

**REPUBLIC OF KENYA**

**NATIONAL OCCUPATIONAL STANDARDS**

**FOR**

**COMPUTER PROGRAMMER**

**LEVEL 6**



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 in the formulation of the Policy Framework for Reforming Education and Training (Sessional Paper No. 4 of 2016). 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 Computer Programming Level 6. These Occupational Standards will also be the basis 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 and Sessional Paper No. 4 of 2016 on Reforming Education and Training in Kenya, emphasized the need to reform curriculum development, assessment and certification. This called for a shift to CBET in order 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.

TVET Curriculum Development, Assessment and Certification Council (TVET CDACC) in conjunction with ICT Sector Skills Advisory Committee (SSAC) have developed these Occupational Standards for Computer Programmer. These Standards will be the basis for development of competency-based curriculum for Computer Programming level 6.

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.

**CHAIRPERSON, 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.

**CHAIRPERSON**

**ICT SECTOR SKILLS ADVISORY COMMITTEE**

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# ABBREVIATIONS AND ACRONYMS

A Control version

AIDS Acquired Immunodeficiency Syndrome

APK Android Package Kit

BC Basic Competency

CBET Competency Based Education and Training

CC Common Competency

CDACC Curriculum Development Assessment Certification Council

CEO Council Secretary

CPU Central Processing Unit

CR Core Unit

CRUD Create, Retrieve, Update, Delete

DBMS Database Management System

DSDM Dynamic Systems Development Methodology

EMS Environmental Management Systems

HIV Acquired Immunodeficiency Virus

ICT Information Communication Technology

IEEE Institute of Electrical and Electronics Engineers

ISO International Organisation for Standardisation

JDK Java Development Kit

KNQA Kenya National Qualification Authority

KNQF Kenya National Qualification Framework

LAN Local Area Network

MAN Metropolitan Area Network

MIS Management Information System

OOP Object Oriented Programming

OS Occupational Standard

OSH Occupational Health and Safety

PAN Personal Area Network

PESTEL Political Environmental Social Technological Economic Legal

PPE Personal Protective Equipment

RAM Random Access Memory

ROM Read Only Memory

SDK Software Development Kit

SOPStandard Operating Procedure

SQL Structured Query Language

SSAC Sector Skills Advisory Committee

SWOT Strength Weakness Opportunity Threat

TVET Technical and Vocational Education and Training

UML Unified Modeling Language

WAN Wide Area Network

# KEY TO UNIT CODE

**ICT/OS/ CP/ BC/ 01/6/A**

Industry or sector

Occupational Standards

Occupational area

Type of competency

Competency number

Competency level

Version control

# COURSE OVERVIEW

Computer Programming Level 6 qualification consists of competencies that a person must achieve to enable him/her to understand computing basics, apply discrete mathematical concepts, demonstrate programming concepts , design and use a database, data structures and algorithms, apply object oriented programming concepts using JAVA, event driven programming concepts using VB.net, develop client side web applications, develop server side web applications, develop mobile applications and understand agile development concepts.

These qualifications consist of the following basic, common and core units of competency:

**Basic Units of Competency**

|  |  |
| --- | --- |
| **Unit Code** | **Unit Title** |
| ICT/OS/CP/BC/01/6/A | Demonstrate Communication Skills |
| ICT/OS/CP/BC/02/6/A | Demonstrate Digital Literacy |
| ICT/OS/CP/BC/03/6/A | Demonstrate Numeracy Skills |
| ICT/OS/CP/BC/04/6/A | Demonstrate Entrepreneurial Skills |
| ICT/OS/CP/BC/05/6/A | Demonstrate Employability Skills |
| ICT/OS/CP/BC/06/6/A | Demonstrate Environmental Literacy |
| ICT/OS/CP/BC/07/6/A | Demonstrate Occupational Safety and Health Practices |

**Common Units of Competency**

|  |  |
| --- | --- |
| **Unit Code** | **Unit Title** |
| ICT/OS/CP/CC/01/6/A | Demonstrate Basic Electronic Skills |

