SECTION A:	***QUALIFICATION DETAILS***																	
QUALIFICATION DEVELOPER (S)	ABM University College																	
TITLE	Bachelor of Engineering (Honours) in Electrical and Electronics Engineering														***NCQF LEVEL***	*8*		
FIELD	Manufacturing, Engineering, And Technology		***SUB-FIELD***	Engineering and engineering trades											***CREDIT VALUE***	685		
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

RATIONALE:

The Electrical industry is one of the fastest growing industrial sectors in Botswana and plays a key role in the Botswana economy. This award has been designed to meet the need for electrical and electronic engineering graduates as the industry makes improvements to the existing supply network, the development of localized power generation and the integration of renewable energy technologies. The qualification has been designed with input from potential employers, and will develop skills that are in demand by the employers for electrical and electronic engineering graduate engineers. Tremendous effort has been made to align the qualification to vision 2036 which states “Botswana will be energy secure, with diversified, safe and clean energy sources, and

a net energy exporter." Attention has also been given to the Certificate in Electrical Engineering qualification which seeks for provision of quality, globally competitive tertiary education with emphasis on science, technology, and finance.

The Institution administered a survey instrument to respondents in professional and business fields whose lines of duty is in Engineering lines of work to assess their perceived levels of demand for qualifications in the Electrical Engineering field. According to the survey results, BSc In Electrical and Electronic Engineering falls at position 6 out of the 9 qualifications identified by the respondents as the "most in-demand". On The other hand, the Human Resources Development Council's list of Priority Skills (2016) includes skills sets that are included within the BSc Electrical and Electronic Engineering qualification.

PURPOSE:

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

- Undertake design work, using mathematical and computer models.
- Solve engineering problems, undertake practical work.
- Utilize business and management principles to demonstrate a life-long commitment to learning and further study as part of professional development.
- Solve convergent and divergent engineering problems creatively and innovatively.
- Perform creative, procedural and non-procedural design and synthesis of components, systems, engineering works, products or processes.
- Design and conduct investigations and experiments.

ENTRY REQUIREMENTS (including access and inclusion)

Minimum entry:

- Certificate V (NCQF Level IV) or equivalent.
- There shall be a provision for entry through RPL and CAT in accordance with applicable interinstitutional policies.

SECTION B	*QUALIFICATION SPECIFICATION*
GRADUATE PROFILE (LEARNING OUTCOMES)	*ASSESSMENT CRITERIA*
1. Investigate, and analyse broadly defined electrical and power engineering problems and activities.	• Define the electrical problem. • Identify the scope of the electrical problem. • Identify necessary information and applicable engineering and other knowledge and skills. • Examine and appraise relevant information, products, projects, processes, or systems using appropriate tools and techniques. • Test analysis for the correctness of results. • Conduct investigations with a view to generating novel solutions, outcomes, products, or creations. • Formulate possible approaches to the solution of problems and analyse the viability of possible solutions. • Formulate and present the solution in an appropriate form.
2. Design, implement and maintain power and utility systems.	• Analyse the operation of power systems. • Examine the protection of power systems. • Demonstrate the design requirements for power systems. • Experiment with the operation and performance of electrical machines. • Categorise the fundamental concepts of power electronic systems. • Design and implement electrical drawings for building services
3. Demonstrate competence to perform creative, procedural and non-procedural design and synthesis of components, systems, engineering works, products or processes.	• Identify and formulate the design problem to satisfy user needs, applicable standards, codes of practice and legislation. • Plan and manage the design process. • Evaluate engineering principles and apply the design tools. • Test and perform techno-economic analysis.

	• Assess the impact of the design on social, legal, health, safety, and environmental aspects. • Explain the design logic information.
4. Demonstrate competence to design and conduct investigations and experiments in the field of Electrical and Electronics Engineering.	• Plan, investigate and perform experiments as well as analyse and interpret data to come up with a solution to an engineering problem. • Perform a literature search on electrical and electronic engineering problems. • Analyse critical literature material. • Select and use appropriate equipment or software. • Analyse, interpret and derive information from data. • Formulate conclusions based on evidence. • Explain the purpose, process and outcomes in a technical report.
5. Demonstrate competence to use appropriate engineering methods, skills and tools, including those based on information technology.	• Select and assess the applicability and limitations of the method, skill or tool. • Apply the right methods, skills and tools for the right job. • Design and test products using the right engineering methods, skills or tools.
6. Communicate and analyze information, ideas, problems and solutions to both technical and non-technical audiences.	• Apply appropriate structure, style and language for purpose and audience. • Use effective graphical support to relay information. • Apply methods of providing information for use by others involved in engineering activity. • Explain technical information to suit the requirements of the target audience.
7. Demonstrate critical awareness of the impact of engineering activity on the	• Examine the impact of technology on society. occupational and public health and safety.

