

**REPUBLIC OF KENYA**

**NATIONAL OCCUPATIONAL STANDARDS**

 **FOR**

**GIS TECHNOLOGIST LEVEL 4**



TVET CDACC

P.O. BOX 15745-00100

NAIROBI

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# FOREWORD

The provision of quality education and training is fundamental to the Government’s overall strategy for social economic development. Quality education and training will contribute to achievement Kenya’s development blue print and sustainable development goals.

Reforms in the education sector are necessary for the achievement of Kenya Vision 2030 and meeting the provisions of the Constitution of Kenya 2010. The education sector had to be aligned to the Constitution and this resulted to the formulation of the Policy Framework for Reforming Education and Training. A key feature of this policy is the radical change in the design and delivery of the TVET training. This policy document requires that training in TVET be competency based, curriculum development be industry led, certification be based on demonstration of competence and mode of delivery allows for multiple entry and exit in TVET programmes.

These reforms demand that Industry takes a leading role in curriculum development to ensure the curriculum addresses its competence needs. It is against this background that these Occupational Standards were developed for the purpose of developing a competency-based curriculum for GIS Technologist Level 4. These Occupational Standards will also be the bases for assessment of an individual for competence certification.

It is my conviction that these Occupational Standards will play a great role towards development of competent human resource for the ICT sector’s growth and sustainable development.

**PRINCIPAL SECRETARY, VOCATIONAL AND TECHNICAL TRAINING**

**MINISTRY OF EDUCATION**

# PREFACE

Kenya Vision 2030 aims to transform the country into a newly industrializing, “middle-income country providing a high-quality life to all its citizens by the year 2030”. Kenya intends to create a globally competitive and adaptive human resource base to meet the requirements of a rapidly industrializing economy through life-long education and training. TVET has a responsibility of facilitating the process of inculcating knowledge, skills and attitudes necessary for catapulting the nation to a globally competitive country, hence the paradigm shift to embrace Competency Based Education and Training (CBET).

The Technical and Vocational Education and Training Act No. 29 of 2013 on Reforming Education and Training in Kenya, emphasized the need to reform curriculum development, assessment and certification. This called for shift to CBET to address the mismatch between skills acquired through training and skills needed by industry as well as increase the global competitiveness of Kenyan labour force.

The TVET Curriculum Development, Assessment and Certification Council (TVET CDACC), in conjunction with ICT Sector Skills Advisory Committee (SSAC), have developed these Occupational Standards for GIS Technologist. These occupational standards will be the bases for development of competency-based curriculum for GIS Technologist Level 4. These standards will also be the bases for assessment of an individual for competence certification.

The occupational standards are designed and organized with clear performance criteria for each element of a unit of competency. These standards also outline the required knowledge and skills as well as evidence guide.

I am grateful to the Council Members, Council Secretariat, ICT SSAC, expert workers and all those who participated in the development of these occupational standards.

**Prof. CHARLES M. M. ONDIEKI, PhD, FIET (K), Con. Eng. Tech.**

**CHAIRMAN, TVET CDACC**

# ACKNOWLEDGMENT

These Occupational Standards were developed through combined effort of various stakeholders from private and public organizations. I am sincerely thankful to the management of these organizations for allowing their staff to participate in this course. I wish to acknowledge the invaluable contribution of industry players who provided inputs towards the development of these Standards.

I thank TVET Curriculum Development, Assessment and Certification Council (TVET CDACC) for providing guidance on the development of these Standards. My gratitude goes to the ICT Sector Skills Advisory Committee (SSAC) members for their contribution to the development of these Standards. I thank all the individuals and organizations who participated in the validation of these Standards.

I acknowledge all other institutions which in one way or another contributed to the development of these Standards.

**CHAIRMAN**

**ICT SECTOR SKILLS ADVISORY COMMITTEE**

# ACRONYMS

BC : Basic Competency

CDACC : Curriculum Development, Assessment and Certification Council

CR : Core Competency

CSV : Comma Separated Value

GIS : Geographic Information System

GPS : Global Positioning System

ICT : Information Communication Technology

KML : Keyhole Markup Language

KNQA : Kenya National Qualifications Authority

OS : Occupational Standards

OSHA : Occupation Safety and Health Act

OSHS : Occupation Safety and Health Standards

PPE : Personal Protective Equipment

RDBMS : Relational Database Management System

RS : Remote Sensing

SSAC : Sector Skills Advisory Committee

TVET : Technical and Vocational Education and Training

# KEY TO UNIT CODE

 IT/OS/GIS/BC/01/4/A

Industry or sector

Occupational Standards

Occupational area

Type of competency

Competency number

Competency level

Version Control

#

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# OVERVIEW

**GIS Technologist level 4** consists of competencies that an individual must achieve to be competent. It entails; rrecognizing foundations of Geographical Information Systems,

Using and managing GIS data, visualizing GIS data using maps, performing GIS data analytics, analyzing terrains and images and applying GIS standards and compliance areas. This qualification consists of the following basic and core competencies:

**BASIC COMPETENCIES**

|  |  |
| --- | --- |
| **Unit of learning code** | **Unit of learning title** |
| IT/OS/GIS/BC/01/4/A | Demonstrate communication skills |
| IT/OS/GIS/BC/02/4/A | Demonstrate numeracy skills |
| IT/OS/GIS/BC/03/4/A | Demonstrate digital literacy |
| IT/OS/GIS/BC/04/4/A | Demonstrate entrepreneurial skills |
| IT/OS/GIS/BC/05/4/A | Demonstrate employability skills |
| IT/OS/GIS/BC/06/4/A | Demonstrate environmental literacy |
| IT/OS/GIS/BC/07/4/A | Demonstrate occupational safety and health practices |

**CORE COMPETENCIES**

|  |  |
| --- | --- |
| **Unit code** | **Unit title** |
| IT/OS/GIS/CC/01/4/A | Recognize foundations of Geographical Information Systems  |
| IT/OS/GIS/CC/02/4/A | Use and manage GIS data |
| IT/OS/GIS/CC/03/4/A | Visualize GIS data using maps |
| IT/OS/GIS/CC/04/4/A | Perform GIS Data Analytics |
| IT/OS/GIS/CC/05/4/A | Analyze Terrains and Images |
| IT/OS/GIS/CC/06/4/A | Apply GIS standards and compliance areas |

# BASIC UNITS OF COMPETENCY

## DEMONSTRATE COMMUNICATION SKILLS

**UNIT CODE:** IT/OS/GIS/BC/01/4/A

**UNIT DESCRIPTION**

This unit covers the competencies required to gather, interpret and convey information in response to workplace requirements and to lead in the dissemination and discussion of ideas, information and issues in the workplace.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT** These describe the key outcomes which make up workplace function | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***Bold and italicized terms are elaborated in the Range*** |
| 1. Obtain and convey workplace information
 | * 1. Specific and relevant information is accessed from ***appropriate sources***
	2. Effective questioning, active listening and speaking skills are used to gather and convey information
	3. Appropriate ***medium*** is used to transfer information and ideas
	4. Appropriate non- verbal communication is used
	5. Appropriate lines of communication with supervisors and colleagues are identified and followed
	6. Defined workplace procedures for the location and ***storage*** of information are used
	7. Personal interaction is carried out clearly and concisely
 |
| 1. Complete relevant work-related documents
 | * 1. Range of forms relating to conditions of employment are completed accurately and legibly
	2. Workplace data is recorded on standard workplace forms and documents
	3. Basic mathematical processes are used for routine calculations
	4. Errors in recording information on forms/ documents are identified and properly acted upon
	5. Reporting requirements to supervisor are completed according to organizational guidelines
 |
| 1. Communicate information about workplace processes
 | 1. Appropriate method of communication is selected

