

MODULE II

Unit Category	Unit Code	TVET CDACC CODE	Unit Name	Unit Duration (Hours)
COMMON	0541 451 04A		DISCRETE MATHEMATICAL CONCEPTS	160
CORE	0611 451 08A		APPLICATION END-USER SUPPORT	150
			TOTAL	310

DISCRETE MATHEMATICAL CONCEPTS

ISCED UNIT CODE: 0541 451 04A

TVET CDACC UNIT CODE: ICT/CU/SD/CC/03/5/MA

Relationship to Occupational Standards

This unit addresses the Unit of Competency: Apply Discrete Mathematical Concepts

Duration of Unit: 160 Hours

Unit Description

This unit covers the competence to apply discrete mathematical concepts. It involves carrying out set theory operations, performing matrix operations, applying number systems, applying logic gates, performing sequence and series operations, and demonstrating graph theory.

Summary of Learning Outcomes

Learning Outcomes	Duration (Hours)
1. Carry out set theory operations	32
2. Perform matrix operations	26
3. Apply number system	26
4. Apply logic gates	30
5. Perform sequence and series operations	20
6. Demonstrate graph theory	26
TOTAL	160

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Carry out set theory operations	1.1. Identify sets Characteristics 1.1.1. Definition 1.1.2. Order and Uniqueness 1.2. Methods of set representation 1.2.1. Roster Form 1.2.2. Set Builder Form 1.3. Cardinality of a set. 1.3.1. Finite 1.3.2. Infinite 1.4. Types of sets 1.4.1. Finite set 1.4.2. Infinite set 1.4.3. Empty set 1.4.4. Subset 1.4.5. Universal set 1.5. Venn Diagrams 1.5.1. Drawing Venn diagrams 1.6. Set Operations 1.6.1. Union 1.6.2. Intersection 1.6.3. Difference 1.6.4. Complement	• Practical Activities • Project work • Demonstration • Group Work • Observation • Portfolio of Evidence • Written tests
2. Perform matrix operations	2.1. Applying Matrix order 2.1.1. Dimension of matrix 2.1.2. Types of Matrices 2.1.2.1. Row matrix 2.1.2.2. Column matrix 2.1.2.3. Square matrix 2.1.2.4. Zero matrix 2.2. Matrix operations 2.2.1. Addition 2.2.2. Multiplication 2.2.3. Subtraction 2.3. Transpose of a matrix 2.3.1. Swapping rows and	• Practical Activities • Project work • Demonstration • Group Work • Observation • Third Party report • Portfolio of Evidence • Written tests

		columns 2.4. Transpose operations 2.4.1. Transpose 2.4.2. Sum 2.4.3. Product 2.5. Adjoint of a square matrix identification 2.6. Inverse of a square matrix identification. 2.6.1. Trace of a matrix application 2.6.2. Application of matrices 2.6.3. Computer Graphics 2.6.4. Statistics 2.6.5. Systems of Linear Equations	
3. Apply Systems	number	3.1. Number systems 3.1.1. Definition of terms 3.1.2. Absolute values 3.1.3. Place values 3.1.4. Types of number systems 3.1.4.1. Decimal 3.1.4.2. Binary 3.1.4.3. Octal 3.1.4.4. Hexadecimal 3.2. Base conversion 3.2.1. Decimal to Other number system 3.2.2. Other number systems to decimal 3.2.3. Binary to other number systems 3.2.4. Other number systems to binary 3.3. Number systems arithmetic operations 3.3.1. Binary arithmetic 3.3.1.1. Addition, subtraction, multiplication and division	• Practical Activities • Project work • Demonstration • Group Work • Observation • Third Party report • Portfolio of Evidence • Written tests

