

CURRICULUM STRUCTURE

RQF LEVEL

4



TVET CERTIFICATE IV in Electronics and Telecommunication

TSVETE4001

Kigali, May, 2023

TVET CERTIFICATE IV

in

Electronic and Telecommunication

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LIST OF ABBREVIATIONS

4IR	Fourth Industrial Revolutions
AI	Artificial Intelligence
BPO	Business Process Outsourcing
CAD	Computer-Aided Design
CDU	Curriculum Development Unit
CM	Complementary Modules
CV	Curriculum Vitae
DACUM	Developing a Curriculum
ESSP	Education Sector Strategic Plan
HR	Human Resources
IAP	Industrial Attachment Program
IOT	The Internet of Things
MINEDUC	Ministry of Education
NST	National Strategy for Transformation
NSDEPS	National Skills Development and Employment Promotion Strategy
OHS	Occupational Health and Safety
PPE	Personal Protective Equipment
PSDYES	Private Sector Development & Youth Employment Strategy
REQF	Rwandan Education Qualification Framework
RP	Rwanda polytechnic
SWOT	Strength Weakness Opportunities and Treats
TSS	Technical Secondary School
SDC	Swiss Agency for Development and Cooperation
TVET	Technical and Vocational Education and Training
WDA	Workforce Development Authority
WHS	Work Health & Safety
WPL	Workplace learning

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Curriculum Development Team

1. Core Modules

No	NAMES	FUNCTION	INSTITUTION/COMPANY
1	RWAMASIRABO Aimable	HoD CIMD	Rwanda TVET Board
2	NTASHAMAJE Aimable	Electricity, Electronics and Telecommunication trades Specialist	Rwanda TVET Board
3	NYIRIMIGABO Alex	Chief technician	Competent Technology Access
4	NKURUNZIZA Shadrach	CEO	NYEREKA Tech LTD
5	KANYESHURI Alexandre	Assistant lecturer	UR CST
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7	UWIRAGIYE Jean Paul	Technical Services officer	Deep Switch LTD
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16	NTAMWEMEZI Emmanuel	TVET Trainer	HOPE TSS
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18	MUSONI Flavien	TVET Trainer	APADE TSS
19	KAMUHANDA Deny Beny	TVET Trainer	SOS TSS

2. General modules

No	Names	Organization	Position
1	UWITONZE Nestor	UR/CST	Lecture in Chemistry
2	UFITINEMA Jean Chrisostome	UR/CST	Assistant Lecture in Biology
3	MUNEZERO Wivine	IPRC NGOMA	Teacher of Chemistry
4	UFITINEMA Bonaventure	GSNDP Cyanika	Teacher of Mathematics
5	NINKABANDI Theogene	Nyanza TSS	Teacher of Physics

3. Complementally modules

#	Names	Institution	Position
1	DUSABEMARIYA Francine	IPRC Kigali	Assistant Lecture in Entrepreneurship
2	NDAHAYO Jacques	NYANZA TSS	Teacher of English
3	NTIVUGURUZZA Jean Berchimas	GS KIGEYO/GIKONKO TVET school	Teacher of English
4	MUTAGANZWA Gilbert	ES RUKARA	Umwarimu w'Ikinyarwanda
5	MATATA Jean Bosco	GS ADEBE	Umwarimu w'Ikinyarwanda
6	RIKUNZE Jean Damascene	APEKI-Tumba	Teacher of French
7	RWAGASANA Emmanuel	Buffer Technologies Ltd	Teacher of ICT
8	HARERIMANA Charles	College de la lumiere de Gashonga TSS	Teacher of ICT
9	NGEZAHAYO Emmanuel	RUSUMO High School	Teacher of English
10	NTIVUGURUZZA Procure	GSNDP Cyanika	Teacher of Entrepreneurship
11	AKINGENEYE Angelique	ACEJ Karama	Teacher of Entrepreneurship
12	MBUGUJE Bienvenu	IPRC NGOMA	Assistant Lecture in French
13	SIBOMANA Abbas Mohamed	IPRC NGOMA	Assistant Lecture in English
14	HAKUNDWUMUKIZA Henry	Lycee de Ruhango IKIREZI	Teacher of communication skills
15	MUHAYIMANA Theoneste	Kayenzi TSS	Teacher of IAP

16	HAKIZIMANA Joseph	ST Dominique Mazzarello TSS	Teacher of Kiswahili
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Sponsor:

Rwanda TVET Board (RTB)