 1. Multiple operations involving several topics areas are communicated accordingly
2. Questions are used to gain extra information
3. Correct sources of information are identified
4. Information is selected and organized correctly
5. Verbal and written reporting is undertaken when required
6. Communication skills are maintained in all situations
 |
| 1. Lead workplace discussion
 | 1. Response to workplace issues are sought
2. Response to workplace issues are provided immediately
3. Constructive contributions are made to workplace discussions on such issues as production, quality and safety
4. Goals/objectives and action plan undertaken in the workplace are communicated accordingly
 |
| 1. Identify and communicate issues arising in the workplace
 | 1. Issues and problems are identified as they arise
2. Information regarding problems and issues are organized coherently to ensure clear and effective communication
3. Dialogue is initiated with appropriate personnel
4. Communication problems and issues are raised as they arise
 |

**RANGE**

This section provides work environment and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. ***Methods of communication*** include but not limited to:
 | 1.1. Non-verbal gestures 1.2. Verbal 1.3. Face to face 1.4. Two-way radio1.5. Speaking to groups 1.6. Using telephone 1.7. Written 1.8. Internet |
| 1. ***Workplace discussion*** include but not limited to:
 | 2.1. Coordination meetings 2.2. Toolbox discussion 2.3. Peer-to-peer discussion |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Organize information
* Understand and convey intended meaning
* Participate in variety of workplace discussions
* Comply with organization requirements for the use of written and electronic communication methods
* Effective report writing
* Effective clarifying and probing skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Organization requirements for written and electronic communication methods
* Effective verbal communication methods
* Report writing
* Effective questioning techniques (clarifying and probing)
* Workplace etiquette

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of Competency
 | Assessment requires evidence that the candidate: 1.1 Dealt with a range of communication/information at one time 1.2 Made constructive contributions in workplace issues 1.3 Sought workplace issues effectively 1.4 Responded to workplace issues promptly 1.5 Presented information clearly and effectively in written form 1.6 Used appropriate sources of information 1.7 Asked appropriate questions 1.8 Provided accurate information |
| 1. Resource Implications
 | The following resources should be provided: 2.1 Variety of Information 2.2 Communication tools 2.3 Simulated workplace |
| 1. Methods of Assessment
 | 3.1 Case Study 3.2 Third-party reports3.3 Portfolio 3.4 Interview 3.5 Role Play |
| 1. Context of Assessment
 | Competency may be assessed individually in the actual workplace or through accredited institution |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## DEMONSTRATE NUMERACY SKILLS

**UNIT CODE:** IT/OS/GIS/BC/02/4/A

**UNIT DESCRIPTION**

This unit covers the competencies required to perform numerical functions.The person who is competent in this unit shall be able to: Identify and use whole numbers and simple fractions, decimals and percentages; Identify, measure and estimate familiar quantities for work, Read and use familiar maps, plans and diagrams for work, Identify and describe common 2D and some 3D shapes for work, Construct simple tables and graphs for work using familiar data, Identify and interpret information in familiar tables, graphs and charts for work.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT** These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***Bold and italicized terms are elaborated in the Range.*** |
| 1. Identify and use whole numbers and simple fractions, decimals and percentages for work
 | 1. Simple fractions, decimals and percentages identified and interpreted
2. understanding of place value by organising numbers from smallest to largest demonstrated
3. Required numerical information located and decision made on appropriate method to solve a problem
4. Limited range of calculations performed using the 4 operations
5. Links between operations described
6. Estimations made to check reasonableness of results of problem solving process
7. Numerical information recorded, and the result of the task communicated using informal and some formal language and symbolism
 |
| 2. Identify, measure and estimate familiar quantities for work | 1. Measurement information in workplace tasks and texts identified and interpreted
2. Familiar units of measurement needed for tasks is identified
3. Familiar and simple amounts estimated
4. Appropriate measuring equipment selected
5. Simple measuring equipment graduated in familiar units to measure relevant quantities is used
6. Calculation done using familiar units of measurement
7. measurements and results checked against estimates
8. Results are recorded or reported
9. Results relevant to the workplace task are communicated using informal and some formal mathematical and general language
 |
| 3. Read and use familiar maps, plans and diagrams for work | 1. Items and places are in familiar maps, plans and diagrams
2. Common symbols and keys recognised in familiar maps, plans and diagrams
3. Understanding of direction and location demonstrated by describing the location of objects, or route to familiar places
4. Instructions to locate familiar objects or places are given and followed
5. Informal and some formal oral mathematical language and symbols are used
 |
| 4. Identify and describe common 2D and some 3D shapes for work | 1. Common 2D shapes and some common 3D shapes in familiar situations are identified and named
2. Common 2D shapes and designs are compared and classified
3. Informal and some formal language used to describe common two-dimensional shapes and some common three-dimensional shapes
4. Simple items used to draw or construct common 2D shapes
5. Common 3D shapes matched to their 2D sketches or nets
 |
| 5. Construct simple tables and graphs for work using familiar data | 1. Common types of graphs are identified and named
2. Familiar data to be collected is determined
3. A method to collect data is selected
4. A small amount of simple familiar data is collected
5. One or two variables determined from the data collected
6. Data ordered and collated
7. A table constructed, and data enter
8. Graphs are constructed using data from table
9. Results are promptly checked
10. Graph information related to work is reported or discussed using informal and some formal mathematical and general language
 |
| 6. Identify and interpret information in familiar tables, graphs and charts for work  | 1. Simple tables are identified in familiar texts and contexts
2. Title, headings, rows and columns located in familiar tables
3. Information and data in simple tables identified and interpreted
4. Information is related to relevant workplace tasks
5. Familiar graphs and charts are identified in familiar texts and contexts
6. Title, labels, axes, scale and key from familiar graphs and charts are located
7. Information and data in familiar graphs and charts is identified and interpreted
8. Information related to relevant workplace tasks
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Simple measuring equipment
 | May include but not limited to:1.1 Rulers 1.2 Watches/clocks1.3 Scales1.4 Thermometers1.5 AVO meter |
| 1. Common 2D shapes and common 3D shapes
 | May include but not limited to:2.1 Round2.2 Square2.3 Rectangular2.4 Triangle2.5 Sphere2.6 Cylinder2.7 Cube2.8 Polygons2.9 Cuboids  |
| 3. Diagrammatical representation | May include but not limited to:* Charts
* Maps
* Graphs
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Applying Fundamental operations (addition, subtraction, division, multiplication)
* Using calculator
* Using different measuring tools

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Types of common shapes
* Differentiation between two dimensional shapes / objects
* Formulae for calculating area and volume
* Types and purpose of measuring instruments
* Units of measurement and abbreviations
* Fundamental operations (addition, subtraction, division, multiplication)
* Rounding techniques
* Types of fractions
* Different types of tables and graphs
* Meaning of graphs, such as increasing, decreasing, and constant value
* Preparation of basic data, tables & graphs

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:* 1. Simple fractions, decimals and percentages are correctly identified and interpreted
	2. Performed a limited range of calculations using the 4 operations
	3. Performed calculations using familiar units of measurement
	4. Recognised common symbols and keys in familiar maps, plans and diagrams
	5. Constructed simple tables and graphs using familiar data
	6. Identified and interpret information in familiar tables, graphs and charts
 |
| 2. Resource Implications | 2.1 Calculator* 1. Basic measuring instruments
 |
| 1. Methods of Assessment
 | Competency may be assessed through:3.1 Written Test3.2 Interview/Oral Questioning* 1. Demonstration
 |
| 1. Context of Assessment
 | Competency may be assessed in an off the job setting  |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## DEMONSTRATE DIGITAL LITERACY