	3.3.1.2. Ones and Twos complement 3.3.2. Octal arithmetic 3.3.2.1. Addition and subtraction 3.3.3. Hexadecimal arithmetic 3.3.3.1. Addition and subtraction 3.4. Binary codes 3.4.1. Binary coded decimal (BCD) 3.4.1.1. BCD operations 3.4.1.2. Addition and subtraction 3.4.2. ASCII 3.4.3. Gray Code 3.4.4. Excess-3	
4. Apply logic gates	4.1. Types of Logic gates 4.1.1. AND 4.1.2. OR 4.1.3. NOT 4.1.4. NAND 4.1.5. NOR 4.1.6. XOR 4.1.7. XNOR 4.2. Logic expressions 4.2.1. Logic circuit diagrams 4.2.2. Truth tables 4.3. Simplifying logic expressions 4.3.1. De-Morgan's theorems 4.3.2. Laws of Boolean algebra 4.3.2.1. Commutative 4.3.2.2. Associative 4.3.2.3. Distributive and more 4.3.2.4. Identity laws 4.3.2.5. Null laws 4.3.2.6. Complement laws 4.3.2.7. Commutative laws 4.3.3. Boolean expressions	• Practical Activities • Project work • Demonstration • Group Work • Observation • Third Party report • Portfolio of Evidence • Written tests

	simplification. 4.3.4. Application of Boolean Algebra. 4.3.5. Application of Karnaugh's Maps	
5. Perform sequence and series operations	5.1. Key terms of sequences. 5.1.1. Term 5.1.2. Index 5.1.3. General term (nth term) 5.1.4. Finite sequence 5.1.5. Infinite sequence 5.2. Summation of a sequence. 5.2.1. Arithmetic sum 5.3. Arithmetic series 5.3.1. General form of an arithmetic sequence 5.3.2. Sum of the first n terms 5.4. Geometric series 5.4.1. General form of a geometric sequence	• Practical Activities • Project work • Demonstration • Group Work • Observation • Third Party report • Portfolio of Evidence • Written tests
6. Demonstrate graph theory	6.1. Key Graph terminologies 6.1.1. Node 6.1.2. Edge 6.1.3. Vertex 6.1.4. Adjacent 6.2. Types of graphs 6.2.1. Null 6.2.2. Simple 6.2.3. Multigraph 6.2.4. Directed graphs 6.2.5. Undirected graphs 6.3. Representation of graphs 6.3.1. Adjacency Matrix 6.3.2. Adjacency List 6.3.3. Incidence Matrix 6.4. Application of graphs 6.4.1. Computer Networks 6.4.2. Social Networks 6.4.3. Transport Networks	• Practical Activities • Project work • Demonstration • Group Work • Observation • Third Party report • Portfolio of Evidence • Written tests

	6.4.4. Scheduling and Task Management	
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Suggested Delivery Methods

- Instructor led facilitation using active learning strategies
- Demonstration by trainer
- Practical work by trainees
- Viewing of related videos
- Field Visits
- Group Work
- Role plays
- Group projects

Recommended Resources for 25 Trainees

S/No.	Category/Item	Description/ Specifications	Quantity	Recommended Ratio (Item: Trainee)
A	Learning Materials			
1.	Internet connection	✓ 5mbps	1	1:1
2.	Flip charts	A1	1	1:25
3.	Discrete Mathematics Textbooks	For reference	3	3:25
B	Learning Facilities & infrastructure			
4.	Theory Room	furnished with 25 Arm-chairs and a suitable trainer's table	1	1:25
C	Consumable materials			
5.	Printing papers	A4	5 Reams	1:25
6.	White board markers	Assorted colors	20	4:5
D	Tools and Equipment			
7.	External storage media	HDD / SSD / Flash	1	1:25
8.	Printer	Working printer	2	1:12

9.	1 Smart-board / Smart TV / Projector (with screen)	Where available	1	1:25
10.	Whiteboard/Chalkboard	4 X 8 Feet	1	1:25

APPLICATION END-USER SUPPORT

ISCED UNIT CODE: 0611 451 08A

TVET CDACC UNIT CODE: ICT/CU/SD/CR/03/5/MA

Relationship to Occupational Standards

This unit addresses the Unit of Competency: Offer Application End-User Support

Duration of Unit: 150 Hours

Unit Description

This unit covers the competencies required to offer Application End-user support. It involves developing application technical documents, performing application user training, gathering user feedback and performing application maintenance.

