BQA NCQF QUALIFICATION TEMPLATE

SECTION A:	QUALIFICATION DETAILS																
QUALIFICATION DEVELOPER (S)	Department of Teacher Training and Technical Education																
TITLE	Diploma in Electrical and Electronics Engineering									**NCQF LEVEL**	6						
STRANDS (where applicable)	N/A.																
FIELD	Manufacturing, Engineering and Technology									**CREDIT VALUE**	370						
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:

Sub field of Electrical & Electronic has been identified as one of the occupations in high demand. (HRDC Occupation Code No. 3113). This is based on the Labour Market Analysis conducted by the HRDC.

This qualification has been developed in line with NDP 11 which identified refurbishment of Morupule Power B as one of the major projects that will facilitate the development of other sectors of the economy NDP11(Page 91). Electrical & Electronic qualification produces Electrical & Electronic Technician. Vision 2036 emphasizes implementation of curriculum which is aligned to the needs of the economy and business, science, mathematics, and technology (page 20).

The qualification is another way of establishing a positive image for improved perception of the TVET sector as it increases enrollment and at the same time the alignment of TVET programmes and institutions will create demand for qualified, productive and competitive human resources as stated in Education Training Strategic & Sector Plan (ETSSP) PG 98.

The qualification will enable the industry to employ competent electrical & electronics technicians whose skills will be utilized in commercial plants such as Morupule, Botswana Power Cooperation, Mines, Soda Ash. All industries whose mandate is to provide their services to both domestic and commercial clients will benefit from the skills and knowledge derived from this qualification.

In addition, qualification has been developed in line with Botswana Government's Vision 2036 which acknowledges Technical and Vocational Education Training (TVET) as one of the key contributors to economic growth and employment creation (page 17) and NDP11 (page 71)

Vision further emphasizes implementation of curriculum which is aligned to the needs of the economy, business, science, mathematics, and technology (page 20).

Furthermore, the Continental Education Strategy for Africa 2016 – 2025 stipulates that there is a need to expand TVET opportunities at both secondary and tertiary level and strengthen linkage between the world of work and education and training systems.

PURPOSE: (itemise exit level outcomes)

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

1. Provide solutions to an electrical and electronics engineering problems in a domestic and industrial set up.
2. Design, install, test, and maintain electrical and electronic components and systems observing health and safety measures.
3. Use appropriate techniques, resources and modern engineering tools including information technology to solve engineering problems.
4. Communicate effectively both orally and in writing with stake holders.

MINIMUM ENTRY REQUIREMENTS (including access and inclusion)

Minimum entry requirement for this qualification is as follows:

- Certificate IV, NCQF Level 4(General Education or TVET Intermediate Certificate)
- Applicants who do not meet minimum entry will be absorbed through RPL and CAT according to the ETP's policies aligned to BQA RPL and CAT policies

SECTION B	QUALIFICATION SPECIFICATION
GRADUATE PROFILE (LEARNING OUTCOMES)	***ASSESSMENT CRITERIA***
1 Employ engineering principles to systematically diagnose and solve broadly defined engineering problems.	1.1 Apply electrical theorems, laws, and principles in circuit analysis. 1.2 Apply concepts of electrical machines in modern power systems. 1.3 Analyse concepts of power generation, transmission, and distribution in an industrial environment. 1.4 Analyse principles and schemes for protecting systems in an industrial environment. 1.5 Apply the theory of semiconductor devices and passive components, and their application operations in power electronics.
2 Apply mathematical concepts in control systems theory.	2.1 Employ knowledge of control concepts and representation of dynamic systems. 2.2 Carry out time response analysis and stability of first and second order dynamic control systems. 2.3 Carry out frequency response analysis of dynamic second order control systems. 2.4 Cary out frequency domain design and analysis of controllers in linear time- invariant control systems.
3 Apply analogue and digital skills in electrical systems for installing, diagnosing, and repairing communication equipment.	3.1 Employ knowledge and understanding of bus systems used in control systems. 3.2 Examine the purpose, structure, and application of different communication systems. 3.3 Install, diagnose, and repair communication equipment used in electrical and electronics field.
4 Diagnose and rectify faults in analogue and digital electronic circuits.	4.2 Assemble, test and trouble shoot analogue electronic circuits consisting of passive and active electronic components.