**UNIT CODE:** IT/OS/GIS/BC/03/4/A

**UNIT DESCRIPTION**

This unit covers the competencies required to effectively demonstrate digital literacy in a working environment. It entails identifying and using digital devices such as smartphones, tablets, laptops and desktop PCs for purposes of communication and performing work related tasks at the work place.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT** These describe the key outcomes which make up workplace function | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***Bold and italicized terms are elaborated in the Range*** |
| 1. Identify computer software and hardware
 | * 1. ***Appropriate computer software*** is identified according to manufacturer’s specification
	2. ***Appropriate computer hardware*** is identified according to manufacturer’s specification
 |
| 1. Apply security measures to data, hardware, software
 | * 1. ***Data security and privacy are classified*** in accordance with the technological situation
	2. ***Security and control measures*** are applied in accordance with laws governing protection of ICT
	3. Computer threats and crimes are detected.
	4. Protection against computer crimes is undertaken in accordance with laws governing protection of ICT
 |
| 1. Apply computer software in solving tasks
 | * 1. Basic ***word processing concepts*** are applied in resolving workplace tasks
	2. ***Word processing utilities*** are applied in accordance with workplace procedures
	3. Data is manipulated on worksheet in accordance with office procedures
 |
| 1. Apply internet and email in communication at workplace
 | * 1. Electronic mail is applied in workplace communication in accordance with office procedures
	2. Office internet functions are defined and executed in accordance with office procedures
	3. ***Network configuration*** and uses are determined in accordance with office operations procedures
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| **Range** | **Variable** |
| ***Appropriate computer software*** may include but not limited to: | * A collection of instructions that enable the user to interact with a computer, its hardware, or perform tasks.
* Computer tools that will help computer users interact with the hardware in a computer*.*
 |
| ***Appropriate computer hardware*** may include but not limited to: | Collection of physical parts of a computer system. This includes the computer case, monitor, keyboard, and mouse and all the parts inside the computer case, such as the hard disk drive, motherboard, video card, |
| ***Data security and privacy*** may include but not limited to: | * Confidentiality
* Cloud computing
* Confidentiality
* Cyber terrorism
* Integrity -but-curious data serving
 |
| ***Security and control measures*** may include but not limited to: | * Countermeasures and risk reduction
* Cyber threat issues
* Risk management
 |
| ***Word processing concepts*** may include but not limited to: | Using a special program to create, edit, and print documents |
| ***Network configuration*** may include but not limited to: | Organizing and maintaining information on the components of a computer network |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Analytical skills
* Interpretation
* Typing
* Communication
* Computing (applying fundamental operations such as addition, subtraction, division and multiplication)
* Using calculator
* Basic ICT skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Input and output devices
* Central processing Unit (CPU)
* Peripherals
* Storage Media
* Software concept
* Types of concept
* Function of computer software
* Data security and privacy
* Security threats and control measures
* Computer crimes
* Detection and protection of computer crimes
* Laws governing protection of ICT
* Word processing;
* Functions and concepts of word processing.
* Documents and tables creation and manipulations
* Mail merging
* Word processing utilities
* Spread sheet;
* Meaning, formulae, function and charts, uses, layout, data manipulation and application to cell
* Networking and Internet;
* Meaning, functions and uses of networking and internet.
* Electronic mail and world wide web
* Emerging trends and issues in ICT;
* Identify and apply emerging trends and issues in ICT
* Challenges posed by emerging trends and issues

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:* 1. Identified input, output, CPU and storage media devices of computers in accordance to computer specification
	2. Identified concepts, types and functions of computer software according to operation manual
	3. Identified and controlled security threats
	4. Detected and protected computer crimes
	5. Applied word processing in office tasks
	6. Prepared work sheet and applied data to the cells in accordance to workplace procedures
	7. Used Electronic Mail for office communication as per workplace procedure
	8. Applied internet and World Wide Web for office tasks in accordance with office procedures
	9. Applied laws governing protection of ICT
 |
| 1. Resource Implications
 | * 1. Smartphones
	2. Tablets
	3. Laptops and
	4. Desktop PCs
	5. Desktop computer
	6. Lap top
	7. Calculator
	8. Internet
	9. Smart phone
	10. Operations Manuals
 |
| 1. Methods of Assessment
 | Competency may be assessed through:* 1. Written Test
	2. Demonstration
	3. Practical assignment
	4. Interview/Oral Questioning
	5. Demonstration
 |
| 1. Context of Assessment
 | Competency may be assessed in an off and on the job setting |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## DEMONSTRATE ENTREPRENEURIAL SKILLS

**UNIT CODE:** IT/OS/GIS/BC/04/4/A

**UNIT DESCRIPTION**

This unit covers the competencies required for creating and maintaining small scale business, establishing small business customer base, managing and growing a micro/small-scale business.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**These describe the **key outcomes** which make up workplace function. | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***Bold and italicized terms are elaborated in the Range*** |
| 1. Create and maintain small-scale business | 1.1 Generation and evaluation of business ideas is undertaken in accordance with the existing procedure 1.2 Competencies are matched with business opportunities in accordance with business practices.1.3 Procedure for starting a small business is identified as per the legal requirements1.4 SWOT/ PESTEL analysis and or industrial survey is carried out according to office procedures 1.5**Business operations** are monitored and controlled following established procedures. 1.6Quality assurance measures are implemented consistently. 1.7 Good relations are maintained with staff/workers. 1.8Policies and procedures on occupational safety and health and environmental concerns are constantly observed.  |
| 2. Establish small business customer base | 2.1 Good customer relations are maintained in accordance with office procedures2.2 New customers and markets are identified, explored and reached out to according to the marketing plan2.3 Promotions/Incentives are offered to loyal customers in accordance with office procedures 2.4 Additional products and services are evaluated and tried in accordance with marketing strategy2.5 Customer record is maintained in accordance with office procedures |
| 3. Manage small scale business  | 3.1 Enterprise is built up and sustained through judicious control of cash flows. 3.2 **Profitability of enterprise** is ensured though appropriate internal controls. 3.3 Unnecessary or lower-priority expenses and purchases are avoided to ensure profitability3.4 Basic cost-benefit analysis are undertaken in accordance with office procedures3.5 Basic financial management are undertaken in accordance with office procedures3.6 Basic financial accounting in undertaken in accordance with office procedures3.7 Business **internal controls** are implemented in accordance with office procedure3.8 Setting business priorities and strategies is carried out according to office procedures3.9 Preparation and interpretation of basic financial statements is undertaken in accordance with set procedures3.10*Preparation of business plans* for small business is undertaken in accordance with business strategy3.11 Business Social Responsibility is maintained in accordance with Standard Operations Procedures (SOP) |
| 4.Grow/ expand small scale business | 4.1 Prepared business growth strategy for small sale business in accordance with office procedures4.2 Incorporated technology in small scale business growth in accordance with technological trends 4.3 Emerging issues and trends are considered in accordance with business growth strategy4.4 Built audience interest in product/service according to growth strategy4.5 Boosted cooperate communication according to business **communication strategy** |