FOREWORD

The global rapid changes in the labour market tend to call for appropriate training and skills development through outcome-based training approaches. Skills development and employment promotion are central to Rwanda's transformative Vision 2050, aiming to secure high standards of living for all Rwandans. In a bid to transform Rwanda into a knowledge-based economy, the National Strategic Transformation 1(NST1) calls for socio-economic transformation through TVET skills development. The Rwanda TVET Board (RTB) was established to promote quality education in technical and vocational education and training from level one (1) to five (5) aimed fast-tracking socio-economic development of the country. Designing and distributing curricula, teaching materials, trainer's guides, and methodologies, and establishing training methods for technical and vocational education and training from level one (1) to five (5); are among other RTB's responsibilities.

The existing curricula were limited and narrowed in terms of acquired skills and knowledge and were not meeting the requirements of the current labour market at both national and regional levels. In addition, there were. Barriers in vertical mobility and pathways in TVET which resulted in negative TVET perception. Furthermore, there were barriers to the admission of TVET graduates of certain programs into higher learning institutions.

The TVET modernization process has begun with a clear picture of the programs focusing on sectors with the highest employment potential like electronics and telecommunication among others. In this respect, Rwanda TVET Board, is honored to avail the curriculum of Electronics and Telecommunication Level four (4) which serves as the official document and responds to the above-mentioned concerns. With the help of the training providers, trainers, and parents whose role is central to the success of this curriculum, the trainees will gain appropriate hand on skills that will make a difference not only to their own lives but also to the success of Rwanda's economy. I wish to sincerely extend my appreciation to the people who contributed to the development of this document.

Dipl.-Ing. Paul UMUKUNZI

Director General/ RTB

1. GENERAL INTRODUCTION

The curriculum presents a coherent and significant set of competencies to acquire in order to perform the occupations of Electronics and Telecommunication. It is designed with an approach that takes into account the training needs, the work situation, as well as the goals and the means to implement training.

The modules of the curriculum include a description of the expected results at the end of training. They have a direct influence on the choice of theoretical and practical learning activities. The competencies are the targets of training and the acquisition of each is required for certification.

The curriculum is the reference to carry out the assessment of learning. Assessment tools of learning are developed based on this document.

The curriculum consists of three parts. The first part is of general interest and shows the nature and goals of a program and the key concepts and definitions used in the document. The second part presents the qualification, its level in the qualification framework, its purpose, its rationale, and the list of modules it comprises. The third part deals with the training package. It includes the competencies chart, the sequencing of module learning, the description of each module, and the course structure.

The pages describing the modules are the heart of a curriculum. They present the title of the module, the length of training, the number of credits, the context in which the competency is performed, the prerequisite competencies, the learning units, and the performance criteria.

In each module, a course structure is provided. The course structure describes indicative content (knowledge, skills and attitude) and the learning contents related to each learning outcome. Also, the learning activities and resources are suggested.

Finally, the assessment specifications and guidelines are included in each module.

2. QUALIFICATION DETAILS

2.1. Description

Title:	TSVETE 4001 - TVET Level 4 in Electronics and Telecommunication
Level:	RQF Level 4
Credits:	120
Sector:	Technical Services
Sub-sector/trade:	Electronics and Telecommunication
Issue date:	May 2023

Note: The 120 credits are corresponding to the total of notional learning hours (1200 hours make 37 weeks of effective teaching and learning in TVET setting and company). Notional learning hours include direct contact time with trainers and workplace learning facilitators (directed learning), and time spent in studying, doing assignments, and undertaking practical tasks (self-directed). It includes also the time of summative assessment (Workplace Comprehensive-, Integrated- and End Level Assessment) which is conducted at the company in collaboration with the school.

