



Republic of Rwanda
Ministry of Education



RQF Level

3

TVET CERTIFICATE III IN SOFTWARE DEVELOPMENT

ICTSWD3002

Kigali, June 2022

ICTSWD3002 - TVET CERTIFICATE III
IN
SOFTWARE DEVELOPMENT
RQF LEVEL 3 CURRICULUM

© Rwanda TVET Board, 2022

Copies available from:

Rwanda TVET Board (RTB)

Email: info@rtb.gov.rw

Web: www.rtb.gov.rw

P.O. Box: 4940 Kigali, Rwanda

Original published version updated:

June ,2022

Copyright

The Competent Development Body of this Curriculum is © Technical Vocational and Training Board (RTB). Reproduced with permission.

The following copyright warning applies to the material from the Training Package:

All rights reserved. This work has been produced initially with RTB. This work is copyright, but permission is given to trainers and teachers to make copies by photocopying or other duplicating processes for use with their own training organizations or in a workplace where the training is being conducted. This permission does not extend to the making of copies for use outside the immediate training environment for which they are made, or the making of copies for hire or resale to third parties. The views expressed in this version of the work do not necessarily represent the views of RTB. The competent Body does not give warranty nor accept any liability.

The RTB owns the copyright on all Curricula. Schools may reproduce this program in part or in full for bona fide study or classroom purposes only. Acknowledgement of the RTB copyright must be included on any reproductions. Learners may copy reasonable portions of the curriculum for the purpose of study. Any other use of this curriculum must be referred to the RTB.

© Technical Vocational and Training Board (RTB) 2022

Published by

Rwanda Technical Vocational Education and Training Board (RTB)

Email: info@rtb.gov.rw

Web: www.rtb.gov.rw

P.O. Box: 4940 Kigali, Rwanda

List of Abbreviations

CLI:	Command-Line Interface
CRUD:	Create Read Delete
ICT:	Information CommunicationTechnology
IDE:	Integrated development environment
IT:	Information Technology
NISR:	National Institute of Statistics of Rwanda
NPM:	Node Package Manager
NST1:	National Strategic Transformation 1
RQF:	Rwanda Qualification Framework
RTB:	Rwanda TVET Board
SASS:	Syntactically awesome style sheets
SDG:	Sustainable Development Goals
SEO:	Search Engine Optimization
SVG:	Scalable Vector Graphics
TQUM:	TVET Quality Management
TVET:	Technical Education and Vocational Training
UI:	User Interface
UX:	User Experience

Acknowledgments

Rwanda Technical Vocational and Training Board (RTB) wishes to extend its gratitude to the following partners, stakeholders and institutions involved in development of this programme including private sector, government institutions and other professionals.

Production team

Coordination

RWAMASIRABO Aimable, **Head of Curriculum and Instructional Materials Development Department, RTB**

Ramos Maria Bernadette., **Project Leader, TQUM**

Facilitation

MUTIJIMA Asher Emmanuel, **ICT & Multimedia Trades Specialist, RTB**

GANZA Jean Francois Regis , **TVET Curriculum Development Specialist, TQUM**

Co-Facilitation

KWIZERA INGABIRE Diane, **Curriculum Facilitator, GSNDP Cyanika**

NTIHINYURWA Jean Bosco, **Curriculum Facilitator, IPRC Gishari**

Curriculum Development Team

No	Names	Position	Organization
1	Dr. MBANZABUGABO Jean Baptiste	CEO	B SOLUTIONS HUB Ltd
2	DUSABIMANA Pacifique	TVET Trainer	GSNDP Cyanika
3	GAHAMANYI Cedric	Full Stack Developer	Motion CodeHouse Ltd
4	HABIMANA Jean de Dieu	Software Developer	OTAM Ltd
5	HARERIMANA Charles	TVET Trainer	College la lumiere Gashonga TVET
6	IYAMUREMYE Benjamin	Software Engineer	HAZATECH Ltd
7	KAGARAMA Gilles	CEO	Keetela Ltd
8	KAYUMBA Eric	CEO	Progress MIH Ltd.
9	MBONIMPA Jean Leonard	Software engineer	Fidalix
10	MUGABIYIMANA Elyse	Trainer	St KIZITO SAVE TVET SCHOOL