**RANGE**

This section provides work environment and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range**  |
| **Business Strategy** include but not limited to: | Manage wastages, environmental conservation |
| **Business Operations** include but not limited to: | * Purchasing
* Accounting/administrative
* Work production/operations/sales
* Marketing
 |
| **Internal control** includes but not limited to: | * Accounting systems
* Financial statements/reports
* Cash management
* Human resource management
 |
| **Profitability of enterprise** include but not limited to: | Operating expenses lower than income |
| **Communication strategy** include but not limited to: | * Blue print of exchange of information
* Technology and exchange of information
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Individual marketing skills
* Using basic advertising (posters/ tarpaulins, flyers, social media,
* Basic bookkeeping/ accounting skills
* Communication skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Generation and evaluation of business ideas
* Legal requirements for starting a small business
* SWOT/ PESTEL analysis
* Occupational Safety and Health
* Public relations concepts
* Business plan
* Business financing
* Marketing strategies
* Business management and control
* Production/ operation process
* Product promotion strategies
* Market and feasibility studies
* Business ethics
* Building customer relations
* Business models and strategies
* Types and categories of businesses
* Business internal controls
* Relevant national and local legislation and regulations
* Basic quality control and assurance concepts
* Building relations with customer and employees
* Building competitive advantage of the enterprise
* Business growth strategies

**EVIDENCE GUIDE**

|  |  |  |
| --- | --- | --- |
| 1. Critical aspects of Competency
 | Assessment requires evidence that the candidate:

|  |
| --- |
| 1.1 Demonstrated entrepreneurial skills 1.2 Demonstrate competencies to create a small-scale business1.2 Demonstrated ability to conceptualize and plan a micro/small business 1.3 Grew customer base for the small-scale business1.3 Demonstrated ability to manage/operate a micro/small-scale business 1.4 Demonstrated competencies to grow a micro/small-scale business |

 |
| 1. Resource Implications
 |

|  |
| --- |
| The following resources should be provided:  |

2.1 Case studies on micro/small-scale enterprises 2.2 Materials and location relevant to the proposed activity and tasks  |
| 1. Methods of Assessment
 | Competency in this unit may be assessed through:

|  |  |
| --- | --- |
| 3.1 Case studies3.2 Oral Questioning 3.3 Portfolio 3.4 Projects |  |

 |
| 1. Context of Assessment
 | 4.1 Competency may be assessed in workplace or in a simulated workplace setting 4.2 Assessment shall be observed while tasks are being undertaken whether individually or in-group |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

##  DEMONSTRATE EMPLOYABILITY SKILLS

**UNIT CODE:** IT/OS/GIS/BC/05/4/A

**UNIT DESCRIPTON**

This unit covers competencies required to demonstrate employability skills. It involves conducting self-management, demonstrating critical safe work habits, demonstrating workplace learning and workplace ethics.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***Bold and italicized terms are elaborated in the Range*** |
| 1. Conduct self-management
 | 1. Personal vision, mission and goals are formulated based on potential and in relation to organization objectives
2. Emotions are managed as per workplace requirements
3. Individual performance is evaluated and monitored according to the agreed targets.
4. Assertiveness is developed and maintained based on the requirements of the job.
5. Accountability and responsibility for own actions are demonstrated.
6. Self-esteem and a positive self-image are developed and maintained.
7. Time management, attendance and punctuality are observed as per the organization policy.
8. Goals are managed as per the organization’s objective
9. Self-strengths and weaknesses are identified as per ***personal objectives***
10. Critics are managed as per personal objectives
11. Demonstrate interpersonal communication
12. Information is shared as per communication structure
13. Work activity is organized with other involved personnel as per the SOPs
 |
| 1. Demonstrate critical safe work habits
 | * 1. Stress is managed in accordance with workplace procedures.
	2. Punctuality and time consciousness is demonstrated in line with workplace policy.
	3. Personal objectives are integrated with organization goals based on organization’s strategic plan.
	4. Work priorities are set in accordance to workplace procedures.
	5. ***Feedback*** on performance is collected and evaluated based on established ***team*** learning process
	6. Leisure time is recognized in line with organization policy.
	7. Abstinence from ***drug and substance abuse*** is observed as per workplace policy.
	8. Awareness of HIV and AIDS is demonstrated in line with workplace requirements.
	9. Safety consciousness is demonstrated in the workplace based on organization safety policy.
	10. ***Emerging issues*** are dealt with in accordance with organization policy.
 |
| 1. Demonstrate workplace learning
 | * 1. Personal training needs are identified and assessed in line with the requirements of the job
	2. Own learning is managed as per workplace policy.
	3. Learning opportunities are sought and allocated based on job requirement and in line with organization policy.
	4. Contribution to the learning community at the workplace is carried out.
	5. ***Range of media for learning*** are identified as per the training need
	6. Application of learning is demonstrated in both technical and non-technical aspects based on requirements of the job
	7. Enthusiasm for ongoing learning is demonstrated
	8. Time and effort is invested in learning new skills-based job requirements
	9. Willingness to learn in different context is demonstrated based on available learning opportunities arising in the workplace.
	10. Opportunities for performance improvement are identified proactively in area of work.
	11. Awareness of personal role in workplace ***innovation*** is demonstrated.
 |
| 1. Demonstrate workplace ethics
 | * 1. Policies and guidelines are observed as per the workplace requirements
	2. Self-worth and profession is exercised in line with personal goals and organizational policies
	3. Code of conduct is observed as per the workplace requirements
	4. Personal and professional integrity is demonstrated as per the personal goals
	5. Commitment to jurisdictional laws is demonstrated as per the workplace requirements
 |

**RANGE**

This section provides work environment and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

|  |  |
| --- | --- |
| **Range** | **Variable** |
| ***Drug and substance abuse*** includes but not limited to: | Commonly abused* Alcohol
* Tobacco
* Miraa
* Over-the-counter drugs
* Cocaine
* Bhang
* Glue
 |
| ***Feedback*** includes but not limited to: | * Verbal
* Written
* Informal
* Formal
 |
| ***Team*** includes but not limited to: | * Small work group
* Staff in a section/department
* Inter-agency group
 |
| ***Personal objectives*** include but not limited to: | * Long term
* Short term
* Broad
* Specific
 |
| ***Innovation*** include but not limited to: | * New ideas
* Original ideas
* Different ideas
* Methods/procedures
* Processes
* New tools
 |
| ***Emerging issues*** include but not limited to: | * Terrorism
* Social media
* National cohesion
* Open offices
 |
| ***Range of media for learning*** include but not limited to:  | * Mentoring
* peer support and networking
* IT and courses
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Personal hygiene practices
* Intra and Interpersonal skills
* Communication skills
* Knowledge management
* Interpersonal skills
* Critical thinking skills
* Observation skills
* Organizing skills
* Negotiation skills
* Monitoring skills
* Evaluation skills
* Record keeping skills
* Problem solving skills
* Decision Making skills
* Resource utilization skills
* Resource mobilization skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Work values and ethics
* Company policies
* Company operations, procedures and standards
* Occupational Health and safety procedures
* Fundamental rights at work
* Personal hygiene practices
* Workplace communication
* Concept of time
* Time management
* Decision making
* Types of resources
* Work planning
* Resources and allocating resources
* Organizing work
* Monitoring and evaluation
* Record keeping
* Workplace problems and how to deal with them
* Negotiation
* Assertiveness
* Team work
* Gender mainstreaming
* HIV and AIDS
* Drug and substance abuse
* Leadership
* Safe work habits
* Professional growth and development
* Technology in the workplace
* Learning
* Creativity
* Innovation
* Emerging issues
	+ Social media
	+ Terrorism
	+ National cohesion