	4.3 Assemble, test and trouble shoot digital electronic circuits consisting of passive and active electronic components. 4.4 Apply circuit simulation software in analogue and digital circuit analysis. 4.5 Design and develop Printed Circuit Board (PCB) for analogue and digital circuits.
5 Carryout electrical and electronics installations, maintenance and commissioning according to applicable procedures and standards.	5.1 Handle and use electrical and electronics tools and testing equipment according to safety standards. 5.2 Interpret and analyse measurements of electrical and electronics quantities using graphs and charts. 5.3 Use engineering application softwares for design and analysis in an electrical discipline. 5.4 Implement and monitor environmentally friendly and energy efficient practices and standards. 5.5 Perform installation and commissioning of electrical and electronics equipment. 5.6 Perform maintenance and service on electrical and electronic equipment according to applicable maintenance procedures and standards.
6 Design engineering drawings used in Electrical and Electronics engineering industry.	6.1 Examine the symbols associated with mechanical, electrical, electronic and instrumentation diagrams. 6.2 Analyse different types of Electrical and Electronics engineering diagrams and associated documentation. 6.3 Draw and develop Electrical and Electronics engineering diagrams using application software.
7 Execute health and safety measures to ensure a health and safety compliant environment.	7.1 Adhere to health and safety regulations in the workplace to minimize risks and accidents. 7.2 Apply and monitor occupational, health and safety regulations, codes, and practices in the workplace to ensure best safety practices. 7.3 Report injuries and accidents in the workplace to comply with health and safety reporting procedures.

8 Apply professional skills (soft) applicable in Electrical and Electronics engineering.	8.1 Employ ICT skills in electrical and electronics engineering to execute the assigned tasks. 8.2 Use applicable skills to communicate effectively and efficiently in the electrical and electronics field. 8.3 Apply entrepreneurship practical skills in a business set up. 8.4 Perform administrative duties within electrical and electronics discipline. 8.5 Employ professional skills to carry out research in electrical and electronics discipline. 8.6 Adhere to code of ethics for engineers in work environment
9 Employ engineering mathematics skills to analyse circuits and systems in Electrical and Electronics engineering.	9.1 Perform calculations in order to solve problems within Electrical and Electronics discipline field. 9.2 Employ mathematical concepts and principles in field of Electrical and Electronics discipline engineering. 9.3 Perform calculations on Electrical and Electronics discipline engineering systems.

SECTION C	***QUALIFICATION STRUCTURE***				
COMPONENT	***TITLE***	***Credits Per Relevant NCQF Level***			***Total Credits***
		Level [ ]	***Level [5]***	***Level [6]***	
FUNDAMENTAL COMPONENT *Subjects/ Courses/ Modules/Units*	Occupational Health & Safety		***6***		***6***
	Entrepreneurship		***8***		***8***
	Introduction to Computing		***8***		***8***
	Communication Skills		***8***		***8***
	Introduction to Research Methods			***8***	***8***
	Engineering Ethics			***8***	***8***
CORE COMPONENT *Subjects/Courses/ Modules/Units*	Engineering Mathematics		***18***	***18***	***36***
	Electrical Workshop Practice		***14***		***14***
	Electrical Engineering		***24***		***24***
	Electrical Engineering Drawing		***10***		***10***

	Introduction to Computing		***8***		***8***
	Electronics		***14***	***14***	***28***
	Measurement and Instrumentation		***12***		***12***
	Electrical Computer Aided Drawing			***10***	***10***
	Electrical Machines			***14***	***14***
	Control Systems			***14***	***14***
	Power Systems			***14***	***14***
	Power Generation, Transmission and distribution			***14***	***14***
	Programmable Logic Controllers			***12***	***12***
	Electrical Protection			***8***	***8***
	C++ Programming			***12***	***12***
	Integrated Research Project			***30***	***30***
	Work Placement			***60***	***60***
STRANDS/ SPECIALIZATION	*Subjects/ Courses/ Modules/Units*	***Credits Per Relevant NCQF Level***			***Total Credits***
		Level [ ]	***Level [ ]***	***Level [ ]***	
1.					
	N/A				

