on skills, this qualification is strengthened by work-integrated learning, which provides students with industry opportunities to apply their specialized skills, knowledge, and competencies in different workplace environments. Therefore, the Master of Science (Physics) qualification will further catalyze the process of transforming Botswana from a resource-based to a knowledge-based economy as expressed by the national policy documents, including the NDP 11 and Vision 2036. By producing skilled scientists, engineers, and technologists who are highly employable and entrepreneurial in Botswana, the region and the world will surely assist in driving industrial and economic development. While the proposed Master of Science (Physics) qualification is offered in name by other universities in the region (see attached comparability matrix), the particulars of this degree qualification clearly distinguish it as a vital qualification for Botswana and the region. More significantly, the Master of Science (Physics) qualification is responsive to the quest by the HRDC Strategic Plan 2016 and national priorities highlighted in Vision 2036's NDP 11.

PURPOSE: (itemise exit level outcomes)

The purpose of the Master of Science (Physics) qualification is to deploy Physics as a vehicle to:

- Produce high calibre physics MSc graduates with highly employable and valued, transferable research skills (critical thinking, problem-solving, as well as communication and presentation skills, and independent working), scarce skills (investigation, analytical, innovation, entrepreneurship, Information Technology, good working habits and personality traits, and ethical behaviour), and leadership potential

to drive industrialization, sustainable socio-economic diversification, and conduct and contribute to active scientific research in Botswana the region and the world at large.

- Empower MSc graduates with a robust and well-rounded working knowledge of Physics for solving complex and interdisciplinary research problems of local importance and global relevance in diverse scientific and non-scientific professions.
- Develop advanced research and industry sought after skills in data processing, computing, and programming, including local research Physics expertise in in Astronomy and Astrophysics, Materials Science, Applied Nuclear Physics and Technology, Complex Systems, and Computational Physics, including Big Data Analytics.
- Produce graduates who will work as (amongst others): Laser Physicist, Research Associate/Scientist, Quantitative Analyst, Data Analyst, Optical Physicist, Design Physicist, Software Developer, Accelerator Physicist, Computational Physicist, Nuclear Physicist, Materials Scientist, Astronomer, Astrophysicist.

MINIMUM ENTRY REQUIREMENTS (including access and inclusion)

Admission to the Master of Science (Physics) degree programme

A Bachelor of Science in Physics/ Applied Physics degree with a minimum CGPA of 3.0 is required or a Bachelor of Science Honours in Physics/ Applied Physics degree is required. Holders of an Honours degree with Mathematics, Engineering or equivalent background may also be admitted, if they have a sufficiently strong physics and mathematics background attained at a level comparable to that described by the NCQF level 8 descriptors. Any of the above-mentioned qualifications must be registered on the NCQF or other national NQF offered by an Education and Training Provider which is accredited by Botswana Qualifications Authority.

International Qualifications

The evaluation of international qualifications shall be determined based on the Botswana Qualifications Authority (BQA) or Universities and Colleges Admissions Services (UCAS) equivalency standards as interpreted by Registry Services and/or the Postgraduate School. Where qualifications are in a foreign language, certificates and academic records must be translated into English and notarized as a true version of the original and provided by the applicant.

Other Tertiary Education Qualifications

Applicants who have completed other tertiary studies at NCQF Level 9 (or equivalent level to NQCF level 9) and above will be assessed based on such qualifications and its compatibility with the Master of Science (Physics) qualification.

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

SECTION B	***QUALIFICATION SPECIFICATION***
GRADUATE PROFILE (LEARNING OUTCOMES)	***ASSESSMENT CRITERIA***
1. Analyse and synthesise forefront research developments in different specialisation areas of Physics.	1.1 Integrate current knowledge with recent developments in specialised areas of Physics to synthesise novel or alternative approaches.
2. Solve advanced scientific and industrial problems in Physics.	2.1 Formulate, analyse, and solve concrete and abstract problems in new and unknown situations to develop new theories, experiments and technology. 2.2 Apply theoretical knowledge to real-world contexts. 2.3 Integrate knowledge from various subjects and disciplines in solving scientific and industrial problems. 2.4 Evaluate and critique the solutions of self and others to improve solutions.
3. Apply scientific methods and specialised knowledge in Physics to design novel solutions to problems in society and industry, considering ethical and cultural issues.	3.1 Apply advanced relevant scientific knowledge to current societal and industrial issues. 3.2 Appraise ethically and culturally sensitive decisions on the effects of scientifically based activities on society. 3.3 Identify and assess the socio-economic impact of scientific interventions in society and industry. 3.4 Develop approaches and solutions demonstrating how scientific knowledge benefits society and that scientific advancement leads to socio-economic development.
4. Design, select and appraise appropriate novel research methods to solve Physics and industry-related problems and engage and critique current research practices and techniques.	4.1 Develop appropriate Physics methodologies to solve societal and industry-related problems and provide appropriate recommendations. 4.2 Compare and contrast advanced theoretical predictions with published data to evaluate the significance of the results in context. 4.3 Explain the implications of the findings on the problem under consideration. 4.4 Assess the results of an experiment or other type of research investigation and ensure that valid conclusions are drawn while evaluating the level of uncertainty in these results and expected outcomes. 4.5 Develop an analytical ability to manipulate precise and intricate ideas for constructing logical arguments.