2.2 Graduate profile

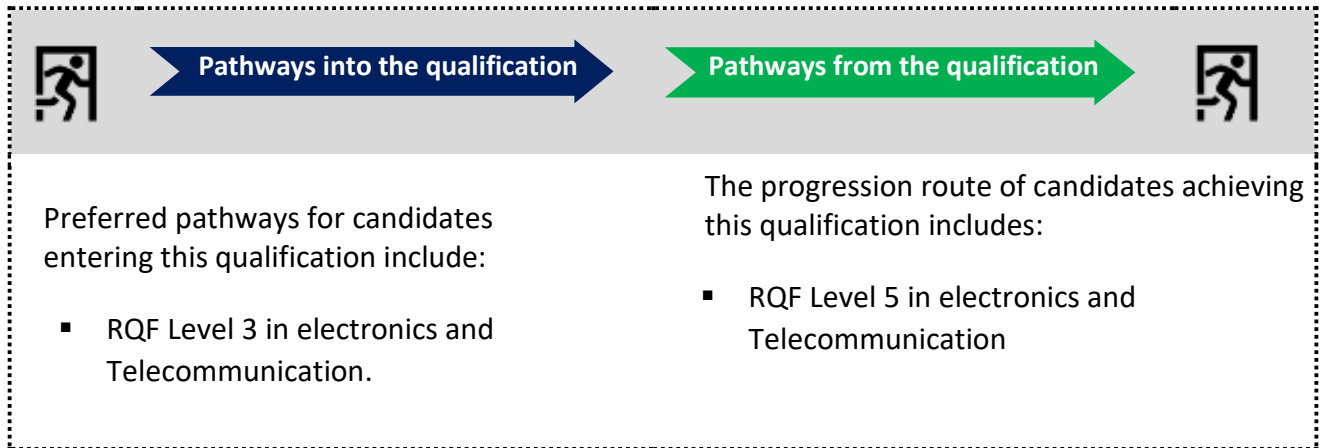
This qualification provides the skills, knowledge, and attitude for a learner to be competent in a range of routine tasks and activities that require the application of practical skills in a defined context. Work would be undertaken in various electronic incubation centres, electronic workshops (wholesaling/warehouse), security companies, Telecommunication companies such as telecom regulating companies, networking operating companies, broadcasting companies, and other related activities in various places such as schools, garages, cooperatives, and NGOs, where different operations and fabrication are carried out. Learners may work with high autonomy or in a team but usually under minimum supervision.

At the end of this curriculum, qualified trainees will be able to:

1. Develop a business plan
2. Use intermediate English at the workplace
3. Apply computer skills
4. Gukoresha Ikinyarwanda cy'umunyamwuga
5. Exprimer des opinions en Français élémentaire
6. apply Citizenship value
7. Apply Fundamental Mathematical Analysis
8. Apply Mechanics and properties of matter
9. Apply digital electronics fundamentals
10. Apply technical drawing
11. Apply networking fundamentals
12. Maintain hardware of OS-based processing devices
13. Maintain software of OS-based processing devices
14. Install telecommunication transmission system
15. Install electronic security system
16. Develop basic embedded system
17. Build power conversion system
18. Install heating, ventilation, and air conditioning system
19. Integrate the workplace

2.3 Minimum entry requirements and pathways

The minimum entry requirement for this qualification is to have completed nine years basic education.



2.4 Rationale of the Qualification

The electronics and telecommunication qualification prepares individuals for careers in the field of electronics and telecommunications by providing them with the necessary knowledge, skills, and expertise. The electronics and telecommunication industry is constantly evolving and expanding. With the increasing reliance on technology and communication systems, there is a growing demand for qualified professionals who can design, develop, install, and maintain electronic and telecommunication systems.

2.5 Job-related information

This qualification prepares individuals to integrate the technical sector with the professionalization of technical workers; this qualification again offers the opportunity to execute the works such as Maintaining hardware of OS-based processing devices, Maintaining software of OS-based processing devices, Install telecommunication transmission system, Install an electronic security system, Develop a basic embedded system, Build power supply converter, Install heating, ventilation and air conditioning system.

**Possible jobs related to this qualification:**

- Electronics and Telecommunication technician,
- Telecom transmission equipment installer,
- Electronic security system technician,
- Embedded system assistant technician,
- Power conversion technician,
- Air condition and ventilation installer,
- OS based processing devices technician,

2.6 Information about competencies

No	Code	Complementary competencies	Credit
1	CCMBP402	Develop a business plan	3
2	CCMEN402	Use intermediate English at workplace	3
3	CCMCS402	Apply computer skills	3
4	CCMKN402	Gukoresha Ikinyarwanda cy'umunyamwuga	3
5	CCMFT402	Exprimer des opinions en français élémentaire	3
6	CCMCZ401	Citizenship	3
Total			18

Co-Curricular activities		Credit
Sports/Clubs		1
Self-study/Library Research		1
Total		2

No	Code	Core competencies	Credit
GENERA	1. GENFA402	Apply Fundamental Mathematical analysis	6
	2. GENMP402	Apply Mechanics and properties of matter	4
	3. ETENF401	Apply Networking Fundamentals	4