**Core Units of Competency**

|  |  |
| --- | --- |
| **Unit Code** | **Unit Title** |
| ICT/OS/CP/CR/01/6/A | Understand Computing Basics |
| ICT/OS/CP/CR/02/6/A | Apply Discrete Mathematical Concepts |
| ICT/OS/CP/CR/03/6/A | Demonstrate Programming Concepts |
| ICT/OS/CP/CR/04/6/A | Design And Use A Database |
| ICT/OS/CP/CR/05/6/A | Data Structures And Algorithms |
| ICT/OS/CP/CR/06/6/A | Apply Object Oriented Programming Concepts Using JAVA |
| ICT/OS/CP/CR/07/6/A | Event Driven Programming Concepts Using VB.Net |
| ICT/OS/CP/CC/08/6/A | Develop Client-Side Web Applications |
| ICT/OS/CP/CC/09/6/A | Develop Server-Side Web Applications |
| ICT/OS/CP/CC/10/6/A | Develop Mobile Applications |
| ICT/OS/CP/CC/11/6/A | Understand Agile Development Concepts |

# BASIC UNITS OF COMPETENCY

# DEMONSTRATE COMMUNICATION SKILLS

**UNIT CODE:** ICT/OS/CP/BC/01/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required to demonstrate communication skills. It involves meeting communication needs of clients and colleagues, developing communication strategies, establishing and maintaining communication pathways, conducting interviews, facilitating group discussion and representing the organization.

**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. Meet communication needs of clients and colleagues | 1. Specific communication needs of clients and colleagues are identified and met based on workplace requirements 2. Different communication approaches are identified and applied according to clients’ needs 3. Conflict is identified and addressed as per the standards of the organization |
| 1. Develop communication strategies | * 1. Strategies for effective internal and external dissemination of information are developed as per organization’s requirements   2. Special communication needs are considered in developing strategies according workplace procedures   3. ***Communication strategies*** are analyzed, evaluated and revised based the workplace needs |
| 1. Establish and maintain communication pathways | * 1. Pathways of communication are established as per organization policy   2. Pathways are maintained and reviewed according to organization procedures |
| 1. Promote use of communication strategies | * 1. Information is provided to all areas of the organization as per strategy requirements   2. Effective communication techniques are articulated and modeled according work requirements   3. Personnel are given guidance about adapting communication strategies as per organization procedures |
| 1. Conduct interview | 1. A range of appropriate communication strategies are employed in ***interview situations*** based on the workplace requirements 2. Records of interviews are made and maintained in accordance with organizational procedures 3. Effective questioning, listening and nonverbal communication techniques are used as per needs |
| 1. Facilitate group discussion | 1. Mechanisms to enhance ***effective group interaction*** are identified and implemented according to workplace requirements 2. Strategies to encourage group participation are identified and used as per organizations’ procedures 3. Meetings objectives and agenda are set and followed based on workplace requirements 4. Relevant information is provided and feedback obtained according to set protocols 5. Evaluation of group communication strategies is undertaken in accordance with workplace guidelines 6. Specific communication needs of individuals are identified and addressed as per individual needs |
| 1. Represent the organization | 1. 7Relevant presentation are researched and presented based on internal or external communication forums requirements 2. Presentation is delivered in a clear and sequential manner as per the predetermined time 3. Presentation is made as per appropriate media 4. Difference views are respected based on workplace procedures 5. Written communication is done as per organizational standards 6. Inquiries are responded according to organizational standard |

**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. Communication strategies may include but not limited to: | * Language switch * Comprehension check * Repetition * Asking confirmation * Paraphrase * Clarification request * Translation * Restructuring * Approximation * Generalization |
| 1. Effective group interaction may include but not limited to: | * Identifying and evaluating what is occurring within an interaction in a nonjudgmental way * Using active listening * Making decision about appropriate words, behavior * Putting together response which is culturally appropriate * Expressing an individual perspective * Expressing own philosophy, ideology and background and exploring impact with relevance to communication |
| 1. Situations may include but not limited to: | * Establishing rapport * Eliciting facts and information * Facilitating resolution of issues * Developing action plans * Diffusing potentially difficult situations |