5. Plan and carryout supervised research projects to acquire specialised knowledge in Physics.	5.1 Demonstrate and assess appropriate Physics research investigations and methodology to produce meaningful results. 5.2 Perform specialised physics research to solve a problem. 5.3 Ensure appropriate analysis of the relevant data is undertaken, and results are discussed and explained in terms of published scientific literature and presented in a written report or publication in prestigious journals.
6. Apply the principles of entrepreneurship and innovation in Physics as tools for driving socio-economic development.	6.1 Demonstrate understanding of entrepreneurship principles to exploit product/service/process and identify commercialisation opportunities. 6.2 Illustrate and break down models of business innovation and entrepreneurship. 6.3 Compose, appraise and defend comprehensive and well-structured business innovation plans and commercialisation of Physics research output.

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

SECTION C	***QUALIFICATION STRUCTURE***				
COMPONENT	***TITLE***	***Credits Per Relevant NCQF Level***			***Total Credits***
		Level 9	***Level [ ]***	***Level [ ]***	
FUNDAMENTAL COMPONENT *Subjects/ Courses/ Modules/Units*	N/A				
CORE COMPONENT *Subjects/Courses/ Modules/Units*	Applied Mathematical Methods	12			12
	Statistical Physics, Artificial Intelligence and Machine Learning	12			12
	Advanced Classical Mechanics and Electrodynamics	12			12
	Advanced Quantum Mechanics with Applications	12			12
	Simulations and Modelling of Physical Systems	12			12
	Research Methodology	12			12
	Light and Matter	12			12
	Research Project [MSc Dissertation]	120			120
	Subjects/ Courses/ Modules/Units				

STRANDS/ SPECIALIZATION		***Credits Per Relevant NCQF Level***			***Total Credits***
		Level 9	***Level [ ]***	***Level [ ]***	
Specialisation Electives: Choose 2 modules from one specialisation track and 1 at least one module from another specialisation track	See below	36			36
1. **Applied Nuclear Physics and Technology**	Nuclear Measurement and Data Analysis Techniques	12			12
	Nuclear Models and Applications	12			12
2. **Astronomy and Astrophysics**	Stellar Spectroscopy	12			12
	Gravitational Physics	12			12
3. **Complex Systems**	Dynamical Systems and Applications	12			12
	Nonlinear Excitations and Coherent Structures	12			12
4. Materials Science	Nanoscience and Nanomaterials	12			12
	Advanced Semiconductor Physics and Applications	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)

Students need to enroll for a minimum of 240 credits which are distributed as follows:

- 7 core modules of 12 credits each (7 x 12 = 84 credits) at NCQF Level 9.
- 3 modules from elective specialization strands of 12 each (3 x 12 = 36 credits). Students need to choose 2 modules from one specialisation track and 1 at least one module from another specialisation track.
- 1 core Research Project worth 120 credits at NCQF Level 9.

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

ASSESSMENT ARRANGEMENTS

In terms of assessment, the Master of Science (Physics) qualification will be flexible and employ a variety of formative (continual) and summative assessment tools that are commonplace in a course intended to impart knowledge on the advanced principles of Physics. The modes of assessment will include (but are not limited to): end of semester written examinations; unseen closed-book and/or open-book written tests or quizzes; written assignments and/or essays; laboratory reports (applicable to modules with a practical component); project reports and software developments; analyses; portfolios and personal development plans; poster and oral presentations; as well as oral examinations. In addition, students will be required to complete a research project in their final year, which forms an integral part of the Master of Science (Physics) qualification.