SPECIFIC	4.	ETETD401	Apply Technical Drawing	4
	5.	ETEDE401	Apply Digital Electronics Fundamental	9
	6.	ETESI401	Install Electronic Security System	10
	7.	ETETT401	Install a Telecommunication Transmission System	8
	8.	ETEPC401	Build a Power Converter System	8
	9.	ETEAC401	Install Heating, Ventilation, and Air Conditioning system	7
	10.	ETEHM401	Maintain Hardware of OS-based Processing Devices	7
	11.	ETESM401	Maintain Software of OS-based Processing Devices	6
	12.	ETEED401	Develop Basic Embedded System	7
	13.	ETEIA 401	Integrate the workplace	20
	Total			100

- ❖ Number of competencies: 19
- ❖ Core competencies :13
- ❖ Complementary competencies: 6
- ❖ The total number of Credits: 120

2.7 Allocation of Learning Hours

N0	Module name	Learning outcome	Theoretical hours	Practical hours	Total hours
1.	Apply Digital Electronics Fundamental	1. Apply for digital numbers	9	21	30
		2. Apply logic gates	5	10	15
		3. Apply Boolean algebra	5	10	15
		4. Apply Fixed logic devices	7	13	20
		5. Apply Programmable Logic Devices	3	7	10
Total hours of module 1			29hours	61hours	90hours
2.	Build a Power Converter System	1. Perform preliminary activities	5	5	10
		2. Develop PCB of power conversion system	5	10	15
		3. Implement a power converter	7	18	25
		4. Perform interconnection of industrial UPS system	5	10	15
		5. Repair the Power Supply system	5	10	15
Total hours of module 2			27 hours	53hours	80hours
3.	Develop Basic Embedded System	1. Perform pre-development activities	3	7	10
		2. Develop a basic embedded system prototype	15	30	45
		3. Perform post-development activities	5	10	15
Total hours of module 3			23hours	47hours	70hours
4.	Apply Technical Drawing	1. Identify drawing instruments, materials, and equipment	2	3	5
		2. Draw symbols, lines, and geometric figures used in technical drawing	3	7	10
		3. Perform drawing projections	3	7	10
		4. Perform drawing using Computer-Aided Design (CAD) software	5	10	15
Total hours of module 4			13hours	27hours	40hours
5.	Apply Networking Fundamentals	1. Describe network concepts	3	5	8
		2. Apply network protocols and communications	5	10	15
		3. Apply IP addressing (IPv4&IPv6)	3	7	10
		4. Install VoIP system	2	5	7
Total hours of module 5			13 hours	27hours	40hours

6.	Install Electronic Security System	1. Perform Pre-installation activities	8	17	25
		2. Perform interconnection of electronic security system	7	13	20
		3. Configure of electronic security system	8	17	25
		4. Operate electronic security systems	5	10	15
		5. Maintain electronic security system	5	10	15
Total hours of module 6			29 hours	61hours	100hours
7.	Install Telecommunication Transmission System	1. Perform pre- activities installation	2	3	5
		2. Perform interconnection of the telecom transmission system	6	14	20
		3. Configure the telecom transmission system	3	7	10
		4. Operate telecom transmission system	5	10	15
		5. Maintain telecom transmission	8	17	25
		6. Perform post-installation activities	2	3	5
Total hours of module 7			26 hours	54hours	80hours
8.	Maintain Hardware of OS-based Processing Devices	1. Perform pre-maintenance activities	3	7	10
		2. Perform maintenance activities	15	35	50
		3. Perform post-maintenance activities.	3	7	10
Total hours of module 8			21 hours	49hours	70hours
9.	Maintain Software of OS-based Processing Devices	1. Perform pre-installation software activities	3	7	10
		2. Perform installation Software activities	6	14	20
		3. Repair software of OS-based processing devices	6	14	20
		4. Perform software post-installation activities	3	7	10
Total hours of module 9			18 hours	42hours	60hours
10.	Install Heating, Ventilation, and Air-conditioning (HVAC) System	1. Perform HVAC pre-installation activities	5	10	15
		2. Carry out HVAC assembling operation	15	30	45
		3. Conduct HVAC post-assembling activities	5	5	10
Total hours of module 10			25hours	45hours	70hours

3. TRAINING PACKAGE

The training package includes the flowchart, the modules, the course structure, and the assessment guidelines.

3.1 Course structure

The course structure describes the indicative content for each learning outcomes. These indicative contents are the essential skills and knowledge to be acquired. The contents to be covered for each indicative content are prescriptive. The learning activities contain a series of suggestions, usually with several options, that will guide the learner and the trainer.