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of Competency
 | Assessment requires evidence that the candidate:* 1. Conducted self-management
	2. Demonstrated critical safe work habits
	3. Demonstrated workplace learning
	4. Demonstrated workplace ethics
 |
| 1. Resource Implications
 |

|  |
| --- |
| The following resources should be provided:  |

* 1. Case studies/scenarios
 |
| 1. Methods of Assessment
 | Competency in this unit may be assessed through: * Oral Interview
* Observation
* Third Party Reports
* Written
 |
| 1. Context of Assessment
 | * 1. Competency may be assessed in workplace or in a simulated workplace setting
	2. Assessment shall be observed while tasks are being undertaken whether individually or in-group
 |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## DEMONSTRATE ENVIRONMENTAL LITERACY

**UNIT CODE:** IT/OS/GIS/BC/06/4/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to follow procedures for environmental hazard control, follow procedures for environmental pollution control, comply with workplace sustainable resource use and evaluate current practices in relation to resource usage.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***Bold and italicized terms are elaborated in the Range*** |
| 1. Control environmental hazard
 | * 1. ***Storage methods*** for environmentally hazardous materials are strictly followed according to environmental regulations and OSHS.
	2. ***Disposal methods*** of hazardous wastes are followed always according to environmental regulations and OSHS.
	3. ***PPE*** is used according to OSHS.
 |
| 1. Control environmental Pollution control
 | * 1. Environmental pollution ***control measures*** are compiled following standard protocol.
	2. Procedures for solid waste management are observed according Environmental Management and Coordination Act 1999
	3. Methods for minimizing ***noise pollution*** complied following environmental regulations.
 |
| 1. Demonstrate sustainable resource use
 | * 1. Methods for minimizing wastage are complied with.
	2. Waste management procedures are employed following principles of 3Rs (Reduce, Reuse, Recycle)
	3. Methods for economizing or reducing resource consumption are practiced.
 |
| 1. Evaluate current practices in relation to resource usage
 | * 1. Information on resource efficiency ***systems and procedures*** are collected and provided to the work group where appropriate.
	2. Current resource usage is measured and recorded by members of the work group.
	3. Current purchasing strategies are analyzed and recorded according to industry procedures.
	4. Current work processes to access information and data is analyzed following enterprise protocol.
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. PPE may include but are not limited to:
 | 1.1 Masks1.2 Gloves1.3 Goggles1.4 Safety hat1.5 Overall* 1. Hearing protector
	2. Safety boots
 |
| 1. Environmental pollution control measures may include but are not limited to:
 | * + Methods for minimizing or stopping spread and ingestion of airborne particles
	+ Methods for minimizing or stopping spread and inhaling gases and fumes
	+ Methods for minimizing or stopping spread and ingestion of liquid wastes
 |
| 1. Waste management Procedures may include but are not limited to:
 | 3.1 Sorting3.2 Storing of items3.2 Recycling of items3.3 Disposal of items3.4 Handling 3.5 Transport |
| 1. Resources may include but are not limited to:
 | 4.1 Electric4.2 Water4.3 Fuel4.3 Telecommunications* 1. Supplies

4.5 Materials |
| 1. Workplace environmental hazards may include but are not limited to:
 | 5.1Biological hazards5.2 Chemical and dust hazards5.3 Physical hazards |
| 1. Organizational systems and procedures may include but are not limited to:
 | 7.1 Supply chain, procurement and purchasing7.2 Quality assurance7.3 Making recommendations and seeking approvals |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Following storage methods of environmentally hazardous materials
* Following disposal methods of hazardous wastes
* Using PPE
* Practicing OSHS
* Complying environmental pollution control
* Observing solid waste management
* Complying methods of minimizing noise Pollution
* Complying methods of minimizing wastage
* Employing waste management procedures
* Economizing resource consumption
* Listing of resources used
* Measuring current usage of resources
* Identifying and reporting workplace environmental hazards
* Conveying all environmental issues
* Following environmental regulations
* Identifying environmental regulations
* Assessing procedures for assessing compliance
* Collecting information on environmental and resource efficiency systems and procedures, and Providing information to the work group
* Measuring and recording current resource usage
* Analysing and recording current purchasing strategies.
* Analysing current work processes to access information and data and Assisting identifying areas for improvement

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Storage methods of environmentally hazardous materials
* Disposal methods of hazardous waste
* Usage of PPE Environmental regulations
* OSHS
* Types of pollution
* Environmental pollution control measures
* Different solid waste
* Solid waste management
* Different noise pollution
* Methods of minimizing noise pollution
* Solid Waste Act
* Methods of minimizing wastage
* Waste management procedures
* Economizing of resource consumption
* Principle of 3Rs
* Types of resources
* Techniques in measuring current usage of resources
* Calculating current usage of resources
* Types of workplace environmental hazards
* Environmental regulations
* Environmental regulations applying to the enterprise.
* Procedures for assessing compliance with environmental regulations.
* Collection of information on environmental and resource efficiency systems and procedures,
* Measurement and recording of current resource usage
* Analysis and recording of current purchasing strategies.
* Analysis current work processes to access information and data Analysis of data and information
* Identification of areas for improvement

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:1.1 Controlled environmental hazard 1.2 Controlled environmental pollution 1.3 Demonstrated sustainable resource use1.4 Evaluated current practices in relation to resource usage |
| 1. Resource Implications
 | The following resources should be provided:* 1. Workplace with storage facilities
	2. Tools, materials and equipment relevant to the tasks (ex. Cleaning tools, cleaning materials, trash bags, etc.)
	3. PPE
	4. Manuals and references
	5. Legislation, policies, procedures, protocols and local ordinances relating to environmental protection
	6. Case studies/scenarios relating to environmental Protection
 |
| 1. Methods of Assessment
 | Competency in this unit may be assessed through:3.1 Demonstration3.2 Oral questioning3.3 Written examination3.4 Third Party Reports3.5 Portfolio (citations/awards from GOs and NGOs, certificate of training – local and abroad)3.6 Simulations and role-plays |
| 1. Context of Assessment
 | Competency may be assessed on the job, off the job or a combination of these as well as in work placement (internship). Off the job assessment must be undertaken in a closely simulated workplace environment.  |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## DEMONSTRATE OCUPATIONAL SAFETY AND HEALTH PRACTICES

**UNIT CODE:** IT/OS/GIS/BC/07/4/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to practice safety and health, and comply with OSH requirements relevant to work