The assessment methods will be consistent with the Exit Level Outcomes and Assessment Criteria of the Master of Science (Physics) Qualification. Furthermore, the types of assessment, weighting factors, and progression criteria will conform to the Assessment Policy and Guidelines of the Education and training Provider. All assessment to be carried out by assessors that are registered with the Botswana Qualifications Authority.

MODERATION ARRANGEMENTS

Pre-assessment moderation will be carried out by qualified moderators (who are registered with the BQA) before administering assessments that contribute towards the award of credits in this qualification and post-assessment moderation will be carried out after the assessment tasks have been marked.

Internal Moderation - All assessment instruments shall be subjected to internal moderation by BQA registered and accredited Assessors and Moderators before administering to ensure fairness, validity, reliability and consistency of assessments.

External Moderation - All assessment instruments shall be moderated by an External Moderator to ensure fairness, validity, reliability and consistency of assessments.

RECOGNITION OF PRIOR LEARNING

In compliance with the NCQF principles of access and lifelong learning, the Policy on Recognition of Prior Learning (RPL) of the tertiary education provider recognizes prior learning of skills, knowledge or competencies that have been acquired through employment, practice, formal and informal education, non-formal learning, or other life experiences. Prior learning should be measurable at the required academic level and meet achievement standards for current modules and research projects. For entry and placement purposes, portfolios of evidence shall be accepted from applicants and assessed for proof that they have acquired learning and met specific outcomes from which they may be exempted. RPL as a form of assessment has been built into the Master of Science (Physics) qualification to recognize competencies acquired outside the programme.

CREDIT ACCUMULATION AND TRANSFER

Credit accumulation and transfer will be accepted in accordance with the Credit Accumulation and Transfer Policy and Guidelines of the Education and Training Provider which are aligned to similar BQA/National policies.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

Students will exit at the end of Level 900 (NCQF Level 9) with a Master of Science (Physics). The Master of Science (Physics) qualification serves as an entry point for learners to pursue a PhD qualification in Physics, Astronomy, Applied Mathematics, and Engineering Physics by research or coursework at the tertiary education provider and other recognized higher education providers in the region.

After successful completion of the Master of Science (Physics) qualification, graduates are will be employable in any of the career sectors listed in Tables 1 and 2 (adapted from a similar table drawn up by the South African Institute of Physics). Graduates of the Master of Science (Physics) qualification need to complete PhD degrees for progression to the academic path of lecturing and research at higher education providers. The academic career path starts at lecturer level and progresses to full professor in the area of expertise.

Furthermore, Table 1 and 2 list general careers and also specific employers in Botswana for graduates with a Master of Science (Physics) degree from the Education and Training Provider (adapted from a similar table drawn up by the South African Institute of Physics).

Articulation

Horizontal articulation: The qualification articulates horizontally with various local, regional and international Doctor of Philosophy degrees in related areas. Qualifications of similar level at NCQF Level 9 include:

- Master of Science in Physics Education,
- Master of Science in Medical Physics,
- Master of Science in Applied Mathematics,
- Master of Science in Data Science.
- Master of Science in Environmental or Climate Science.

Vertical Articulation

Level 9 allows for vertical articulation to Doctor of Philosophy (Physics) qualifications which the Master of Science (Physics) serve as the appropriate prerequisite.

Table 1: Career Paths for Graduates of the Master of Science (Physics) Programme

Sector	Nature of Work	Main Qualities	Job Opportunities	Career Path
Business	Contract research, process management, project management, patent law	Good command of English, research aptitude, management ability, usually also soft skills	Manufacturing Industry, high level management consultancy services, financial services	Start at the advanced junior level, progress to management. Need additional business qualification (en route); Legal qualification necessary in addition for patent law.
Entrepreneurship	Product development, patents	Innovative, applied and ability to work cross disciplinary	Self-employed, industry, commercial	Start at the advanced junior level, progress to management, lead inventor, chief technologist; Need additional business qualification (en route).
Research Policy and Management	Policy research and development, synthesis	National and global perspective, generalist, usually also soft skills	Government institutions	Start at the advanced junior level, progress to management; Need administration qualification (en route).