3.2 Flowchart

The flowchart of sequencing of learning is a schematic representation of the order of acquisition of the competencies. It provides overall planning of the entire training programme and shows the relationship between the modules. This type of planning is to ensure consistency and progression of learning. For each module, the flowchart shows the learning that is already in place, the learning that is to take in parallel or later. The positions defined will have a decisive impact on all subsequent pedagogical choices. The flowchart of the sequence of learning of the modules of the training programme is presented on the following page.

1. Develop a business plan: 30hrs

2. Use intermediate English at workplace: 30 hours

3. Apply computer skills: 30hrs

4. Gukoresha Ikinyarwanda cy'umunyamwuga: 30hrs

5. Exprimer des opinions en Français élémentaire: 30 hours

6. Citizenship: 30hrs

7. Apply Fundamental mathematical analysis: 60hrs

8. Apply mechanics and properties of matters: 40hrs

9. Apply Digital Electronics Fundamental: 90hrs

10. Apply Networking Fundamentals 40hrs

11. Apply Technical Drawing: 40hrs

12. Build Power Converter System: 80hrs

13. Install Electronic Security System: 100hrs

14. Install heating, ventilation and air conditioning system: 70hrs

15. Develop Basic Embedded System: 70hrs

16. Maintain Hardware of OS - based Processing Devices: 70hrs

17. Maintain Software of OS-based Processing Devices : 60hrs

18. Install Telecommuniocation Transmission System 80hrs

19. Industrial Attachment Program : 200Hrs

4. ASSESSMENT GUIDELINES

4.1. Assessment Methodology

Assessment is done in order to assess knowledge, practice, and application skills through a jury system of continuous evaluation. This system encourages trainees to display an understanding of the principles in the application of the set practical tasks and their attendant theory. It is also done so as to assess self-learning. There are two types of assessment which are formative assessment and summative/integrated assessment. Each assessment has its own rules for passing to be declared competent.

4.2. Formative Assessment

Each trainee should be competent on all formative assessments to be declared competent in that module

All formative assessments should be declared competent before taking the summative/integrated assessment

4.3. Summative Assessment

All summative/integrated assessments should match the content of the module in the curriculum.

Summative/Integrated assessment is always practical, giving it as a theoretical type of assessment is not acceptable.

The integrated situation provided in the curriculum is a sample of the assessment to be carried out, the trainer/teacher has the role of developing another one referring to the task to be carried out in the integrated situation in accordance with the circumstances inside the school, but the integrated situation should stick on the components of a task.

During summative/integrated assessment, assessment panel members should be three (3).

The trainee can be declared competent based on the assessment criteria and its respective assessment indicators.

The passing Line for the modules is:

- 50 % for general and complementary modules
- 70 % for specific modules

Training delivery		100%	Assessment		Total 100%
Theoretical content		30%	Formative assessment	30%	50%
Practical work:		70%		70%	
Group project and presentation	20%				
Individual project /Work	50%				
		Summative Assessment			50%

1. Summative assessment is always conducted at the completion of module delivery. It should be practiced through an integrated situation for specific modules and in any other forms of assessment for complementary and general modules.

2. Learning hours assigned to specific module includes the duration assigned to integrated assessment.

5. GLOSSARY

Assessment: A process of gathering and judging evidence to decide whether a person has attained a standard of performance.

Assessment criteria: Statements that describe performances and place them in context with sufficient precision to allow valid and reliable assessment.

Best practice: Management practices and work processes that lead to outstanding or top-class performance and provide examples for others.

Competency standard: An industry-determined specification of performance that sets out the skills, knowledge, and attitudes required to operate effectively in employment. Competency standards are made up of units of competency, which are themselves made up of elements of competency, together with performance criteria, a range of variables, and an evidence guide.

Competency: means the ability to apply knowledge, skills and personal, social and methodological skills in the workplace or during learning, as well as in personal and professional development. This ability or capacity is acquired through learning, exposure to the tasks, and series of training allowing one to perform specific tasks autonomously. The reason why in the context of the CBE Framework competencies are described as responsibility and independence.

Competency-based assessment (or CBA): The gathering and judging of evidence to decide

whether a person has achieved a standard of competency.

Complementary competencies: Set of knowledge, skills, and attitudes which are not directly linked to a specific occupation or industry, but which are important for work, education, and life in general, such as communication, mathematics, organizational aptitude, and computer literacy, interpersonal and analytical competency.