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***Bold and italicized terms are elaborated in the Range*** |
| 1. Observe workplace procedures for hazards and risk prevention
 | 1.1 Arrangement of work area and items in accordance with  Company housekeeping procedures is followed 1.2 Work standards and procedures are followed1.3 ***Prevention and control measures***, including use of ***safety***  ***gears/PPE*** are applied 1.4 Standards and procedures for ***incidents and emergencies*** are studied and applied, as needed |
| 1. Participate in arrangements for workplace safety and health maintenance
 | 2.1 Orientations on ***OSH requirements/regulations*** of tasks is  participated2.2 Feedback on health, safety, and security concerns are provided to appropriate personnel as required in a sufficiently detailed manner. 2.3 Workplace procedures for reporting hazards, incidents, injuries and sickness are practiced2.4 OSH requirements/ regulations and workplace safety and hazard control procedures are reviewed, and compliance reported to appropriate personnel, as needed2.5 Needed ***OSH-related trainings*** are identified and proposed to appropriate personnel |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. ***Prevention and control measures*** may include but are not limited to:
 | 1.1 Eliminate the hazard (i.e., get rid of the dangerous machine1.2 Isolate the hazard (i.e. keep the machine in a closed room and operate it remotely; barricade an unsafe area off)1.3 Substitute the hazard with a safer alternative (i.e., replace the machine with a safer one)1.4 Use administrative controls to reduce the risk (i.e. give trainings on how to use equipment safely; OSH-related topics, issue warning signages, rotation/shifting work schedule)1.5 Use engineering controls to reduce the risk (i.e. use safety guards to machine)1.6 Use personal protective equipment1.7 Safety, Health and Work Environment Evaluation* 1. Periodic and/or special medical examinations of workers
 |
| 1. ***Safety gears /PPE*** (Personal Protective Equipment’s) may include but are not limited to:
 | 2.1 Arm/Hand guard, gloves2.2 Eye protection (goggles, shield) 2.3 Hearing protection (ear muffs, ear plugs)2.4 Hair Net/cap/bonnet2.5 Hard hat2.6 Face protection (mask, shield)2.7 Apron/Gown/coverall/jump suit2.8 Anti-static suits2.9 High-visibility reflective vest |
| 1. ***Incidents and emergencies*** may include but are not limited to:
 | 3.1 Chemical spills3.2 Equipment/vehicle accidents3.3 Explosion3.4 Fire3.5 Gas leak3.6 Injury to personnel3.7 Structural collapse* 1. Toxic and/or flammable vapors emission.
 |
| 1. ***OSH requirements / regulations*** may include but are not limited to:
 | 4.2 Building code4.5 Permit to Operate |
| 1. ***OSH-related trainings*** may include but are not limited to:
 | 5.1 Safety Orientations relevant to tasks5.2 Safe and Correct Operation of Tools and Equipment5.3 Health Orientations/trainings (Healthy Lifestyle, Prevention of drug/alcohol dependence, violence in the workplace, work-stress)5.4 Prevention and Control of OSH Hazards in the workplace5.5 Chemical Handling5.6 Safety Trainings (Fire Safety, Construction Safety, Confined Space)5.7 Prevention and Control of Work-related Injuries and Illness5.8 Basic First-aid Trainings5.9 Emergency Response Trainings5.10 Trainings on use of fire-extinguisher |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Communication Skills
* Knowledge management
* Collaborating skills
* Interpersonal Skills
* Troubleshooting skills
* Critical thinking Skills
* Observation Skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* General OSHprinciples andlegislations
* Principles ofgoodhousekeeping(5S)
* Company/workplacepolicies/guidelines
* Standards andsafetyrequirements ofwork processand procedures
* StandardWorkplaceemergency planand procedures
* Safety and health requirements of tasks
* Workplace guidelines on providing feedback on OSH and security concerns
* OSH regulations
* Hazard control procedures
* OSH trainings relevant to work

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:1.1 Follows work and housekeeping procedures, and complies with its requirements1.2 Follows work standards and procedures1.3 Applies OSH preventive and control measures, including emergency plan, standards and procedures1.4 Participates in orientations on OSH requirements of tasks1.5 Provides feedback on health, safety, and security concerns in a sufficiently detailed manner.1.6 Practices workplace procedures for reporting hazards, incidents, injuries and sickness1.7 Reviews and reports compliance to workplace OSH regulations and hazard control procedures1.8 Identifies and proposes OSH trainings relevant to work |
| 1. Resource Implications
 | The following resources should be provided:2.1 Facilities, materials tools and equipment necessary for the activity |
| 1. Methods of Assessment
 | Competency in this unit may be assessed through:3.1 Observation/Demonstration with oral questioning3.2 Third party report3.3 Written exam |
| 1. Context of Assessment
 | Competency may be assessed on the job, off the job or a combination of these. Off the job assessment must be undertaken in a closely simulated workplace environment.  |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# CORE UNITS OF COMPETENCY

## RECOGNISE FOUNDATIONS OF GISs

**UNIT CODE:** IT/OS/GIS/CC/01/4/A

**UNIT DESCRIPTION**

This unit covers the competencies required to demonstrate foundational GIS concepts, identify GIS components, demonstrate data models in GIS systems and identify GIS applications in real life.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  | **PERFORMANCE CRITERIA*****(Bold and italicised terms are elaborated in the Range)*** |
| --- | --- |
| 1. Demonstrate foundational GIS concepts
 | * 1. ***GISkey terms and concepts*** are explained
	2. GIS is explained
	3. ***GIS operations and functions*** are identified
	4. ***Geographical Concepts*** are illustrated
	5. ***GI technologies*** are recognised
 |
| 1. Identify GIS components
 | * 1. ***Components of a GIS*** are identified
	2. ***GIS software***  are outlined
	3. ArcGIS desktop software tool features are demonstrated
 |
| 1. Demonstrate data models in GIS systems
 | * 1. Data model is explained
	2. ***Types of data models*** are identified
	3. Application areas of data models are illustrated
 |
| 1. Identify GIS applications in real life
 | * 1. ***Areas of GIS application*** are identified
	2. Challenges in the GIS field are explained
	3. ***Technology trends driving geospatial development*** are identified
	4. Areas impacted by geospatial technology trends are identified.
 |

**RANGE**

This section provides work conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range*****May include but is not limited to:*** |
| --- | --- |
| 1. GIS key terms and concepts
 | * Attribute
* **Coordinate System**
* **Datum**
* Digital Elevation Model
* **Esri**
* **Geocode**
* **Geodatabase**
* **Georeference**
* **GIS**
* **Layer**
* **Metadata**
* **Projection**
* **Raster Data**
* **Shapefile**
* Spatial thinking
* **Topography**
* **Topology**
* **Vector Data**
 |
| 1. GIS operations and functions
 | * Data Input
* Data Storage
* Data Manipulation and Processing
* Data output
 |
| 1. Geographical Concepts
 | * Location
* Direction
* Space
* Navigation
* Neighbourhood and region
 |
| 1. GI technologies
 | * Global Positioning System (GPS)
* Remote Sensing (RS)
* Geographic Information System (GIS)
 |
| 1. Components of a GIS
 | * Hardware
* Software
* People
* Data and data sources
* Methods
 |
| 1. GIS software
 | * ArcGIS (Esri) - Desktop, Online
* QGIS (Open Source)
* Geomedia (Hexagon Geospatial)
* MapInfo Professional (Pitney Bowes)
* Manifold GIS (Manifold)
* AutoCAD Map 3D (Autodesk)
 |
| 1. Types of data models
 | * Raster
* Vector
 |
| 1. Areas of GIS application
 | * Urban planning
* Mapping
* Telecom and Network services
* Transport Planning
* Disaster management and mitigation
* Accident Analysis and Hot Spot Analysis
* Environmental Impact Analysis
* Agricultural operations
* Natural Resources Management
* Surveying
* Geology
 |
| 1. Technology trends driving geospatial development
 | * Miniaturization of Technologies
* Proliferation of New Mobile Geospatial Sensor Platforms
* Expanding Wireless and Web Networks
* Advances in Computing Capacity for Geospatial Research
 |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

The individual needs to demonstrate knowledge and understanding of:

|  |
| --- |
| 1. Foundational GIS concepts2. GIS components3. Data models in GIS systems4. GIS applications in real life |

**FOUNDATION SKILLS**

|  |
| --- |
| The individual needs to demonstrate the following additional skills: |
| * Communications (verbal and written);
* Time management;
* Analytical;
* Problem solving;
* Planning;
 | * Decision making;
* Report writing;
 |

