

BQA NCQF QUALIFICATION TEMPLATE

SECTION A: QUALIFICATION DETAILS																		
QUALIFICATION DEVELOPER (S)			Department of Teacher Training and Technical Education															
TITLE		Diploma in Mechanical Engineering						NCQF LEVEL			6							
STRANDS (where applicable)		N/A																
FIELD		Manufacturing, Engineering and Technology						CREDIT VALUE			380							
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: Mechanical Engineering has been identified as one of the occupations in high demand in Botswana and beyond. The occupations or the skills are needed by the automotive, transport, mining, manufacturing, and health, construction, and agriculture, tourism, energy, communications, entertainment and retail sectors respectively. This is based on the Labour Market Analysis conducted by the HRDC. The qualification Diploma in Mechanical Engineering is developed as a response to the need established by Human Resource Development Council Report (HRDC 2023/24) of Top Occupations																		

in Demand, which identified Mechanical Engineering Technicians as one of the occupations in high demand in Botswana

This 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)

The 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 stipulate 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.

The qualification is also developed in line with the African Agenda 63 United Nations Sustainable Development Goals, this qualification will provide graduates with employment opportunities in the fields of plant maintenance, manufacturing technologies and design concepts. Therefore the graduates will contribute toward the Gross Development Product, thus enhancing their capability to contribute towards socio- economic development of Botswana

The Education and Training Sector Strategic Plan (ETTSP) : Technical Vocational Education & Training(TVET) subsector programmes three (3) and nine (9) emphasizes on “ developing high quality and relevant TVET programmes that are related to the needs of the economy as well rationalizing TVET institutions and programmes” respectively. This qualification addresses the above mentioned subsectors as well as contributing to more diversified, knowledge based economy because it will be aligned to the needs of the industry.

In addition, mechanical engineering is one of the fields or areas that will enable graduates to be entrepreneurs' after completion of their studies. The government of Botswana through NDP 11(pg 120) emphasizes that efforts will be made towards resourcing initiatives that promote entrepreneurship development with a view to stimulate economic activities that will generate employment opportunities

PURPOSE: (itemise exit level outcomes)

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

- Install, troubleshoot, repair, service and maintain mechanical structures, machines and systems that adhere to industrial standards.
- Interpret technical documentation, plan work and identify appropriate tools and materials according to set standards.

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- Perform tasks with due consideration to safety rules, accident prevention regulations and environmental protection regulations to comply with environment and sustainability act.
- Restore mechanical systems to their original factory specifications and condition in terms of appearance and functionality.

MINIMUM ENTRY REQUIREMENTS (including access and inclusion)

- 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

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SECTION B QUALIFICATION SPECIFICATION	
GRADUATE PROFILE (LEARNING OUTCOMES)	ASSESSMENT CRITERIA
1. Execute health and safety measures to ensure a health and safety complaint environment	1.1 Adhere to health and safety regulations in the workplace to minimize risks and accidents 2.2 Apply and monitor occupational, health and safety regulations, codes and practices in the workplace to ensure best safety practices 2.3 Report injuries and accidents in the workplace to comply with health and safety reporting procedures
2. Carryout manufacturing of artefacts through engineering manufacturing processes	2.1 Apply engineering principles to solve practical problems in design and manufacturing processes. 2.2 Determine the materials to be used to produce artefacts during manufacturing processes 2.3 Use mechanical tools and equipment to produce artefacts according to manufacturing set standards 2.4 Develop and produce mechanical products and systems according to the design standards 2.5 Apply quality control standards to ensure product quality and performance according to established standards.

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3. Conduct maintenance procedures on mechanical engineering systems	3.1 Prepare and plan for maintenance tasks for mechanical engineering systems and procedures 3.2 Execute maintenance procedures on mechanical systems as per maintenance standards 3.3 Maintain clear and accurate maintenance records of mechanical works carried out
4 Use engineering software to design and develop engineering drawings as per the set standards	4.1 Examine the codes associated with mechanical engineering systems to produce engineering drawings 4.2 Produce engineering components in pictorial and orthographic projection to analyse designs 4.3 Employ the skill to use mechanical engineering software to produce drawings as per the requirements
5. Execute professional skills (generic) applicable in a mechanical engineering discipline	5.1 Employ ICT skills in mechanical engineering to achieve the assigned tasks 5.2 Use applicable skills to communicate effectively in the mechanical engineering field 5.3 Apply entrepreneurship practical skills in a mechanical engineering set up 5.4 Perform administrative duties within mechanical engineering discipline. 5.5 Employ professional skills to carryout research in mechanical engineering discipline
6. Apply engineering mathematics skills to solve mechanical engineering problems	6.1 Perform calculations to solve mechanical engineering problems 6.2 Employ engineering mathematical concepts and principles within mechanical engineering field 6.3 Employ mathematics skills to analyse mechanical engineering systems