social, industrial and physical environment.	• Evaluate the impact of engineering activity on the physical environment. • Analyse the effects of engineering activity on the people, especially the social and cultural values.
8. Demonstrate competence to work effectively as an individual, in teams and in multidisciplinary environments.	• Identify the objectives of the team. • Plan and organise work for a team. • Schedule tasks for a team. Set up the schedule of work and operate within the schedule. • Identify each individual contribution to team activity. • Apply management skills to perform critical functions. • Constructs appraisal forms for team members. • State benefits derived from the support of team members. • Interpret information, express ideas, and share information with team members in a range of media and formats. • Examine working knowledge of co-workers' discipline. • Apply a systematic approach to the hat human and material resources of a firmise organised efficiently to realize the firm's overall objectives as efficiently as possible. • Judge the best way to communicate across disciplinary boundaries.
9. Demonstrate competence to engage in independent learning through well-developed learning skills.	• Justify decisions in academic and professional spheres by Reflecting on own learning and determining learning requirements and strategies. • Examine the sources of information and interpret that information. • Apply knowledge acquired outside formal instruction to solve engineering and social problems. • Challenge assumptions and embrace new thinking.

10. Demonstrate critical awareness of the need to act professionally and ethically and to exercise judgment and take responsibility within your own limits of competence.	• Compare and contrast trends in technology. • Describe the system of professional development. • Classify responsibilities against actions. • Apply and defend own judgment in decision-making during problem-solving and design. • Interpret boundaries of competence in problem-solving and design. • Apply positive work habits to foster healthy work relationships. • Utilize self-awareness skills to contribute to team and organizational success
11. Demonstrate competence in solution-seeking by applying creative skills and being inventive in solution-seeking.	• Apply appropriate modern methods and techniques to solve day-to-day engineering problems. • Determine measurements and compute calculations using appropriate modern equipment and formulae as required. • Demonstrate requisite skills and attitudes for teamwork and a sense of collective responsibility for the achievement of team goals and objectives. • Identify opportunities and initiate a plan of action to improve efficiency as appropriate. • Establish the use of information communication and technology for information retrieval and processing as well as communication and collaboration with others.

SECTION C		***QUALIFICATION STRUCTURE***				
COMPONENT	***TITLE***	***Credits Per Relevant NCQF Level***				***Total (Per** Subject/ Course/ Module/ Units)*
		Level [5]	***Level [6]***	***Level [7]***	***Level [8]***	
FUNDAMENTAL COMPONENT *Subjects/ Courses/ Modules/Units*	Computer Appreciation & Applications	5				12
	Communication and Study Skills	5				12
	Entrepreneurship 1	5				5
	Personal Mastery 1	5				5
	Governance and Ethics 1	5				5
	Innovation 1	5				5
	Entrepreneurship 2		6			5
	Personal Mastery 2		6			5
	Innovation 2		6			5
	Governance and Ethics 2		6			5
	Entrepreneurship 3			7		5
	Governance and Ethics 3			7		5

	Personal Mastery 3			7		5
	Innovation 3			7		5
	Entrepreneurship 4			7		5
	Governance and Ethics 4			7		5
	Entrepreneurship 4			7		5
	Personal Mastery 4			7		5
	Engineering Mathematics I	5				12
	Introductory Physics I	5				12
	Introductory Chemistry I	5				12
	Engineering Mathematics 2	5				12
	Introductory Physics II		6			10
	Introductory Chemistry II		6			10
	Technical Writing and Academic Literacy Skills I		6			10
CORE COMPONENT *Subjects/Courses/ Modules/Units*	Engineering Mathematics 3		6			10
	Introduction to Programming		6			15
	Professional and Workshop skills I		6			10
	Electrical and Electronic Technology I		6			10

	Engineering Drawing I		6			10
	Engineering Drawing II			7		10
	Professional and Workshop skills II			7		10
	Engineering Mathematics 4			7		10
	Introduction to Electronics			7		10
	Statics and Dynamics			7		10
	Advanced Electrical and Electronic Technology			7		10
	Computer Science for Engineers			7		10
	Statistics for Engineers			7		10
	Analogue Electronics			7		10
	Instrumentation and Control Systems			7		10
	Research Methods			7		10
	Electricity and Magnetism			7		10
	Electrical Power and Machines			7		10
	Engineering Mathematics 5			7		10
	Signals and Systems			7		10

	Digital Electronics			7		10
	Mechatronic Systems Design			7		10
	Electrical Energy Distribution and Utilization			7		10
	Digital Systems and Microprocessors			7		10
	Industrial Training I			7		30
	Digital Signal Processing			7		10
	Programmable Logic Controllers			7		10
	Project Management			7		10
	Industrial Training II				8	60
	Engineering Design				8	10
	State Space Control				8	10
	Computer Architecture and Design				8	10
	Industrial Engineering				8	10
	Engineering Management				8	10
	Introduction to Robotics				8	10
	Engineering Project A				8	15
	Engineering Project B				8	15