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and understanding and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:1.1 Illustrated geographical concepts 1.2 Recognised GI technologies1.3 Identified GIS hardware1.4 Identified GIS software and complementary software 1.5 Demonstrated ArcGIS software features1.6 Illustrated application areas of data models  |
| 1. Resource Implications
 | Resources the same as that of workplace are advised to be applied; including computer, printers, scanners, cameras, ArcGISand other software (Excel, MS Project) and Internet. |
| 1. Methods of Assessment
 | Competency may be assessed through:* 1. Oral questioning
	2. Practical demonstration
	3. Observation
	4. Written test
 |
| 1. Context of Assessment
 | Competency may be assessed individually in the actual workplace or through simulated work environment |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## USE AND MANAGE GIS DATA

**UNIT CODE:** IT/OS/GIS/CC/02/4/A

**UNIT DESCRIPTION**

This unit covers the competencies required to identify GIS data foundational concepts builds a relational database, query a relational database and generate relational database reports.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  | **PERFORMANCE CRITERIA*****(Bold and italicised terms are elaborated in the Range)*** |
| --- | --- |
| 1. Identify GIS data foundational concepts
 | * 1. ***Types of GIS data*** are illustrated
	2. ***Common GIS data formats*** are explained
	3. ***Sources of GIS data*** are demonstrated
	4. ***Data preparation methods*** are applied
 |
| 1. Build a relational database
 | * 1. ***Relational database management concepts*** are explained
	2. Role of RDBMS in GIS spatial data management is explained
	3. MSAccess features are demonstrated
	4. Structured Query Language is explained
	5. A relational database is created using MSAccess
 |
| 1. Query a relational database
 | * 1. Queries are explained
	2. SELECT queries are designed
	3. Relevant GIS information is extracted
 |
| 1. Generate relational database reports
 | * 1. Report is explained
	2. Report is designed
	3. Database report is generated
 |

**RANGE**

This section provides work conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range*****May include but is not limited to:*** |
| --- | --- |
| * 1. Types of GIS data
 | * Vector
* Raster
 |
| * 1. Common GIS data formats
 | * CSV
* Shapefile
* Tab
* KML
* GeoJSON
 |
| * 1. Sources of GIS data
 | * Google
* Excel files
* Government web sites
 |
| * 1. Data preparation methods
 | * Table Joins
* Geocoding addressing
* Filtering a dataset
 |
| * 1. Relational database management concepts
 | * Relational Database
* Relation/Table
* Tuple/Record
* Attribute/Field
* Domain
* Keys (Primary, Foreign)
* Entity integrity
* Referential integrity
 |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

The individual needs to demonstrate knowledge and understanding of:

|  |
| --- |
| 1. GIS data foundational concepts
2. Building a relational database
3. Querying a relational database
4. Generating relational database reports
 |

**FOUNDATION SKILLS**

|  |
| --- |
| The individual needs to demonstrate the following additional skills: |
| * Communications (verbal and written);
* Time management;
* Analytical;
* Problem solving;
* Planning;
 | * Decision making;
* Report writing;
 |

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and understanding and range.

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## VISUALISE GIS DATA USING MAPS

**UNIT CODE:** IT/OS/GIS/CC/03/4/A

**UNIT DESCRIPTION**

This unit covers the competencies required to demonstrate foundational map concepts, generate simple maps using a GIS tool, explore GIS mapping capabilities and generate map projections.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  | **PERFORMANCE CRITERIA*****(Bold and italicised terms are elaborated in the Range)*** |
| --- | --- |
| 1. Demonstrate foundational map concepts
 | * 1. Maps are explained
	2. ***Map types*** are identified
	3. Map stacking (adding layers) is demonstrated
	4. ***Interactivity tools*** are demonstrated
 |
| 1. Generate simple maps using a GIS tool
 | * 1. ***Cartographic design features*** are illustrated
	2. ***Map elements*** are identified
	3. ***Map scales***are illustrated
	4. Maps are created using ArcGIS
 |
| 1. Explore GIS mapping capabilities
 | * 1. Location of things is mapped using ArcGIS
	2. Quantities are mapped using ArcGIS
	3. Densities are mapped using ArcGIS
	4. Features inside regions are mapped using ArcGIS
	5. Change in areas is mapped using ArcGIS
 |
| 4. Generate map projections | * 1. ***Earth model reference elements*** are illustrated
	2. Cartesian coordinates is demonstrated
	3. Kenya Geodetic reference system is explained
	4. The Universal Transverse Mercator (UTM) projection style is demonstrated
 |

**RANGE**

This section provides work conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range*****May include but is not limited to:*** |
| --- | --- |
| * + 1. Cartographic design features
 | * Size
* Scale
* Shape
* Symbols
* Labelling
* Fonts and font sizes
 |
| * + 1. Map types
 | * Reference
* Thematic
* Dynamic
* Feature
* Choropleth
* Dot density
* Contour
 |
| * + 1. Interactive tools
 | * Location information/Points of interest
* Map queries
 |
| * + 1. Map elements
 | * Data area/pane
* neat line
* Scale bars
* Legends
* Titles
* North Arrow
 |
| * + 1. Map scales
 | * Large
* Medium
* Small
 |
| * + 1. Earth model reference elements
 | * Latitude
* Longitude
 |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

The individual needs to demonstrate knowledge and understanding of:

|  |
| --- |
| 1. Foundational map concepts
2. Generating simple maps using a GIS tool
3. GIS tools mapping capabilities
4. Generating map projections
 |

**FOUNDATION SKILLS**

|  |
| --- |
| The individual needs to demonstrate the following additional skills: |
| * Communications (verbal and written);
* Time management;
* Analytical;
* Problem solving;
* Planning;
 | * Decision making;
* Report writing;
 |

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and understanding and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:1. Identified map types
2. Demonstrated layer stacking
3. Generated simple maps using ArcGIS
4. Mapped Location of things
5. Mapped Quantities
6. Mapped Densities
7. Mapped Features inside regions
8. Mapped Change in areas
9. Converted Earth reference /geographic coordinates to Cartesian coordinates
10. Applied selected ArcGIS map projection styles
 |
| 1. Resource Implications
 | Resources the same as that of workplace are advised to be appliedIncluding computer, printers, scanner, ArcGIS, map images in digital and hardcopy form, Internet. |
| 1. Methods of Assessment
 | Competency may be assessed through:* 1. Oral questioning
	2. Practical demonstration
	3. Observation
	4. Written test
 |
| 1. Context of Assessment
 | * 1. Competency may be assessed individually in the actual workplace or through simulated work environment
 |
| 1. Guidance information for assessment
 | * 1. Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.
 |

## PERFORM GIS DATA ANALYTICS

**UNIT CODE:** IT/OS/GIS/CC/04/4/A

**UNIT DESCRIPTION**

This unit covers the competencies required to summarize data, find locations, analyse patterns and find proximity using ArcGIS.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  | **PERFORMANCE CRITERIA*****(Bold and italicised terms are elaborated in the Range)*** |
| --- | --- |
| 1. Summarize data
 | * 1. Points aggregation is performed
	2. Features are joined
	3. “Summarize Nearby” is performed

1.4 “Summarize within” is performed |
| 1. Find locations
 | * 1. Existing locations are determined
	2. New locations are derived
	3. Similar locations are identified
	4. Best facilities are identified
 |
| 1. Analyse patterns
 | * 1. Density is calculated
	2. Hot spots are identified
	3. Outliers are identified
 |
| 4. Find proximity | * 1. Buffers are created
	2. Nearest features are extracted
	3. Drive-Time areas are created
 |

**RANGE**

This section provides work conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range*****May include but is not limited to:*** |
| --- | --- |
| N/A | N/A |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

The individual needs to demonstrate knowledge and understanding of:

|  |
| --- |
| 1. Summarising data
2. Finding locations
3. Analysing patterns
4. Finding proximity
 |