Table 2: Careers and Specific Employers in Botswana for Master of Science (Physics) Graduates

Sector	Career	Potential Employer
Basic Research	Universities, National Laboratories, Industrial and Private Laboratories	Debswana, Botswana Power Corporation, Universities, Botswana Institute for Technology Research and Innovation
Engineering	Electronic, Biomedical, Mechanical, Computer, Civil, Chemical, Environmental, Aerospace	Industry, Samsung, AEG, Philips
Communication	Telecommunications, Television, Image Analysis, Video Recording, Photography, Laser Technology	Botswana Fibre Networks Ltd, Botswana Telecommunications Corporation, Botswana Communications Regulatory Authority, Botswana Television, Newspapers, Magazines, Mascom Wireless, Orange Botswana
Medical and Biological	Biophysics, Radiation Oncology, Magnetic Resonance Imaging, Radiation Protection, Nuclear Medicine, Diagnostic Instrumentation,	Hospitals, Ministry of Health and Wellness, Radiation Protection Inspectorate, Botswana Bureau of Standards, Botswana Institute for Technology Research and Innovation
Computer Science	Graphics, Software Design, Peripherals, Modelling, Programming, Artificial Intelligence, Machine Learning and Big Data, Data Processing, Computer Games	Universities, Industry, Games developers, HP, Microsoft
Industry	Metallurgy, Laser Technology, Textile and Clothing, Food, Semiconductors, Energy, Computers, Electrical, Materials, Agriculture Construction, Fuel, Transportation	Industries in Botswana, Botswana Power Corporation, Botswana Meat Commission, Debswana, Lucara Diamond, Botswana Institute for Technology Research and Innovation, Botswana Bureau of Standards

Environmental Science	Noise Control, Pollution Control, Conservation, Radiation Protection, Environmental Monitoring	Botswana Power Corporation, National parks, Mining industry, Okavango Delta, Chemical industry, Local government
Education	Lecturer, Teacher, Policy Maker	Colleges, Universities, High Schools, Primary schools
Military	Lecturer, Researcher, Technician, Scientific Advisor	Botswana Defence Force, Botswana Police
Space and Earth Sciences	Astronomy, Space Technology, Geophysics, Geology, Meteorology, Atmospheric Sciences, Energy and Resources, Water Sciences	Botswana Power Corporation, Universities, Debswana, Botswana Geoscience Institute, Botswana Institute for Technology Research and Innovation
Consultancy	Industry, Government, Military	Minet Botswana, Botswana Insurance Fund Management(BIFM), Buck Consultants, Computer Associates, Computer Sciences , Deloitte Consulting, Ernst and Young, Grant Thornton, KPMG Consulting, Manpower, Price Waterhouse Coopers, InnoLead Consulting, Financial institutions
Non-technical	Law, Administration, Business, Journalism, Museums, Sports, Accounting, stock exchange, Marketing, Art, Financial services, Actuarial Science	Museums, newspapers, magazines, Botswana Stock Exchange

QUALIFICATION AWARD AND CERTIFICATION

Students are awarded the Master of Science (Physics) qualification if they complete a minimum of 10 modules worth 120 credits at NCQF Level 9 (with a pass mark of at least 50% for each module) and a Research Project (assessment criteria are described in the Postgraduate Studies Guidelines of the Education and Training provider) valued at 120 credits at NCQF level 9 as outlined in the Qualification Structure above.

Certification

Graduates meeting the prescribed requirements will be awarded the qualification following the standards prescribed for awarding the qualification and applicable policies. A certificate and transcript of the award of the degree of Master of Science (Physics) will be given upon successful completion of the qualification.

SUMMARY OF REGIONAL AND INTERNATIONAL COMPARABILITY

This Master of Science (Physics) qualification is compliant with and conforms to the Subject Benchmark Statement[1] for Physics published by the Quality Assurance Agency for Higher Education in the United Kingdom. Furthermore, the exit-level outcomes of the qualification are consistent with the Level Descriptors for the South African National Qualifications Framework[2]. In addition, the skills, achievements, and knowledge of subject matter that are expected from graduates of an accredited MSc Degree in Physics are aligned with those published[3] by the Institute of Physics in the United Kingdom.

The Master of Science (Physics) qualification of the education provider has been benchmarked against a sample of similar international qualifications offered by the University of Namibia (Namibia), Makerere University (Uganda), the University of Western Australia (Australia), and Ohio University (USA. From our research, we cannot identify any ongoing taught Master of Science in Physics qualifications in the Southern African Development region at NQCF level 9, hence this qualification will be unique in the region. In South Africa, most of the MSc programs are by research, and in Zimbabwe, taught MSc programs are more specialized and restricted either to Medical Physics or Applied Physics. The aim of the present comparability is to evaluate the similarities and differences between the Master of Science (Physics) qualification offered by the education and training provider and what is offered in other institutions in the region and internationally.

University of Namibia (Namibia) – MSc Physics Qualification

The University of Namibia (Namibia) offers a two-year MSc Physics[4] qualification.