**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
* Active listening
* Interpretation
* Negotiation
* Writing

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Communication process
* Dynamics of groups
* Styles of group leadership
* Key elements of communications strategy

**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. Developed communication strategies to meet the organization requirements and applied in the workplace 2. Established and maintained communication pathways for effective communication in the workplace 3. Used communication strategies involving exchanges of complex oral information |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace or appropriately simulated environment where assessment can take place 2. Materials relevant to the proposed activity or tasks |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Direct observation 2. Oral questioning 3. Written texts |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. Off-the –job 3. During Industrial attachment |
| 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:** ICT/OS/CP/BC/02/6/A

**UNIT DESCRIPTION**

This unit describes the competencies required to demonstrate numeracy skills. It involves; applying a wide range of mathematical calculations for work; applying ratios, rates and proportions to solve problems; estimating, measuring and calculating measurement for work; using detailed maps to plan travel routes for work; using geometry to draw and construct 2D and 3D shapes for work; collecting, organizing and interpreting statistical data; using routine formula and algebraic expressions for work and using common functions of a scientific calculator.

**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. Apply a wide range of mathematical calculations for work | * 1. Mathematical information embedded in a range of workplace tasks and texts is extracted as per workplace procedures.   2. Mathematical information is interpreted and comprehended as per job specifications   3. A range of mathematical and problem solving processes are selected and used as per job specification   4. Different forms of fractions, decimals and percentages are flexibly used as per SOPs   5. Calculation performed with positive and negative numbers as per SOPs   6. Numbers are expressed as powers and roots and are used in calculations as per SOPs   7. Calculations done using routine formulas as per SOPs   8. Estimation and assessment processes are used to check outcome as per workplace procedures   9. Mathematical language is used to discuss and explain the processes, results and implications of the task as per workplace procedures |
| 1. Use and apply ratios, rates and proportions for work | * 1. Information regarding ratios, rates and proportions extracted from a range of workplace tasks and texts as per SOPs   2. Mathematical information related to ratios, rate and proportions is analysed as per SOPs   3. Problem solving processes are used to undertake the task as per workplace procedures   4. Equivalent ratios and rates are simplified as per SOPs   5. Quantities are calculated using ratios, rates and proportions as per SOPS   6. Graphs, charts or tables are constructed to represent ratios, rates and proportions as per SOPs   7. The outcomes reviewed and checked as per job specifications   8. Information is record using mathematical language and symbols as per workplace procedures |
| 1. Estimate, measure and calculate measurement for work | * 1. Measurement information embedded in workplace texts and tasks are extracted and interpreted as per job specifications   2. Appropriate workplace measuring equipment are identified and selected as per job specifications   3. Accurate measurements are estimated and made as per SOPs   4. The area of ***2D shapes*** including compound shapes are calculated as per SOPs   5. The volume of 3D shapes is calculated using relevant formulas as per SOPs   6. Sides of right angled triangles are calculated using Pythagoras’ theorem as per SOPs   7. conversions are perform between units of measurement as per job specification   8. Problem solving processes are used to undertake the task as per workplace Procedures   9. The measurement outcomes are reviewed and checked as per workplace procedures   10. Information is recorded using mathematical language and symbols appropriate for the task as per workplace procedures |
| 1. Use detailed maps to plan travel routes for work | * 1. Different types of maps are identified and interpreted as per job requirements   2. Key features of maps are identified as per job requirements   3. Scales are identified and interpreted as per job requirements   4. Scales are applied to calculate actual distances   5. Positions or locations are determined using directional information as per job requirements   6. Routes are planned by determining directions and calculating distances, speeds and times as per job requirements   7. Information is gathered and identified and relevant factors related to planning a route checked as per job requirements   8. Relevant equipment is select and checked for accuracy and operational effectiveness as per job requirements   9. Task is planned and recorded using specialized mathematical language and symbols appropriate for the task as per job requirements |