ELECTIVE/ OPTIONAL COMPONENT *Subjects/Courses/ Modules/Units* ***For Semester 9 & 10 the learners specialize in either a) Power, or b) Telecommunications by selecting two modules per semester in these respective disciples*** ***Specializations will be selected by learners before placement into Industrial Training II***	**POWER ELECTIVES**					
	Power Generation and Transmission				8	12
	Energy System and Conversion				8	12
	Electrical Machine Design				8	12
	Power Electronics				8	12
	Telecommunications Electives					
	Communication Principles				8	12
	Computer Systems and Networking				8	12
	Mobile Communication				8	12
	Communication Systems Performance				8	12

SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL	
TOTAL CREDITS PER NCQF LEVEL	
NCQF Level	***Credit Value***
5	***92***
6	***105***
7	***290***
8	***198***
TOTAL CREDITS	***685***

Rules of Combination:

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

A candidate to be awarded the Qualification must complete the minimum of the following:

Fundamentals	Level 5	92 Credits
Fundamentals	Level 6	50 Credits
Fundamentals	Level 7	40 Credits
Core	Level 6	55 Credits
Core	Level 7	250 Credits
Core	Level 8	198 Credits
Total		**685 Credits**

ASSESSMENT ARRANGEMENTS

Formative Assessment

- The weighting of Formative Assessment is **60%** of the final grade.

Summative Assessment

- The Final Examination is **40%** of the final grade.

Assessment will be conducted by professionals registered an accredited by BQA as Assessors.

MODERATION ARRANGEMENTS

There will be both internal and external moderation, conducted by professionals registered and accredited by BQA as Moderators.

RECOGNITION OF PRIOR LEARNING

There is a provision for the Award of the qualification through RPL. This will be done with reference to the institution's policy which shall be aligned with the BQA National RPL policy.

CREDIT ACCUMULATION AND TRANSFER

There is a provision for the Award of the qualification through CAT. This will be done with reference to the institution's policy which shall be aligned with the BQA National CAT policy.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

Horizontal Articulation

Graduates of this qualification may consider pursuing related qualifications for purposes of multiskilling, retooling, etc.

- Bachelor of Science in Telecommunications Engineering
- Bachelor of Science in Computer Engineering
- Bachelor of Science in Control and Instrumentation Engineering
- Bachelor of Science in Computer Information Systems Engineering
- Bachelor of Science in Engineering Management Science

Vertical Articulation

Graduates may progress to qualifications such as:

- Master of Science Degree in Electrical and Electronic Engineering
- Master of Science Degree in Engineering Management Science
- Master of Science Degree in Control and Instrumentation Engineering
- Master of Science Degree in Telecommunications Engineering
- Master of Business Administration.
- Post Graduate Diploma in Business Management
- Honours Degree in Business Administration

Employment

Graduates will have requisite competencies and attributes to work as:

- Electrical Engineer
- Electronic Engineer
- Electrical Design Engineer
- Electrical Instrumentation & Control Engineer
- Technical Sales Engineer
- Electrical Maintenance Engineer etc.

QUALIFICATION AWARD AND CERTIFICATION

Minimum Standard of achievement for the award of the qualification.

Learners will be awarded Diploma in Electrical and Electronics Engineering qualification upon attainment of a **minimum of 685 articulated credits**
There will be the issuance of a certificate and an official transcript at the award.

REGIONAL AND INTERNATIONAL COMPARABILITY

This qualification has been benchmarked with the following:

University of Cape Town – Bachelor of Science in Engineering in Electrical Engineering: NQF Level 7, 560 Credits

The programme produces candidates with the competence to undertake design work, use mathematical and computer models, solve engineering problems, undertake practical work and demonstrate awareness of leading-edge knowledge.

University of Witwatersrand – Bachelor of Science in Electrical Engineering: NQF Level 7, 480 Credits

This programme develops competencies in undertaking design work, using mathematical and computer models, solving engineering problems, undertaking practical work and demonstrating awareness of leading-edge knowledge.

University of Manchester – Bachelor of Science in Electrical Engineering: QCF Level 5, 360 Credits

The programme develops competence to apply knowledge of mathematics, basic science and engineering sciences from first principles to solve engineering problems, providing engineering drawing knowledge and practical skills to solve engineering problems. It provides competency in engineering management and leadership across all fields of electrical engineering.

This qualification generally compares well with all the qualifications studied since the exit outcomes cover similar scope and depth and are aligned to exit-level descriptors typical of this level and type of qualification as done within the region and beyond. What sets this qualification apart from the ones examined is that there is provision for the development of attributes such as a life-long commitment to learning and further study as part of professional development and understanding of enterprise and entrepreneurship which are critical for global citizenship.

REVIEW PERIOD

This qualification will be reviewed after five 5 years