11	MUGABO Yves	Software Developer	ONTECH
12	MUGWANEZA Bruce	Web developer	InoventyK
13	MUKABIHINDI Allen	TVET Trainer	LYCEE DE MUHURA TVET
14	MUKUNZI Elysee	TVET Trainer	ESTG
15	MUSABIREMA Janvier	TVET Trainer	ESA BIRAMBO
16	MUTABONWA A. Happy	Software developer	RNJ Empire Ltd
17	NDACYAYISENGA Jean Damascene	TVET Trainer	ACEJ Karama TVET School
18	NDAYISABA Christophe	TVET Trainer	GIHEKE TVET
19	NIRINGIYIMANA Augustin	TVET Trainer	EAV GITWE
20	NIYITANGA Festus	TVET Trainer	COBANGA
21	NSENGIMANA David	CEO	GIGANTIC TECH
22	NSHIZIRUNGU Olivier	CEO	LOXOTECH LTD
23	NTIRANTA Jean Claude	TVET Trainer	SJITC Nyamirambo
24	NYIRANTEZIMANA Odette	TVET Trainer	APEKI TUMBA
25	NZISABIRA Jean Nepomscene	Core software developer	Qonics Inc
26	RUGARUZA Jean Claude	Instructional Technology Senior Engineer	Rwanda Polytechnic
27	SEBANANI Theoneste	Web Editor	NEXGEN PIXEL Ltd
28	SEKABANZA Jean de la Paix	TVET Trainer	GS BUMBA TVET
29	SHEMA Bertin	Web Editor	IBC Ltd
30	UFITAMAHORO Richard	MD	OTAM Ltd
31	UWAMUKIJIJE Donatien	TVET Trainer	APENA TVET School
32	UWIRAGIYE Jean Paul	Technical Service Officer	Deep Switch Ltd
33	UWIZERA Chantal	TVET Trainer	GSMK APACE
34	YONKURU Blaise	CTO	HHLinks LTD

Sponsor:

TVET Quality Management (TQUM) Project

FOREWORD

The global rapid changes in the labour market tends do 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 socio-economic transformation through TVET skills development. The Rwanda TVET Board (RTB) was established to promote quality education in technical and vocation education and training from level one (1) to five (5) aimed at fast tracking socio-economic development of the country. Designing and distributing curricula, teaching materials, trainer's guides, methodologies and establish training methods for technical and vocation education and training from level one (1) to five (5); is 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 level. In addition there were. Barriers in vertical mobility and pathways in TVET which resulted in negative TVET perception. Furthermore, the were barriers to 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 sector with the high employment potential like Software Development among others. In this respect, Rwanda TVET Board, is honoured to avail the curriculum of Software Development which serves as the official document and respond to the above mentioned concerns.

With the help of the training providers, trainers, parents whose role is central to the success of this curriculum, the trainees will gain appropriate hand on skills which 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 towards 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 Frontend Web Developer, Web Analyst, UI/UX Designer, UX Researcher and UX Writer. 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 the 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 on the basis of 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 amount 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 the learning outcomes (knowledge, skills and attitude) and the learning contents related to each learning unit. Also, the learning activities and resources for learning are suggested.

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

2. QUALIFICATION DETAILS

2.1. Description

Title:	TVET Certificate III in Software Development
Level:	RQF Level 3
Credits:	120
Sector:	ICT and MULTIMEDIA
Sub-sector:	Software Development
Issue date:	June, 2022

2.2 Graduate profile

This qualification provides the skills, knowledge and attitudes for a learner to be competent in tasks and activities that require the application of practical skills in a defined context. Work would be undertaken in various Software Development field/industry including Frontend Web Development, Web Analysis, UI/UX Design, UX Research and UX Writing. Learners may work with some autonomy or in a team but usually under regular supervision.