| 1. Use geometry to draw 2D shapes and construct 3D shapes for work | * 1. A range of 2D shapes and 3D shapes and their uses in work contexts is identified as per job specifications   2. Features of 2D and 3D shapes are named and described as per job specifications   3. Types of angles in 2D and 3D shapes are identified as per job specifications   4. Angles are drawn, estimated and measured using geometric instruments as per job requirements   5. Angle properties of 2D shapes are named and identified as per SOPs   6. Angle properties are used to evaluate unknown angles in shapes as per SOPs   7. Properties of perpendicular and parallel lines are applied to shapes as per SOPs   8. Understanding and use of symmetry is demonstrated as per SOPs   9. Understanding and use of similarity is demonstrated as per SOPs   10. The workplace tasks and mathematical processes required are identified as per workplace procedures   11. 2D shapes is drawn for work as per job specification   12. 3D shapes is constructed for work as per job specification   13. The outcomes are reviewed and checked as per workplace procedures   14. Specialized mathematical language and symbols appropriate for the task are used as per SOPs |
| 1. Collect, organize, and interpret statistical data for work | * 1. Workplace issue requiring investigation are identified as per workplace procedures   2. Audience / population / sample unit is determined as per workplace procedures as per workplace procedures   3. Data to be collected is identified as per workplace procedures   4. Data collection method is selected as per workplace procedures   5. Appropriate statistical data is collected and organized as per SOPs   6. Data is illustrated in appropriate formats as per SOPs   7. The effectiveness of different types of graphs are compared as per SOPs   8. The summary statistics for collected data is calculated as per SOPs   9. The results / findings are interpreted as per SOPs   10. Data is checked to ensure that it meets the expected results and content as per workplace procedures   11. Information from the results including tables, graphs and summary statistics is extracted and interpreted as per workplace procedure   12. Mathematical language and symbols are used to report results of investigation as per workplace procedure |
| 1. Use routine formula and algebraic expressions for work | * 1. Understanding of informal and symbolic notation, representation and conventions of algebraic expressions is demonstrated as per SOPs   2. Simple algebraic expressions and equations are developed as per job specification   3. Operate on algebraic expressions as per job requirement   4. Algebraic expressions are simplified as per job requirement   5. Substitution into simple routine equations is done as per SOPs   6. Routine formulas used for work tasks are identified and comprehended as per SOPs   7. Routine formulas are evaluate by substitution as per SOPs   8. Routine formulas transposed as per SOPs   9. Appropriate formulas are identified and used for work related tasks as per workplace procedures   10. Outcomes are checked and result of calculation used as per workplace procedures |
| 1. Use common functions of a scientific calculator for work | * 1. Required numerical information to perform tasks is located as per job specification   2. The order of operations and function keys necessary to solve mathematical calculation are determined as per job specification   3. Function keys on a scientific calculator are identified and used as per SOPs   4. Estimations are referred to check reasonableness of problem solving process as per workplace procedures   5. Appropriate mathematical language, symbols and conventions are used to report results as per workplace 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.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. 2D shapes may include but not limited may include but not limited to: | * Triangles * Square * Rectangle * Triangle |

**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:

* Measuring
* Logical thinking
* Computing
* Drawing of graphs
* Applying mathematical formulas
* Analytical

**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. Developed communication strategies to meet the organization requirements and applied in the workplace 2. Established and maintained communication pathways for effective communication in the workplace 3. Used communication strategies involving exchanges of complex oral information |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace or appropriately simulated environment where assessment can take place 2. Materials relevant to the proposed activity or tasks |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Observation 2. Oral questioning 3. Written test 4. Portfolio of Evidence 5. Interview 6. Third party report |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. Off-the –job 3. During Industrial attachment |
| 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:** ICT/OS/CP/BC/03/6/A

**UNIT DESCRIPTION**

This unit describes competencies required to demonstrate digital literacy. It involves, identifying computer software and hardware, applying security measures to data, hardware, and software in automated environment, applying computer software in solving task, applying internet and email in communication at workplace, applying desktop publishing in official assignments and preparing presentation packages.