Core modules: Modules leading to competencies' acquisition that an industry sector has agreed upon as essential for a person to be accepted as competent at a particular level. All modules may be core, but in many cases, competency at a level will involve core modules plus optional or specialization modules. Core competencies are normally those central to working in a particular industry.

Credential: Formal certification issued for achievement of a defined set of outcomes, e.g. successful completion of a course in recognition of having achieved particular knowledge, skills, or competencies; successful completion of an apprenticeship or traineeship.

Credit: The acknowledgment that a person has satisfied the requirements of a module.

Curriculum: The specifications for a course or subject (module) which describe all the learning experiences a learner undergoes, generally including objectives, content, intended learning outcomes, teaching methodology, recommended

or prescribed assessment tasks, assessment exemplars, etc.

Evidence guide: The part of a competency standard that provides a guide to the interpretation and assessment of the unit of competency, including the aspects which need to be emphasized in assessment, relationships to other units, and the required evidence of competency.

Flexible delivery: A range of approaches to providing education and training, giving trainees greater choice of when, where, and how they learn. Flexible delivery may involve distance education, mixed-mode delivery, online education, self-paced learning, self-directed learning, etc.

Formal education: Also formal training education or training provided in educational institutions such as schools, universities, colleges, etc., or off the job in a workplace, usually involving direction from a teacher or instructor.

General competencies: competencies correspond to larger operations that go beyond the tasks, but generally contribute to their implementation. These activities require more fundamental learning and are generally common to several tasks and transferable to many work situations.

Generic modules: Modules leading to the attainment of complementary competencies.

Informal education: The acquisition of knowledge and skills through experience, reading, social contact, etc.

Internship: An opportunity for a learner to integrate career-related experience by participating in planned, supervised work.

Key competencies: Any of several generic skills or competencies considered essential for people to participate effectively in the workforce. Key competencies apply to work generally, rather than being specific to work in a particular occupation or industry. The following are key areas of competency that were developed into seven key competencies: collecting, analyzing, and organizing information; communicating ideas and information; planning and organizing activities; working with others and in teams; using mathematical ideas and techniques; solving problems; and using technology.

Knowledge: means the result of the adoption of information through the learning process. Knowledge is a set of facts, principles, theories, and practices related to the area of work or study. In the CBE context lifelong learning knowledge is described as theoretical and/or factual.

Learning outcomes: are statements of what learner knows, understands and can perform, based on the completion of the learning process, defined by knowledge, skill, and competency.

Learning activities: Suggested activities that can be developed during lesson planning and activity preparation. The choice of learning activities must be tailored according to group size, available material resources and communication tools.

Learning hours: Amount of hours required to acquire the competency, including the time allocated to evaluation, which is estimated

between 5 and 10% of the total learning time of the competency.

Indicative content: Statements that indicate what trainees will know or be able to do as a result of a learning activity. Indicative content is usually expressed as knowledge, skills, or attitudes.

Element of competence: Any of the basic building blocks of a module, which describes the key activities or the elements of the work covered by the module

Module: A unit of training that corresponds to one competency and which can be completed on its own or linked to others.

Occupation: The principal business of one's life.

Performance criteria The part of a competency standard specifying the required level of performance in terms of a set of outcomes that need to be achieved in order to be deemed competent. It describes the quality requirements of the result obtained in labor performance.

Qualification: means the formal name for the result of a process of assessment and validation, which is obtained when a competent body determines that an individual has achieved learning outcomes to the standards laid down.

Quality assurance: The systems and procedures designed and implemented by an organization to ensure that its products and services are of a consistent standard and are being continuously improved.

Recognition of prior learning (or RPL): The acknowledgment of a person's skills and knowledge acquired through previous training,

work, or life experience, which may be used to grant status or credit in a subject or module.

Skills: are the ability to apply knowledge and use the principle of "know-how" to perform a specific task, and to solve a problem. In the context of the CBE Framework, skills are defined as cognitive (involving the use of logical, intuitive and creative thinking), practical (including physical skill and use of methods, materials, devices, and instruments), and social skills (communication and cooperation skills, emotional intelligence and other).

Specific competencies: Competencies that are directly related to the tasks of the occupation in the workplace context. They refer to concrete, practical, and focused aspects

Traineeship: A system of vocational training combining off-the-job training at an approved training provider with on-the-job training and practical work experience. Traineeships generally take one to two years and are now a part of the New Apprenticeships system.

Unit of competency: A component of a competency standard. A unit of competency is a statement of a key function or role in a particular job or occupation. See also element of competency, performance criteria, and range of variables.