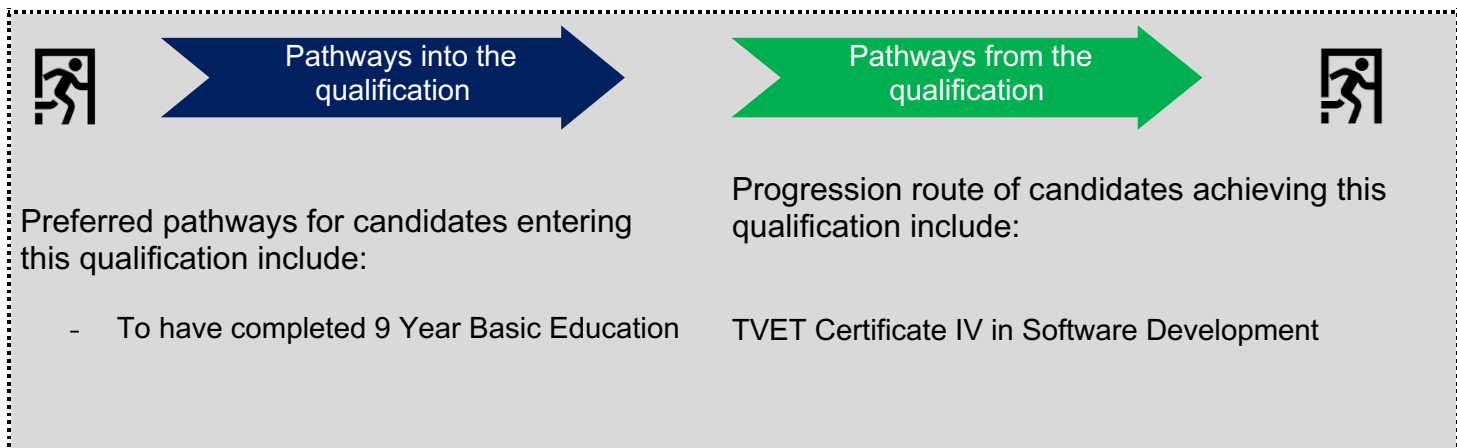
At the end of this qualification, qualified learners will be able to:

1. Apply basic graphics design
2. Develop website
3. Apply JavaScript
4. Conduct Version Control
5. Analyze project requirements
6. Design UI/UX
7. Develop game in Vue
8. Integrate at workplace
9. Describe occupation and learning process
10. Maintain SHE at workplace

11. Communicate simply using English in familiar situation
12. Apply computer literacy
13. Gukoresha Ikinyarwanda kiboneye
14. Apply general Physics
16. Apply citizenship
15. Apply fundamental Mathematics
16. Pratiquer les activités de communication en Français dans le metier
17. Create a business

2.3 Minimum entry requirements and pathways

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



2.4 Rationale of the Qualification

A Frontend Developer contributes to Rwanda’s digital transformation and Internet based services as stated in ICT Sector Strategic Plan (2018-2024), several achievements have been registered by the sector in areas related to ICT infrastructure, service development, business and investments, cyber security, global partnerships, among others.

Over the last decade and half, the Gross Domestic Product of the ICT sector in Rwanda has been growing at a median rate of 15.3% (NISR,2016). Internet **Penetration in** Rwanda is increasing steadily. For instance, internet penetration increased from 7% in 2011 to 39.76% mid 2017. While mobile increased from 639,673 to 9.7 million over the period 2010 -2017

In order to attain long term developmental goals of Rwanda and Africa, such as the Sustainable Development Goals (SDG), Rwanda’s Vision 2050 and African Union’s common goals under the Agenda 2063, it is essential to maximize the power of ICT as a true enabler of socio-economic development.

The ICT sector remains one of the primary targets to boost country’s economy, which will be achieved through:

- Positioning Rwanda as a world class and high end ICT hub
- Job creation that reduces the poverty
- Contribution to GDP growth
- Facilitation of cost-effective public and private services
- Impact of ICT-related capital investments on overall capital deepening
- Increase of labor productivity & significant contribution to value-added by ICT jobs
- Digital Literacy for all to promote integration of isolated communities into the national economy & Increase the access of larger markets coverage
- Developing the ICT industry and build the capacity of the private sector to provide high levels of service delivery.

2.5 Job related information

This qualification prepares individuals to integrate in all types of ICT companies from small to big, private to public that require ICT related services with the professionalization of Software Development and can even work for themselves.



Possible jobs related to this qualification:

- Frontend Web Developer
- UX Writer
- UI/UX Designer

2.6 Information about competencies

No	Code	Complementary competencies	Credit
1	CCMOL302	Describe occupation and learning process	3
2	CCMHE302	Maintain SHE at the workplace	3
3	CCMEN302	Communicate simply using English in familiar situation	3

4	CCMCL302	Apply computer literacy	3
5	CCMKN302	Gukoresha Ikinyarwanda kiboneye	3
6	CCMCZ301	Apply citizenship	3
7	CCMFT302	Pratiquer les activités de communication en Français dans le metier	3
8	CCMBC302	Create a business	3
Total			24

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

	No	Code	Core competencies	Credit
G E N E R A L	1.	GENGD301	Apply basic graphics design	8
	2	GENAM301	Apply Algebra and Trigonometry	6
	3	GENPY301	Apply general physics	4
S P E C I F I C	4	SWDWD301	Develop website	12
	5	SWDJF301	Apply JavaScript	10
	6	SWDVC301	Conduct Version Control	7
	7	SWDPR301	Analyse project requirements	5
	8	SWDUX301	Design UI/UX	10
	9	SWDVF301	Develop game in Vue	12
	10	CCMIA301	Integrate at workplace	20
Total			94	