DESCRIPTION OF QUALIFICATION

The admission requirement for the MSc qualification will be a University of Namibia NQF Level 8 degree in Physics or an equivalent degree from a recognised university. The applicant will be accepted based on his/her undergraduate academic record with an average mark of at least 60%. Former University of Namibia double major Physics graduates may be admitted but will first have to take and pass relevant additional undergraduate courses prescribed by the Department on a case-by-case basis. The first year will mostly consist of coursework, while the second year will be dedicated to a supervised research project and thesis writing.

The modules include Advanced Quantum Mechanics, Research Methodology, Mathematical Methods of Physics, Advanced Academic Writing for Postgraduate Students, Lasers and Applications, Radiation Physics, Computational Physics, Advanced Classical Mechanics, Astro- and Space Physics are compulsory. The second year of the degree is dedicated to completing the thesis.

COMPARABILITY WITH PROPOSED QUALIFICATION

Compared to our BIUST MSc qualification the structure of the University of Namibia qualification is similar. However, the University of Namibia degree is not offered with any research specializations within the degree.

Makerere University (Uganda) – MSc Physics Qualification

Makerere University (Uganda) offers a two-year MSc Physics[5] qualification.

DESCRIPTION OF QUALIFICATION

Admission into the MSc Physics qualification is governed by the general Makerere University and Faculty of Science entrance requirements for Postgraduate Courses. A candidate should be in possession of at least a Second-Class honours degree, from a recognised University or Institution, in Physics or Physics combined with another subject. Candidates seeking admission to a particular area of specialisation within the programme must show competence (such as having offered subjects closely related to the area as part of an honours degree programme) in such an area. Candidates with lower qualifications will be considered for admission provided they have demonstrated academic growth in Physics and/or specialisation they are seeking admission to.

The MSc Physics is conducted by coursework and dissertation and a student is expected to select an area of specialisation. Each such area of specialisation has three Core Courses, and in addition to the Core Courses, a student will select two courses from the electives to make up 5 courses to be done in year 1, semester 1 and 2. During the Second Year, Semesters 1 and 2, a student will be required to carry out research in his/her area of specialisation and to submit an acceptance dissertation.

The main objectives of the postgraduate training in Physics include Capacity Building (to train Physicists who are needed in the various workforce sectors); Knowledge (to impart more advanced knowledge and keep up to date with new advances in Physics beyond the undergraduate level); Research (To impart research skills and encourage research leading to new knowledge and solutions of problems related to industry and society needs in general).

COMPARABILITY WITH PROPOSED QUALIFICATION

Our MSc Physics qualification is similar to the above qualification at least in terms of the exit level outcomes. The main difference between our MSc program and the one offered by Makerere University is the number of specialization areas. Our program also has a stronger focus on Complex Systems, which are areas in high demand by industry. Furthermore, our qualification offers four specialization tracks compared to the one specialization area offered by Makerere University.

The University of Western Australia (Australia) – Physics MSc Qualification

The University of Western Australia (Australia) offers a two-year Master of Science[5] (Physics) qualification which is accredited by the Department of Education and Training in Australia.

DESCRIPTION OF QUALIFICATION

The Master of Science (Physics) qualification outcomes are for graduates to develop a combination of high-level research, analytical and problem-solving skills which are highly valued by industry and government employers. Specifically, students will learn to: understand and apply the fundamental laws and principles of physics; review the scientific literature in their field of study; gain the mathematical and computational skills required to interpret models of physical behaviour; plan, execute and report the results of an experiment in a research environment; gain the skills required to apply theoretical knowledge of physical principles and mathematical techniques to practical problems.

The Master of Science (Physics) qualification proposes that the learners (students) specialise in one of five areas of physics: Astronomy and Astrophysics, Computational Physics, Experimental Physics, Medical Physics, and Theoretical Physics. While each of the areas has its core modules, there are common modules that cover the following domains in Physics: Foundations of Physics, Mathematical Methods, Experimental and Computational Statistics for Physics, Computational Methods for Physics, Special Topics in Physics, Specialisation Topics (Solid State Physics science and Nanoscience), and Industrial Training.