2.					
Electives	Power Electronics			***12***	***12***
	Solar Photovoltaic Systems			***12***	***12***
	Microprocessor Based Systems			***12***	***12***

SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL	
TOTAL CREDITS PER NCQF LEVEL	
NCQF Level	***Credit Value***
Level 5	***120***
Level 6	***250***
TOTAL CREDITS	***370***

Rules of Combination:

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

Fundamentals

Level 5 = 24 Credits

Level 6 = 16 Credits

Core

Level 5= 92 Credits

Level 6= 226 Credits

Electives

Leve 6= 12 Credits

Total= 370 credits

There are three electives at NCQF level 6 and the candidate chooses 1

The candidate has to pass all the fundamental, core and chosen elective modules.

ASSESSMENT ARRANGEMENTS

Documentation

All necessary documents including qualification document, alignment matrices, assessment instruments and Assessment criteria/rubrics should be available.

Formative (60%)

The contribution of formative assessment to the final grading shall be 60%.

Summative Assessment (40%)

The contribution of summative assessment to the final grade shall be 40%.

Assessment shall be carried out by BQA registered and accredited Assessors.

MODERATION ARRANGEMENTS

Internal and external moderators to be engaged will be BQA accredited subject specialists in relevant fields with relevant industry experience and academic qualification. The moderators should be holders of Bachelor's Degree in in Control & Instrumentation Engineering, Bachelor's Degree in Industrial Automation and Robotics Engineering, Bachelor's Degree in Mechatronics and Industrial Instrumentation Engineering, Bachelor's Degree in Electrical and Electronics Engineering, Bachelor's Degree in Electronics Engineering , relevant/similar qualifications and industrial experience will be an added advantage.

RECOGNITION OF PRIOR LEARNING

Recognition of Prior Learning (RPL) will be considered for the award of the credits towards the equal according to applicable RPL policies.

CREDIT ACCUMULATION AND TRANSFER

Credit Accumulation and Transfer will be considered for the award of the credits towards the equal according to applicable RPL policies.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

LEARNING PATHWAYS

Horizontal Articulation (related qualifications of similar level that graduates may consider)

- Diploma in Electronics and Communications Engineering
- Diploma in Engineering Technology in Electronic Engineering
- Diploma in Engineering Technology in Power Engineering
- Diploma in Engineering Technology in Instrumentation Engineering
- Diploma in Control and Instrumentation Engineering
- Diploma in Renewable Energy Engineering

Vertical Articulation(qualifications to which the holder may progress to)

- Bachelor of engineering in Electrical & Electronics Engineering

Employment Pathways
On successful completion of this qualification the graduate may be absorbed in the job market as:

- Electrical Power Technician
- Assistant Electrical Engineer
- Assistant Electronics Engineer
- Aircraft Maintenance Engineer
- Assistant Project Engineer
- Assistant Test Engineer
- Assistant Process Engineer
- Assistant Quality Engineer
- Biomedical Equipment Service Engineer
- Field Service Assistant Engineer
- IT Support Engineer
- Maintenance Assistant Engineer
- Material Planner
- Technical Officer (Control & Instrumentation)

Technical Officer (Power Distribution System)

QUALIFICATION AWARD AND CERTIFICATION

Qualification Award

- Candidates meeting the required minimum of 370 credits will be awarded Diploma in Electrical and Electronics Engineering in accordance with the qualification composition rules and applicable policies.

Certification

- A certificate will be awarded to graduate.