Number of competencies:21
 Core competencies:94
 Complementary competencies:24
 The total number of Credits: 120

2.7 Allocation of Learning Hours

NO	Module name	Learning Outcome	Theoretical hours	Practical hours	Total hours
1	APPLIED PHYSICS	Describe basic measurements in physics	2	3	5
		Describe Motion in 1-Dimension	2	3	5
		Analyse motion in two Dimensions	2	3	5
		Demonstrate electrostatic phenomena	2	3	5
		Apply Geometric optics	3	7	10
		Characterize sources of energy in the world	3	7	10
Total hours module 1			14hours	26hours	40 hours
2	BASIC GRAPHIC DESIGN	Edit photos with Adobe Photoshop	8	17	25
		Manipulate graphics with adobe illustrator	12	28	40
		Export file	4	11	15
Total hours module 1			24hours	56hours	80 hours
3	JAVA SCRIPT FUNDAMENTALS	Apply javascript basic concepts	4	11	15
		Manupulate data with javascript	17	38	55
		Apply javascript in Project	9	21	30
Total hours module 2			30hours	70hours	100hours
4	WEBSITE DEVELOPMENT	Apply keyboard skills	4	11	15
		Create Website	17	38	55
		Style Web Element	15	35	50
Total hours module 3			36hours	84hours	120hours
5	VERSION CONTROL	Setup Repository	6	14	20
		Manupulate Files	6	14	20
		Ship Code	9	21	30
Total hours module 4			21hours	49hours	70hours

6	DESIGN UI/UX	Analyze user experience	4	11	15
		Define the user	4	11	15
		Design mockup	21	49	70
Total hours module 5			29hours	71hours	100hours
7	VUE .JS FRAMEWORK	Set up environment	6	14	20
		Apply Vue framework	9	21	30
		Plan game	7	18	25
		Develop game	13	32	45
Total hours module 6			35hours	85hours	120hours
8	ANALYZE PROJECT REQUIREMENTS	Identify customer needs	4	11	15
		Gather project requirements	4	11	15
		Determine user requirements	6	14	20
Total hours module 7			14hours	36hours	50hours
9	INDUSTRIAL ATTACHMENT PROGRAM (IAP)	Apply for internship	2	3	5
		Demonstrate workplace behaviour and attitudes	2	3	5
		Analyze own professional gaps in line with industry demands	3	7	10
		Enhance acquired competencies at the workplace	54	126	180
Total hours module 7			61hours	139hours	200hours
Total hours modules of core modules			227hours	633hours	860hours

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 learning outcomes for each learning unit. These learning outcomes are the essential skills and knowledge to be acquired. The contents to be covered for each learning outcome 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 an 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.