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7 Diagnose mechanical engineering systems to effect repairs	7.1 Perform diagnostic tests using test equipment 7.2 Carry out service and repairs adhering to mechanical engineering service manuals 7.3 Carry out repair procedures in accordance with identified correctional measures
8. Work as an individual, team, and collaborate in a multidisciplinary project in the workplace	8.1 Adhere to personal development competency plan as per set standards 8.2 Works effectively and efficiently as a team member by contributing towards workplace set goals and objectives 8.3 Build and sustain an innovative work environment to enhance working relationship amongst different disciplines 8.4 Apply engineering code of ethics in work environment
9. Apply engineering management skills in the workplace	9.1 Adhere to continuous professional development schedule in the workplace 9.2 Use information management system according to workplace standards 9.3 Employ knowledge and understanding of engineering management principles and economic decision-making automotive electrical and electronics discipline 9.4 Implement, monitor policies and procedures for environmentally sustainable work practices
10 Carry out mechanical engineering activities to environmental issues	10.1 Conduct Environmental Impact Assessment prior to construction and installation of mechanical systems 10.2 Develop environmental management plan for executing mechanical engineering processes 10.3 Apply engineering knowledge to solve problems regarding sustainable (green) technology in mechanical engineering discipline

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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 and Safety		6		6
	Communication Skills		8		8
	Introduction to Computing		8		8
	Engineering Ethics			8	8
	Introduction to Research Methods			8	8
	Entrepreneurship		8		8
CORE COMPONENT Subjects/Courses/ Modules/Units	Engineering Mathematics		18	18	36
	Engineering Drawing		6		6
	Mechanical Engineering Science		20		20
	Measurements and Instrumentation		12		12

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	Workshop Processes & Practice		14		14
	Electrical Engineering Principles		12		12
	Electronics		12		12
	Mechanical Computer Aided Design			12	12
	Hydraulics and Pneumatics			10	10
	Applied Mechanics			12	12
	Engineering Design			12	12
	Engineering Materials			8	8
	Manufacturing Methods			20	20
	Plant Engineering			17	17
	Thermo-fluids			16	16
	Plant Maintenance and Services			17	17
	Programming for Engineering Technicians			8	8
	Integrated Research Project			30	30
	Work Placement			60	60

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STRANDS/ SPECIALIZATION	Subjects/ Courses/ Modules/Units	Credits Per Relevant NCQF Level			Total Credits
		Level []	Level []	Level []	
1.					
	N/A				
2.					
Electives	N/A				

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SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL

TOTAL CREDITS PER NCQF LEVEL

NCQF Level	Credit Value
Level 5	124
Level 6	256
TOTAL CREDITS	380

Rules of Combination:

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

Fundamentals NCQF 5= 30
Fundamental NCQF 6 = 16

Core NCQF 5 = 94
Core NCQF 6=240

Total Credits 380

NCQF Level 5 and 6 fundamental modules add up to 46 credits. Credits for NCQF Level 5 and 6 for core and fundamental add up to 334. The total credits for the qualification is 380.

There are no electives for this qualification therefore the candidate has to pass all core modules and fundamentals modules

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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 of Engineering in Mechanical Engineering, Bachelor of Electrical Engineering, Bachelor of Mechatronics Engineering, Bachelor of Automotive Engineering, Bachelor of Manufacturing Engineering or 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 according to applicable RPL policies. Candidates may submit evidence of prior learning and current competence and/or undergo appropriate forms of RPL assessment for the award of credits towards the qualification in accordance with applicable RPL policies and relevant national-level policy and legislative framework. Implementation of RPL shall also be consistent with requirements, if any, prescribed for the field or sub-field of study by relevant national, regional or international professional bodies.

