Republic of Rwanda
Ministry of Education

RTB | RWANDA TVET BOARD

# C PROGRAMMING FUNDAMENTALS

## GENCP302

## APPLY C PROGRAMMING FUNDAMENTALS

## Competence

**RQF Level:** 3

**Learning Hours** 80

**Credits:** 8

**Sector:** Technical Services

**Trade:** Electronics and Telecommunication

**Module Type:** General

**Curriculum:** TESELT3002-TVET Level 3 in Electronics and Telecommunication



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<table>
<tr><td>Purpose statement</td><td colspan="6">Electronics and Telecommunication domain is shifting from manual manipulated to more automated installations. To automate equipment, they need to make decisions depending on the inputs that they are reading. The control of these decisions is done through programming of their control parts. At the end of this module, trainees will be equipped with knowledge and skill to describe computer-programming languages, write a C program and run the programming.</td></tr>
<tr><td rowspan="7">Delivery modality</td><td colspan="2">Training delivery</td><td>100%</td><td colspan="2">Assessment</td><td>Total 100%</td></tr>
<tr><td colspan="2">Theoretical content</td><td>30%</td><td rowspan="4">Formative assessment</td><td>30%</td><td rowspan="4">50%</td></tr>
<tr><td colspan="2">Practical work:</td><td rowspan="3">70%</td><td rowspan="3">70%</td></tr>
<tr><td>● Group project and presentation</td><td>20%</td></tr>
<tr><td>● Individual project /Work</td><td>50%</td></tr>
<tr><td colspan="3"></td><td colspan="2">Summative Assessment</td><td>50%</td></tr>
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## Elements of Competency and Performance Criteria

| Elements of competency | Performance criteria |
|---|---|
| **1. Apply Computer programming Languages** | 1.1. Programming languages are properly identified considering their types and application |
| | 1.2. Algorithm is conveniently developed considering the problem to be solved |
| | 1.3. Flowchart is accurately developed based on the logic of question |
| **2. Write C Programming codes** | 2.1. C programming building blocks are properly described based on programming standards |
| | 2.2. C program structure is property described according to programming standards |
| | 2.3. Condition statements are effectively applied according to the logic of the problem to be solved. |
| | 2.4. Loops are effectively applied according to the logic of the problem to be solved. |
| | 2.5. Functions are effectively applied according to the logic of the problem to be solved. |
| | 2.6. Arrays are effectively applied according to the logic of the problem to be solved. |
| | 2.7. C problems are correctly solved by using C programming techniques |
| | 3.1. Different program errors are carefully identified according to the programming standards |

| | | |
|---|---|---|
| **3. Perform Program testing Debugging** | 3.2. | The program is systematically compiled in accordance with the program instructions. |
| | 3.3. | The program is tested and errors are completely corrected based on the program and programming instructions. |

# Course content

| | |
|---|---|
| **Learning outcomes** | **At the end of the module the learner will be able to:**<br>1. Describe computer programming Languages<br>2. Write C Programming codes<br>3. Perform Program Debugging |
| **Learning outcome 1: Describe Computer programming Languages** | **Learning hours: 20** |

**Indicative content**

- **Identification of programming Language**
  - ✓ Types of programming languages
  - ✓ Role of programming languages in electronics and telecommunication
  - ✓ Types of C programming IDE
  - ✓ Setting up C programming environment
- **Development of a flowchart**
  - ✓ Flowchart symbols
  - ✓ Steps of developing a flowchart
- **Development of an algorithm**
  - ✓ Types of algorithm
  - ✓ Steps of developing an algorithm

**Resources required for the learning outcome**

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|---|---|
| **Equipment** | Computers, Projector, Projection screen, Printers |

| | |
|---|---|
| **Materials** | Chalks, Pens, Books, Papers, Flip-chart |
| **Tools** | Internet access, C programming IDE |
| **Facilitation techniques and learning activities** | • Demonstration and simulation<br>• Individual and group work<br>• Practical exercise<br>• Individualized<br>• Trainer guided<br>• Group discussion |
| **Formative assessment methods** | • Written assessment<br>• Oral presentation<br>• Performance assessment |

| **Learning outcome 2: Write C Programming codes** | **Learning hours: 50** |
|---|---|
| **Indicative content** | |