Summary of Learning Outcomes

Learning Outcomes	Duration (Hours)
1. To develop application technical documents	32
2. To perform application user training	42
3. To gather user feedback	33
4. To perform application maintenance	43
TOTAL	150

Learning Outcome	Content	Suggested Assessment Methods
1. Develop application technical documents	1.1 Identify types of application technical Documents 1.2 Prepare application technical documents 1.2.1 Contents / format & importance of each 1.2.2 Software requirement specification 1.2.3 Technical design documents 1.2.4 User interface design document 1.2.5 Database design document 1.2.6 Test plan and test case 1.2.7 Installation and deployment guide 1.2.8 User manual or user guide 1.2.9 API documentation 1.3 Validation of application technical documents	● Written tests ● Practical Activities ● Project work ● Third Party report ● Portfolio of Evidence
2. Perform application user training	2.1 Training needs assessment 2.1.1 Definition of TNA 2.1.2 Reasons for carrying out TNA 2.1.3 End User Training 2.1.4 Importance of end user training 2.1.5 User & customer training methods 2.1.5.1 Classroom mode / face-to-	● Practical Activities ● Project work ● Demonstration ● Group Work ● Role Plays ● Observation ● Third Party report ● Portfolio of Evidence

	face training 2.1.5.2 Automated online (virtual / Simulation) training 2.1.5.3 Self-paced learning modules 2.1.5.4 On-the-Job / On-Site training 2.2 Prepare end user training resources 2.2.1 Tutorials 2.2.2 Frequently asked questions 2.2.3 Demo videos 2.2.4 User manuals 2.2.5 Charts, Help windows, Videos 2.3 Prepare user training schedule 2.4 Practices when conducting user training	● Written tests
3. Gather user feedback	3.1 Method of gathering user feedback 3.1.1 Surveys 3.1.2 Form builders 3.1.3 Questionnaires 3.1.4 Observation 3.2 Preparation of Data collection tools 3.2.1 Surveys 3.2.2 Form builders 3.2.3 Questionnaires 3.2.4 Observation 3.3 Collection of User Feedback 3.3.1 Surveys 3.3.2 Feedback forms 3.3.3 Social media monitoring	☐ Practical Activities ☐ Project work ☐ Demonstration ☐ Group Work ☐ Role Plays ☐ Observation ☐ Third Party report ☐ Portfolio of Evidence ☐ Written tests

	3.3.4 Beta tests 3.3.5 User analytics 3.4 Customer feedback analysis 3.4.1 What it is 3.4.2 Why it's important 3.4.3 Feedback analysis methods	
4. Perform application maintenance	4.1 Carrying out technical assistance 4.1.1 Customer relation practices 4.2 Monitoring & reporting on application Performance 4.3 Performing application optimization 4.4 Performing security Application updates 4.4.1 Security update 4.4.2 System updates 4.5 Perform routine system maintenance 4.6 Performing system updates	● Practical Activities ● Project work ● Demonstration ● Group Work ● Role Plays ● Observation ● Third Party report ● Portfolio of Evidence ● Written tests

Suggested Delivery Methods

- Instructor led facilitation using active learning strategies
- Demonstration by trainer
- Practical work by trainees
- Role plays
- Project work by trainees
- Group Work
- Group projects

Recommended Resources for 25 Trainees

S/No.	Category/Item	Description/ Specifications	Quantity	Recommended Ratio (Item: Trainee)
A	Learning Materials			
1.	Internet connection	For each computer	1	1:1
2.	Flip charts	A1	1	1:25
3.	Textbooks	For reference	3	3:25
B	Learning Facilities & infrastructure			
4.	Computer Laboratory	To accommodate 25 Learners	1	1:25
5.	Theory Room	furnished with 25 Arm-chairs and a suitable trainer's table	1	1:25
C	Consumable materials			
6.	Printing papers	A4	2 Reams	1:12
7.	Toner / Ink bottles	For printers	2 pcs	1:12
8.	White board markers	Assorted colors	20	4:5
D	Tools and Equipment			
9.	Computers	Genuine Windows/Linux Genuine Microsoft office Software Google Workspace Account Antivirus Software Suitable IDE	25	1:1
10.	External storage media	HDD / SSD / Flash	1	1:25
11.	Printer	Working printer	2	1:12
12.	1 Smart-board / Smart TV / Projector (with screen)	Where available	1	1:25
13.	Whiteboard/Chalkboard	4 X 8 Feet	1	1:25