Detailed information on learning outcomes(such as create algorithms using computational thinking to solve of problems; write computer using python to implement algorithms, demonstrate the process of computational problem solving; demonstrate high-level understanding of advanced physical principles in Electrodynamics, Quantum Mechanics, Planetary Astronomy, Stellar Astrophysics and astronomical techniques, Many-Particle Physics; apply critical thinking skill at an advanced level in practical applications; execute an experiment relevant to physics; modelling evaluate the results of an experiment relevant to physics; demonstrate skills in document preparation, data collection, presentation and referencing; independently apply research methods, including ethical considerations, to a specific research problem or topic; analyze data by carrying out high-level exploratory data analysis and processing skills; and communicate clearly, effectively and appropriately using written, oral and visual means in a range of contexts) and assessment (such as laboratory; labs tests; quizzes; projects; assignments; final examination) methods for the specific courses is available on the website of the University of Western Australia.

Graduates are highly versatile as they can work in almost any industry related to Astronomy, Medical Physics, Analytics, Chief Information Officer, Developer Programmer, Finance Manager, Software Engineering, Software and Application Programmer and Physicist. Educational pathways include pursuing a PhD degree.

COMPARABILITY WITH PROPOSED QUALIFICATION

The proposed qualification is very similar to the above qualification in terms of the exit level outcomes, domains covered, methods, education and employment pathways, industrial internships (work-integrated learning), and the inclusion of applications of physics.

Ohio University (USA) – Master of Science Physics

Ohio University (USA) offers a two-year Master of Science in Physics[6] qualification which is accredited by the Middle States Commission on Higher Education.

DESCRIPTION OF QUALIFICATION

The Physics and Astronomy Department offers a Master of Science degree, which is achieved through research and coursework. The MSc degree can be earned by submitting a research thesis with an oral examination and at least 14 credit hours of graduate-level lecture or laboratory courses in Physics and Astronomy. It can also be obtained under a non-thesis option, which requires satisfactory completion of a faculty-approved project (one to four credits) and the department's set of six core courses. The research activities in the department are broad and include Astrophysics and Cosmology, Biophysics, Condensed Matter and Surface Sciences, and Nuclear and Particle Physics. In addition, experimental and theoretical studies take place in these areas. Furthermore, inter-disciplinary and inter-departmental programs are also possible. Upon completion of the program, should have acquired the following skills: Develop analytical skills and the ability to solve problems; Achieve a good understanding of physical laws and principles; Gain experience with measurement techniques and equipment; Develop the ability to assess uncertainties and assumptions; Demonstrate the ability to present the results of investigations orally and in writing; Acquire facility in the use of mathematics to solve problems and test hypotheses.

The non-thesis MSc Physics qualification covers the following domains in physics: Mathematical Methods, Quantum Mechanics, Mechanics, Statistical Mechanics and Electrodynamics.

Students achieving the MSc Physics can go on and pursue further graduate studies in Physics and Astronomy or in other fields. They can also obtain positions as professional scientists. The MSc Physics is the minimal professional qualification for most physicist/astrophysicist positions in the USA.

COMPARABILITY WITH PROPOSED QUALIFICATION

Our qualification combines both MSc options as it offers coursework and imposes a research report to be undertaken during the program's second year. Also, the number of tracks/streams offered by our MSc is more diverse, based on core modules and specialization modules in Complex Systems, Astronomy and Astrophysics, Applied Nuclear Physics and Technology and Material Science.

Comparability Matrix

The comparability between the different qualifications is summarised in the attached document titled "DNCQF.P01.GD03 BQA Qualification Comparability Matrix" in terms of the: name of the awarding body (and country); title of the qualification, NQF level and credit; main exit outcomes; domains covered; assessment strategies and weightings, qualification rules and minimum standard for the award of the qualification; education and employment pathways.

References

1. Subject Benchmark Statement, Physics, Astronomy and Astrophysics: Draft for Consultation, published by the Quality Assurance Agency for Higher Education in the United Kingdom, April 2016.
2. Benchmark Statement for Physics in South Africa, South African Institute of Physics, http://www.saip.org.za/index.php/sa-physics-benchmark-statement, accessed on 20 April 2019.
3. The Physics Degree: Graduate Skills Base and the Core of Physics, Institute of Physics, September 2011.
4. https://www.unam.edu.na/faculty-of-science/physics/postgraduate-qualifications/physics
5. https://physics.mak.ac.ug/MSc.Physics
6. https://www.uwa.edu.au/study/courses/master-of-physics
7. https://www.ohio.edu/cas/physics-astronomy/graduate/masters-ms

REVIEW PERIOD

According to standard curriculum development proactive, five (5 years) review has been set. In setting the review, we recognize a rapidly changing industry that will render graduates at a disadvantage of knowledge and skills gaps. Hence, Continuing Professional Development is a built-in programme to train graduates in lifelong learning concerning changes in technology and the profession.

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