**FOUNDATION SKILLS**

|  |
| --- |
| The individual needs to demonstrate the following additional skills: |
| * Communications (verbal and written);
* Time management;
* Analytical;
* Problem solving;
* Planning;
 | * Decision making;
* Report writing;
 |

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and understanding and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:1. Performed Points aggregation
2. Joined features
3. Performed “Summarize Nearby”
4. Performed “Summarize within”
5. Determined Existing locations
6. Derived New locations
7. Identified Similar locations
8. Identified Best facilities
9. Calculated Density
10. Identified Hot spots
11. Identified Outliers
12. Created Buffers
13. Extracted Nearest features
14. Created Drive-Time areas
 |
| 1. Resource Implications
 | Resources the same as that of workplace are advised to be appliedIncluding computer, ArcGIS, Maps, Internet.  |
| 1. Methods of Assessment
 | Competency may be assessed through:* 1. Oral questioning
	2. Practical demonstration
	3. Observation
	4. Written test
 |
| 1. Context of Assessment
 | * 1. Competency may be assessed individually in the actual workplace or through simulated work environment
 |
| 1. Guidance information for assessment
 | * 1. Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.
 |

## ANALYSE TERRAINS AND IMAGES

**UNIT CODE:** IT/OS/GIS/CC/05/4/A

**UNIT DESCRIPTION**

This unit covers the competencies required to recognise terrain analysis areas, demonstrate terrain characteristics, perform terrain analysis using a GIS tool and identify key elements in aerial and satellite image capture.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  | **PERFORMANCE CRITERIA*****(Bold and italicised terms are elaborated in the Range)*** |
| --- | --- |
| 1. Recognise terrain analysis areas
 | * 1. Terrain analysis is explained
	2. Key ***terrain variables***are explained
	3. ***Terrain analysis areas*** are identified
 |
| 1. Demonstrate terrain characteristics
 | * 1. ***Terrain analysis functions***are illustrated
	2. Slope and Aspect are recognised from ready images
	3. Slope and Aspect are interpreted
 |
| 1. Perform terrain analysis using a GIS tool
 | * 1. ArcGIS ***Geoprocessing tools*** for terrain datasets are explained
	2. Terrain data set is selected
	3. Surface slope and Surface Aspect tools are applied
 |
| 1. Identify key elements in aerial and satellite image capture.
 | * 1. Essential features of quality aerial images are explained
	2. Tools for capturing aerial images are identified.
	3. Basic principles of satellite scanners are explained
 |

**RANGE**

This section provides work conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range****May include but is not limited to:** |
| --- | --- |
| 1. Terrain variables
 | * Height
* Slope
* Aspect
* Visibility
* Profile curvature
 |
| 1. Terrain analysis areas
 | * Inventory forest resource
* Assess slope erosion potential
* Determine habit suitability
 |
| 1. Terrain analysis functions
 | * Hydrological functions: watershed, flow direction, drainage network
* Viewsheds
* Shaded relief maps
 |
| 1. Geoprocessing tools
 | * Conversion tools
* Functional Surface tools
* Triangulated Surface tools
* Visibility tools
 |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

The individual needs to demonstrate knowledge and understanding of:

|  |
| --- |
| 1. Terrain analysis areas2.Terrain characteristics3.Terrain analysis using a GIS tool4.Key elements in aerial and satellite image capture. |

**FOUNDATION SKILLS**

|  |
| --- |
| The individual needs to demonstrate the following additional skills: |
| * Communications (verbal and written);
* Time management;
* Analytical;
* Problem solving;
* Planning;
 | * Decision making;
* Report writing;
 |

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and understanding and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:1.1 Identified terrain analysis areas1.2 Illustrated terrain analysis functions 1.3 Recognised Slope and Aspect from ready images1.4 Interpreted Slope and Aspect1.5 Applied GIS Surface slope and Surface Aspect tools on selected terrain data 1.6 Identified tools for capturing aerial images  |
| 1. Resource Implications
 | Resources the same as that of workplace are advised to be appliedIncluding computer, ArcGIS, Internet, Maps, Photographs (Aerial and Satellite) |
| 1. Methods of Assessment
 | Competency may be assessed through:* 1. Oral questioning
	2. Practical demonstration
	3. Observation
	4. Written test
 |
| 1. Context of Assessment
 | * 1. Competency may be assessed individually in the actual workplace or through simulated work environment
 |
| 1. Guidance information for assessment
 | * 1. Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.
 |

## APPLY GIS STANDARDS AND COMPLIANCE AREAS

**UNIT CODE:** IT/OS/GIS/CC/06/4/A

**UNIT DESCRIPTION**

This unit covers the competencies required to recognize data spatial standards, measure data accuracy, evaluate state of GIS implementation in Kenya and recognize statutory and other compliance areas.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  | **PERFORMANCE CRITERIA*****(Bold and italicised terms are elaborated in the Range)*** |
| --- | --- |
| 1. Recognise spatial data standards
 | * 1. Standards are explained
	2. ***Types of GIS standards*** are explained
	3. ***Spatial data standards*** are explained
 |
| 1. Measure data accuracy
 | * 1. ***Types of error****s* are explained
	2. Sources of GIS errors are explained
	3. Positional accuracy is illustrated
 |
| 1. Evaluate state of GIS implementation in Kenya
 | * 1. Available infrastructure is identified
	2. ***Spatial Planning stakeholders*** are identified.
	3. Challenges of implementing GISs are explained
 |
| 1. Recognise statutory and other compliance areas.
 | * 1. GIS professional guidelines are identified
	2. ***Relevant national laws*** are identified
	3. International standards are identified
 |

**RANGE**

This section provides work conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range*****May include but is not limited to:*** |
| --- | --- |
| 1. Types of GIS standards
 | * Data
* Interoperability
* Analysis
* Professional or certification
* National
* International
 |
| 1. Spatial data standards
 | * Media
* Format
* Data Accuracy
* Documentation
 |
| 1. Types of errors
 | * Positional accuracy
* Attribute accuracy and precision
* Conceptual accuracy and precision
 |
| 1. Spatial Planning stakeholders
 | * National Government
* County Governments
* Survey professionals
* Telecommunication firms
 |
| 1. Relevant national laws
 | * Physical Planning Act 2010
* National Land Commission Act 2012
* Urban Areas and Cities Act 2019
* Land Act 2012
 |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

The individual needs to demonstrate knowledge and understanding of:

|  |
| --- |
| 1. Spatial data standards
2. Measuring and documenting data accuracy
3. State of GIS implementation in Kenya
4. Statutory and other compliance frameworks
 |

**FOUNDATION SKILLS**

|  |
| --- |
| The individual needs to demonstrate the following additional skills: |
| * Communications (verbal and written);
* Time management;
* Analytical;
* Problem solving;
* Planning;
 | * Decision making;
* Report writing;
 |

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and understanding and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:* 1. Identified various types of GIS standards
	2. Illustrated positional accuracy

1.3 Evaluated state of GIS implementation in Kenya1.4 Identified GIS professional guidelines, relevant national laws and international standards. |
| 1. Resource Implications
 | Resources the same as that of workplace are advised to be appliedIncluding computer, ArcGIS, Internet, Maps. |
| 1. Methods of Assessment
 | Competency may be assessed through:* 1. Oral questioning
	2. Practical demonstration
	3. Observation
	4. Written test
 |
| 1. Context of Assessment
 | * 1. Competency may be assessed individually in the actual workplace or through simulated work environment
 |
| 1. Guidance information for assessment
 | * 1. Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.
 |