**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 appropriate computer software and hardware | * 1. Concepts of ICT are determined in accordance with computer equipment   2. Classifications of computers are determined in accordance with manufacturers specification   3. Appropriate computer software is identified according to manufacturer’s specification   4. Appropriate computer hardware is identified according to manufacturer’s specification   5. Functions and commands of operating system are determined in accordance with manufacturer’s specification |
| 1. Apply security measures to data, hardware, software in automated environment | * 1. ***Data security and privacy are classified*** in accordance with the prevailing technology   2. ***Security threats*** reidentified ***and control measures*** are applied in accordance with laws governing protection of ICT   3. Computer threats and crimes are detected in accordance to Information Management security guidelines   4. Protection against computer crimes is undertaken in accordance with laws governing protection of ICT |
| 1. Apply computer software in solving tasks | * 1. ***Word processing concepts*** are applied in resolving workplace tasks, report writing and documentation as per the job requirements   2. ***Word processing utilities*** are applied in accordance with workplace procedures   3. Worksheet layout is prepared in accordance with work procedures   4. Worksheet is built and data manipulated in the worksheet in accordance with workplace procedures   5. Continuous data manipulated on worksheet is undertaken in accordance with work requirements   6. Database design and manipulation is undertaken in accordance with office procedures   7. Data sorting, indexing, storage, retrieval and security is provided in accordance with workplace procedures |
| 1. Apply internet and email in communication at workplace | * 1. Electronic mail addresses are opened and applied in workplace communication in accordance with office policy   2. Office internet functions are defined and executed in accordance with office procedures   3. ***Network configuration*** is determined in accordance with office operations procedures   4. Official World Wide Web is installed and managed according to workplace procedures |
| 1. Apply Desktop publishing in official assignments | * 1. Desktop publishing functions and tools are identified in accordance with manufactures specifications   2. Desktop publishing tools are developed in accordance with work requirements   3. Desktop publishing tools are applied in accordance with workplace requirements   4. Typeset work is enhanced in accordance with workplace standards |
| 1. Prepare presentation packages | * 1. Types of presentation packages are identified in accordance with office requirements   2. Slides are created and formulated in accordance with workplace procedures   3. Slides are edited and run-in accordance with work procedures   4. Slides and handouts are printed according to work requirements |

**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. Appropriate computer hardware may include but not limited to: | Collection of physical parts of a computer system such as:   * Computer case, monitor, keyboard, and mouse * All the parts inside the computer case, such as the hard disk drive, motherboard and video card |
| 1. Data security and privacy may include but not limited to: | * Confidentiality of data * Cloud computing * Integrity -but-curious data surfing |
| 1. Security and control measures may include but not limited to: | * Counter measures against cyber terrorism * Risk reduction * Cyber threat issues * Risk management * Pass-wording |
| 1. Security threats may include but not limited to: | * Cyber terrorism * Hacking |