- **Description of C programming building blocks**
  - ✓ Tokens in C
  - ✓ Data types
  - ✓ Variables
  - ✓ Constants
  - ✓ Operators
- **Description of C program structure**
  - ✓ Preprocessor Commands
  - ✓ Functions
  - ✓ Variables
  - ✓ Statements & Expressions
  - ✓ Comments
- **Application of condition statements**
  - ✓ If

- ✓ Else if
- ✓ Switch statement
- ✓ Nested conditions

- **Application of loops**
  - ✓ For
  - ✓ While
  - ✓ Do while
  - ✓ Nested loops
- **Application of functions**
  - ✓ Types of function
  - ✓ Defining a Function
  - ✓ Function Declarations
  - ✓ Calling a Function
  - ✓ Function Arguments
- **Application of Arrays**
  - ✓ Types of arrays
  - ✓ Declaring Arrays
  - ✓ Initializing Arrays
  - ✓ Initializing Arrays
- **Solving a c programming problem**
  - ✓ Draw the problem flowchart
  - ✓ Design the algorithm to solve the problem
  - ✓ Write the C program to solve the problem
  - ✓ Program documentation

| Resources required for the indicative content | |
|---|---|
| **Equipment** | Computers, Projector, Projection screen, Printers |
| **Materials** | Chalks, Pens, Books, Papers, Flip-chart |

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|---|---|
| **Tools** | Internet access, C programming IDE |
| **Facilitation techniques** | • Demonstration and simulation<br>• Individual and group work<br>• Individualized<br>• Trainer guided<br>• Group discussion |
| **Formative assessment methods** | • Written assessment<br>• Oral presentation<br>• Performance assessment<br>• Product based assessment<br>• Project based assessment |

| **Learning outcome 3: Perform Program Debugging** | **Learning hours: 10** |
|---|---|
| **Indicative content** | |
| • **Identification of errors**<br>✓ Types of errors<br>✓ Techniques of correcting errors<br>• **Compilation of the C program**<br>✓ Types of compilers<br>✓ Compilation techniques<br>• **Test of the C program**<br>✓ Design of effective test cases<br>✓ Debugging techniques | |
| **Resources required for the indicative content** | |
| **Equipment** | Computers, Projector, Projection screen, Printers |
| **Materials** | Chalks, Pens, Books, Papers, Flip-chart |

| | |
|---|---|
| **Tools** | Internet access, C programming IDE |
| **Facilitation techniques** | ● Demonstration and simulation<br>● Individual and group work<br>● Individualized<br>● Trainer guided<br>● Group discussion |
| **Formative assessment methods** | ● Written assessment<br>● Oral presentation<br>● Performance assessment<br>● Product based assessment<br>● Project based assessment |

## References:


1. Stephen, Kochan.G (2005). A complete introduction to the C programming language.3rd ed. Indianapolis, Indiana 46240 : Cindy Teeters
2. www.javatpoint.com. 2022. *Learn C Programming Language Tutorial - javatpoint*. [online] Available at: <https://www.javatpoint.com/c-programming-language-tutorial> [Accessed 30 March 2022].
3. W3schools.in. 2022. *C Tutorial - Learn C Programming*. [online] Available at: <https://www.w3schools.in/c-tutorial/> [Accessed 30 March 2022].
4. Smartdraw.com. 2022. Flowchart Symbols. [online] Available at: <https://www.smartdraw.com/flowchart/flowchart-symbols.htm> [Accessed 30 March 2022].
5. Algorithms, T., 2022. Types of Algorithms | Learn The Top 6 Important Types of Algorithms. [online] EDUCBA. Available at: <https://www.educba.com/types-of-algorithms/> [Accessed 30 March 2022].