CREDIT ACCUMULATION AND TRANSFER

Credit Accumulation and Transfer will be considered for the award of the credits 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 Automotive Engineering
- Diploma in Refrigeration and Air-conditioning Engineering
- Diploma in Electrical and Electronics Engineering
- Diploma in Heavy Equipment Engineering
- Diploma in Mechatronics Engineering

- Diploma in Auto Body Repairs and Refinishing Engineering

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

- Bachelor of Engineering in Mechanical Engineering
- Bachelor of Engineering in Automotive Engineering (Honours)
- Bachelor of Engineering Refrigeration and Air-conditioning Engineering
- Bachelor of Engineering in Heavy Plant Engineering
- Bachelor of Engineering in Mechatronics Engineering
- Bachelor of Engineering in Industrial Engineering

Employment Pathways

- On successful completion of this qualification the holder may be absorbed in the job market as:
- Mechanical Engineering Instructor/ Lecturer
- Mechanical Technician
- Plant Maintenance Technician
- Manufacturing Technician
- Automotive Technician
- Aerospace Technician
- Locomotive Technician

QUALIFICATION AWARD AND CERTIFICATION

Qualification Award

Candidate meeting the required minimum of 380 credits will be awarded Diploma in Mechanical Engineering in accordance with the qualification composition rules and applicable policies.

Certification

There will be certification upon awarding of Diploma in Mechanical Engineering qualification.

SUMMARY OF REGIONAL AND INTERNATIONAL COMPARABILITY

Introduction

The Diploma in Mechanical Engineering is a three year (National Credit Qualification Framework: NCQF Level 6) qualification which aims to produce a competent Mechanical Technician. The qualification has been benchmarked with other qualifications from Mangosutho University of Technology: MUT (South Africa) and Wintec (New Zealand).

Title of Qualifications

The developed and MUT qualifications title(s) is Diploma in Mechanical Engineering whereas Wintec is Diploma in Engineering (Mechanical). The three qualifications produce a Technician with similar competencies.

Duration and Level

The duration of the developed qualification and MUT is three years while for Wintec is two years. The developed and MUT qualifications have two entry levels which are at year 1(NCQF/NQF Level

4) and at year 2(NCQF Level 5). Wintec qualification entry is for candidates with NQF Level 5 hence the two years duration.

Main Exit outcomes

The benchmarked qualifications and the developed qualification have similar competencies such as applying engineering principles to solve and analyse mechanical engineering problems, use of machining and welding equipment, use of softwares , application of engineering ethics, applying engineering management skills, design of components, systems, works, products/processes, perform maintenance and others

Modules

The developed and the benchmarked qualification share some similar modules that cover content of engineering mathematics, engineering drawing, project, CAD, manufacturing, work-placement, maintenance, engineering design, fluid mechanics, communication skills, and computer skills.

Assessment strategies and Weightings

The developed and the benchmarked qualifications mode of assessments(s) are formative and summative.

Qualification rules and minimum Standards for the award of the qualification

The developed and the benchmarked qualifications have stated that the candidate has to satisfy all the minimum set standards in order to be awarded the diploma.

Differences

The minor difference observed is that the developed qualification does not have electives but the benchmarked qualifications have electives

The students of the developed qualification can articulate horizontally or transfer to institutions offering similar qualifications. Horizontal articulation qualifications include: but are not limited to Diploma in Heavy Equipment Engineering, Diploma in Automotive Engineering, Diploma in Refrigeration and Air Conditioning Engineering and Diploma in Mechatronics Engineering.

Students can articulate vertically to NCQF /NQF or other qualifications frame works at Level 7 in Bachelor of Engineering in Mechanical Engineering, Bachelor of Engineering (Mechanical), Bachelor of Engineering in Automotive Engineering, Bachelor of Engineering in Mechatronics Engineering, Bachelor of Engineering in Refrigeration and Air Conditioning Engineering, Bachelor of Engineering in Heavy Plant Engineering and Bachelor of Engineering in Industrial Engineering. The graduates of the developed qualification can be employed as Mechanical Engineering Instructor/ Lecturer, Mechanical Technician, Plant Maintenance Technician, Manufacturing Technician, Automotive Technician, Aerospace Technician, Locomotive Technician and others

Fields of employment include automotive, transport, mining, manufacturing, and health, construction, and agriculture, tourism, energy, communications, entertainment and retail sectors.

In conclusion, the developed and the benchmarked qualifications share similar qualification titles, the naming of the modules as well as the competencies. The developed qualification does not have electives whereas the benchmarked qualifications have electives. The graduates of the developed qualification can work locally regionally and internationally since the competencies/skills they will attain is needed by the international labour market.

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REVIEW PERIOD

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

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CODE (ID)			
REGISTRATION STATUS	BQA DECISION NO.	REGISTRATION START DATE	REGISTRATION END DATE
LAST DATE FOR ENROLMENT		LAST DATE FOR ACHIEVEMENT	

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