FLOWCHART

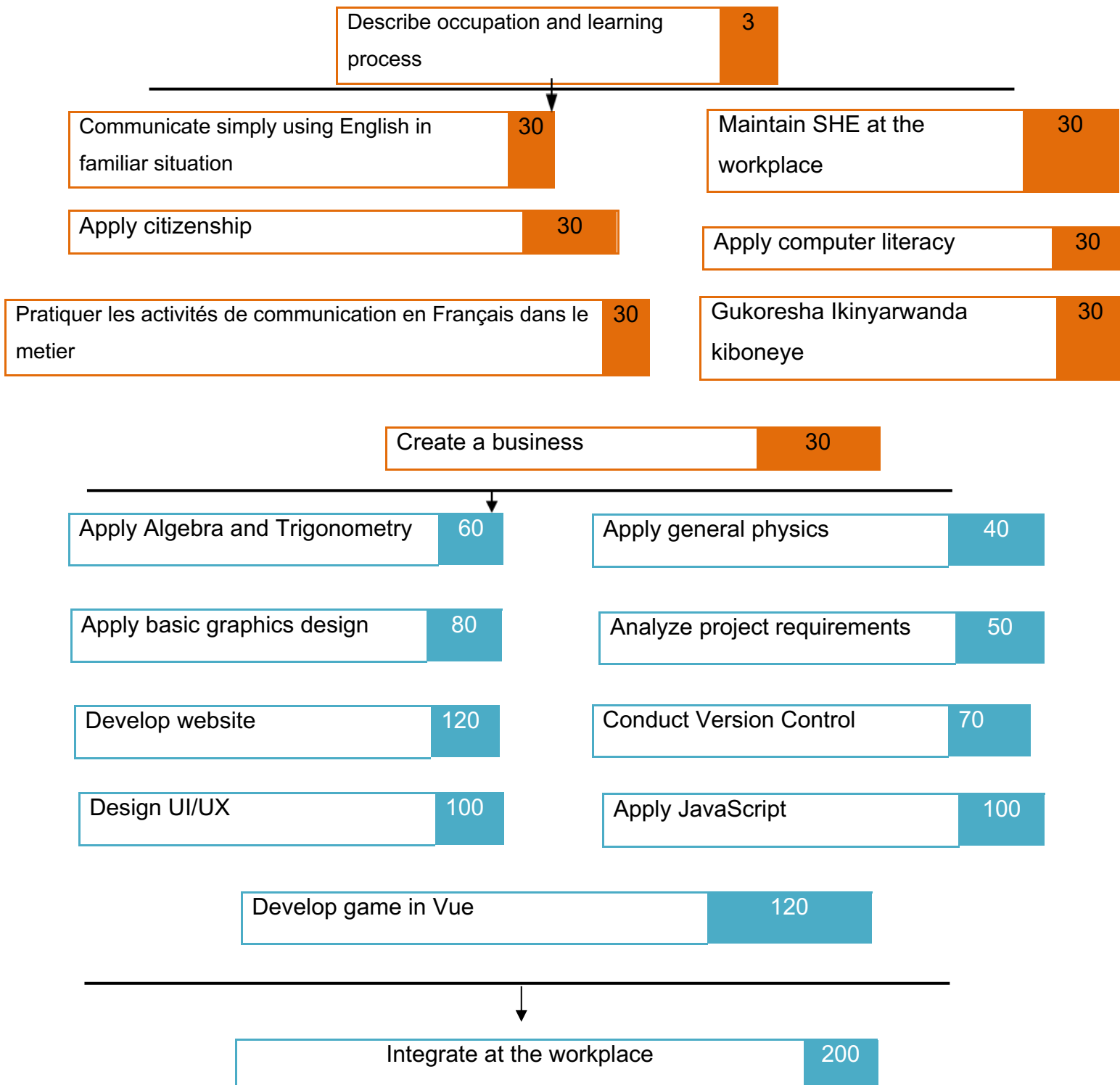


Figure 1: Flowchart

4. ASSESSMENT GUIDELINES

4.1 Assessment Methodology

To assess knowledge, practical, and application skills through a jury system of continuous evaluation that encourages learners to display understanding of the principles in application to set practical tasks and their attendant theory to assess self-learning.

There are two types of assessment (Formative Assessment and Summative/Integrated Assessment). Each assessment has its own rule for passing to be declared competent.

Formative Assessment

This is applied on all types of modules (e.g. Complementary, General and Specific modules)

A trainee to be competent for a formative module must have at least 70%

A trainee to be eligible to undertake integrated assessment of specific modules must have at least 50% as passing line for general and complementary modules.

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

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

Summative Assessment

All Summative/Integrated assessment should match with the content of the module in the curriculum.

Summative/Integrated Assessment is always in 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 to the circumstances inside school, but the integrated situation should stick on the components of a task.

During Summative/Integrated assessment, assessor 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 practical 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

Glossary

NodeJs: An open-source, cross-platform, back-end JavaScript runtime environment that runs on the V8 engine and executes JavaScript code outside a web browser, which was designed to build scalable network applications.

NPM: The package manager for the Node JavaScript platform. It puts modules in place so that node can find them, and manages dependency conflicts intelligently. It is extremely configurable to support a wide variety of use cases. Most commonly, it is used to publish, discover, install, and develop node programs.

Pinia: A lightweight state management library for Vue. js. It allows you to share a state across components/pages.

Redux: An open-source JavaScript library for managing and centralizing application state. It is most commonly used with libraries such as vue, React or Angular for building user interfaces.

User Journey: A path a user may take to reach their goal when using a particular website.

User Personas: A technique that supports designing and engineering interactive systems with focus on the end-users. The common understanding of the personas technique is that a persona is a description of a fictitious person based on data collected about the target user group.

User story: A tool in Agile software development used to capture a description of a software feature from a user's perspective. The user story describes the type of user, what they want and why. A user story helps to create a simplified description of a requirement.

Vue js: A JavaScript framework for building user interfaces. It builds on top of standard HTML, CSS and JavaScript, and provides a declarative and component-based programming model that helps you efficiently develop user interfaces, be it simple or complex.

Vuex: A state management pattern + library for Vue. js applications. It serves as a centralized store for all the components in an application, with rules ensuring that the state can only be mutated in a predictable fashion.