SUMMARY OF REGIONAL AND INTERNATIONAL COMPARABILITY

Title of Qualifications

The tittle for the developed qualification is Diploma in Electrical and Electronics Engineering whereas for TAFE- Queensland is Diploma of Electrical Engineering while for International College of Auckland Limited and Tshwane University of Technology is Diploma in Electrical Engineering. The developed and benchmarked qualifications are for Electrical Power Technician with electronics competencies, hence the qualification name 'Diploma in Electrical and Electronics Engineering' for the developed qualification. The names of the benchmarked qualifications are different from the developed qualification but they produce a Technician with similar competencies.

Duration and Level

The duration of the qualification by TAFE Queensland is between 1-2 years, whereas for International College of Auckland Limited, University of Tshwane Technology and the developed qualification are 3 years. The TAFE Queensland entry level is for graduates of NQF level 5(who have first year- Artisans/ Certificate V) while for International College of Auckland Limited, University of Tshwane Technology and the developed minimum entry levels is NQF/NCQF level IV(high school leavers). The NCQF/NQF for International College of Auckland Limited, University of Tshwane Technology and the developed ends at level 10 whereas for TAFE Queensland ends with level 12 but the content and depth is equivalent.

Main Exit outcomes

The benchmarked qualifications and the developed qualification have similar competencies such as apply occupational health and safety codes and practices in the workplace, use drawings, diagrams, schedules, standards, codes and specifications, diagnose and rectify faults, install, assemble, maintain electrical equipment, communicate effectively, design and implement electronic systems and others.

Modules

The developed and the benchmarked qualification share some similar modules as shown on the table below:

Developed Qualification (DTT&TE)	International College of Auckland Limited	TAFE Queensland	Tshwane University of Technology
Programmable Logic Controllers	Programmable Logic Controllers		
Electrical Machines	Electrical Machines	Electrical Machines	Electrical Machines
Integrated Research Project	Engineering Project		Design Projects
Engineering mathematics	Engineering mathematics	Engineering mathematics	
Electrical Protection	Protection	Power System Protection	
Electronics			Electronics
Power Generation, Transmission and Distribution		Electrical Power Distribution	
Electrical Engineering Drawing		Electrical Drawings	

Assessment strategies and Weightings

The proposed qualification and benchmarked qualifications do have formative and summative assessments

Qualification rules and minimum Standards for the award of the qualification

The developed qualification and the benchmarked have stated that the candidate has to certify all the set minimum standards (such as all the modules should be passed including electives where applicable) of the qualification in order to be awarded a diploma. Candidates for International College of Auckland Limited and for University of Tshwane Technology candidate are required to achieve a minimum of 240 and 360 credits respectively. The candidate of TAFE Queensland is required to a minimum of achieve a minimum of 2210 weighting points whereas for the developed

qualification a minimum of 370 credits should be achieved in order to be awarded a full qualification.

Comparability and Articulation

- The students of the developed qualification can articulate horizontally (NQF Level 6) or transfer to institutions offering the developed qualification since benchmarked qualifications are similar or related qualifications. Horizontal articulation qualifications include Diploma in Electrical & Electronics Engineering, Diploma in Industrial Automation Engineering, Diploma in Instrumentation Engineering, Diploma in Control and Instrumentation Engineering, Diploma in Communication and Electronics Engineering and Diploma in Renewable Energy Engineering.

- Students can articulate vertically to NQF Level 7(bachelor's degree) since the benchmarked qualifications offers qualification of bachelor's degree in electrical and Electronics Engineering. Other vertical articulation qualifications include: Bachelor's Degree in Control and Instrumentation Engineering, Bachelor's Degree in Electrical Engineering, Bachelor's Degree in Electronics Engineering and Bachelor's Degree in Renewable Energy Engineering

Graduate of Diploma in Electrical and Electronics Engineering can be employed locally and internationally as in areas such as manufacturing, mining, oil and gas, power generation and energy, communication, utilities, consulting engineers companies' as well in pharmaceutical fields,. The graduates can be employed as Power Systems Technician, Electrical Technician, Electrical services Technician.

See attachment A

REVIEW PERIOD

The qualification will be reviewed every five (5) years or as and when required depending on the changing needs of the market**.**

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**	

REVISION DATE:		**NAME OF PROFESSIONAL BODIES/REGULATORY**	