REPUBLIC OF KENYA

COMPETENCY BASED MODULAR CURRICULUM

FOR

COMPUTER SCIENCE

KNQF LEVEL 6

(CYCLE 3)

PROGRAMME ISCED CODE: 0613 554 A.

TVET CDACC
P.O. BOX 15745-00100
NAIROBI

ALGORITHMS AND DATA STRUCTURES

ISCED UNIT CODE: 0613 554 09A

UNIT CODE: ICT/CU/CS/CR/09/6/MA

Relationship to Occupational Standards

This unit addresses the unit of competency: Create Algorithms and Data Structures

Duration of Unit: 190 hours

Unit Description

This unit covers the competencies required to understand algorithms and data structure. It involves Understand fundamental principles of algorithms understanding fundamental concepts of data structures, linked lists, stacks and queues, search techniques and sorting techniques

Summary of Learning Outcomes

Learning Outcomes	Duration (Hours)
1. Fundamental principles of algorithms	30
2. Fundamental concepts of data structures	30
3. Linked lists	40
4. Stacks and Queues	30
5. Search Techniques	25
6. Sorting Techniques	35
TOTAL	**190**

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Method
1. Fundamental principles of algorithms	1.1 Algorithm priciples 1.2 Characteristics of an Algorithm 1.3 Principles of algorithm writing 1.4 Algorithm Analysis 1.5 Complexities of algorithms 1.5.1 Space 1.5.2 Time 1.6 Greedy algorithms are outlined 1.6.1 Counting coins 1.7 Divide and conquer algorithms 1.7.1 Divide /break 1.7.2 Conquer/solve 1.7.3 Merge/combine	• Written tests • Oral tests • Practical tests
2. Fundamental concepts of data structures	2.1 Key concepts in data structures 2.1.1 Data 2.1.2 Object 2.1.3 Data type 2.2 Explanation of Arrays 2.3 Array insertion operations 2.3.1 At the beginning 2.3.2 At the given index 2.3.3 After the given index 2.3.4 Before the given index 2.4 Array delete, search and update 2.5 Demonstration of array operations	• Written tests • Oral tests • Practical tests
3. Linked lists	3.1 Linked lists 3.1.1 Linked lists representation 3.1.2 Types of linked lists 3.2 Doubly linked lists	• Written tests • Oral tests • Practical tests

	3.2.1 Representation 3.2.2 Basic operations 3.3 Circular linked lists 3.3.1 Representation 3.3.2 Basic operations 3.4 Demonstration of basic operations for the various linked lists using C++ 3.4.1 Insertion 3.4.2 Deletion 3.4.3 Reverse 3.4.4 Display	
4. Stacks and Queues	4.1 Definition of Stacks 4.2 Representation of stacks 4.3 Basic operations 4.3.1 Pop 4.3.2 Push 4.4 Definition of queues 4.5 Representation of queues 4.6 Basic operations 4.6.1 Enqueue 4.6.2 Dequeue 4.7 Demonstration of stack and queues using C++	• Written tests • Oral tests • Practical tests
5. Search Techniques	5.1 Definition of search 5.2 Explanation of Linear Search 5.3 Explanation of Binary Search 5.4 Demonstration of linear search and binary search using C++	• Written tests • Oral tests • Practical tests
6. Sorting Techniques	6.1 Definition of Sorting 6.2 Categories of sorting 6.2.1 Stable and not stable sorting	• Written tests • Oral tests • Practical tests

	6.2.2 Adaptive and Non-Adaptive Sorting Algorithm 6.2.3 In place and not in place 6.3 Types of Sorting algorithms 6.3.1 Bubble sort 6.3.2 Insertion sort 6.3.3 Selection sort 6.4 Demonstration of sorting algorithms using C++	

Suggested Methods of Instruction

- Presentations by trainer;
- Guided learner activities and research to develop underpinning knowledge;
- Supervised practical assignments
- Visiting expert from the ICT sector;
- Industrial visits

Recommended Resources for 25 Trainees

S/No.	Category	Item Description / Specifications	Quantity	Trainee:Item Ratio
1	**Learning Materials**	Textbooks and handouts on algorithms, data structures, and C++ syntax	25	1:1
		Algorithm analysis cheat sheets and complexity tables	25 Sets	1:1
		Access to online platforms	25 Logins	1:1
2	**Learning Facilities**	Computer lab/classroom with 25 workstations, whiteboard, projector	1 Room	Shared
3	**Infrastructure**	Stable internet connection	1 Setup	Shared

4	**Tools & Equipment**	Laptops/desktops	25	1:1
		Code editors (Code::Blocks, Visual Studio Code with C++ extension)	25 Installs	1:1
		Online compilers	25 Logins	1:1
		Git & GitHub for version control and practice	25 Accounts	1:1
5	**Consumable Materials**	Printed exercises, pens, notebooks	25 Sets	1:1
		Flash drives or shared cloud storage (Google Drive, OneDrive, etc.)	10	1:2.5
6	**Support & Safety**	Antivirus software, surge protectors, basic electrical safety equipment	5 Kits	1:5