**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:

* Software concept
* Functions of computer software and hardware
* Data security and privacy
* Computer security threats and control measures
* Technology underlying cyber-attacks and networks
* Cyber terrorism
* 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 sheets;
* Meaning, formulae, function and charts, uses and layout
* Data formulation, manipulation and application to cells
* Database;
* Database design, data manipulation, sorting, indexing, storage retrieval and security
* Desktop publishing;
* Designing and developing desktop publishing tools
* Manipulation of desktop publishing tools
* Enhancement of typeset work and printing documents
* Presentation Packages;
* Types of presentation Packages
* Creating, formulating, running, editing, printing and presenting slides and handouts
* Networking and Internet;
* Computer networking and internet.
* Electronic mail and world wide web
* Emerging trends and issues in ICT;
* Identify and integrate 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 and controlled security threats   2. Detected and protected computer crimes   3. Applied word processing in office tasks   4. Designed, prepared work sheet and applied data to the cells in accordance to workplace procedures   5. Opened electronic mail for office communication as per workplace procedure   6. Installed internet and World Wide Web for office tasks in accordance with office procedures   7. Integrated emerging issues in computer ICT applications   8. Applied laws governing protection of ICT |
| 1. Resource Implications | The following resources should be provided:   * 1. Access to relevant workplace where assessment can take place   2. Appropriately simulated environment where assessment can take place |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Observation   2. Oral questioning   3. Written test   4. Portfolio of Evidence   5. Interview   6. Third party report |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. Off-the –job 3. During Industrial attachment |
| 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 :** ICT/OS/CP/BC/04/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required to demonstrate understanding of entrepreneurship. It involves demonstrating understanding of an entrepreneur, entrepreneurship, and self-employment, identifying entrepreneurship opportunities, creating entrepreneurial awareness, applying entrepreneurial motivation, developing business innovative strategies and developing business plan.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT** | **PERFORMANCE CRITERIA** |
| 1. Demonstrate understanding of an Entrepreneur | 1. Entrepreneurs and Business persons are distinguished as per principles of entrepreneurship 2. ***Types of entrepreneurs*** are identified as per principles of entrepreneurship 3. Ways of becoming an Entrepreneur are identified as per principles of Entrepreneurship 4. ***Characteristics of Entrepreneurs*** are identified as per principles of Entrepreneurship 5. Factors affecting Entrepreneurship development are explored as per principles of Entrepreneurship |
| 1. Demonstrate understanding of Entrepreneurship and self-employment | 1. Entrepreneurship and self-employment are distinguished as per principles of entrepreneurship 2. Importance of self-employment is analysed based on business procedures and strategies 3. ***Requirements for entry into self-employment*** are identified according to business procedures and strategies 4. Role of an Entrepreneur in business is determined according to business procedures and strategies 5. Contributions of Entrepreneurs to National development are identified as per business procedures and strategies 6. Entrepreneurship culture in Kenya is explored as per business procedures and strategies 7. Born or made Entrepreneurs are distinguished as per entrepreneurial traits |
| 1. Identify Entrepreneurship opportunities | 1. Sources of business ideas are identified as per business procedures and strategies 2. Business ideas and opportunities are generated as per business procedures and strategies 3. Business life cycle is analysed as per business procedures and strategies 4. Legal aspects of business are identified as per procedures and strategies 5. Product demand is assessed as per market strategies 6. Types of ***business environment*** are identified and evaluated as per business procedures 7. Factors to consider when evaluating business environment are explored based on business procedure and strategies 8. Technology in business is incorporated as per best practice |
| 1. Create entrepreneurial awareness | 1. ***Forms of businesses*** are explored as per business procedures and strategies 2. Sources of business finance are identified as per business procedures and strategies 3. Factors in selecting source of business finance are identified as per business procedures and strategies 4. ***Governing policies*** on Small Scale Enterprises (SSEs) are determined as per business procedures and strategies 5. Problems of starting and operating SSEs are explored as per business procedures and strategies |
| 1. Apply entrepreneurial motivation | 1. ***Internal and external motivation*** factors are determined in accordance with motivational theories 2. Self-assessment is carried out as per entrepreneurial orientation 3. Effective communications are carried out in accordance with communication principles 4. Entrepreneurial motivation is applied as per motivational theories |
| 1. Develop innovative business strategies | 1. Business innovation strategies are determined in accordance with the organization strategies 2. Creativity in business development is demonstrated in accordance with business strategies 3. ***Innovative business strategies*** are developed as per business principles 4. Linkages with other entrepreneurs are created as per best practice 5. ICT is incorporated in business growth and development as per best practice |
| 1. Develop Business Plan | 1. Identified Business is described as per business procedures and strategies 2. Marketing plan is developed as per business plan format 3. Organizational/Management plan is prepared in accordance with business plan format 4. Production/operation plan in accordance with business plan format 5. Financial plan is prepared in accordance with the business plan format 6. Executive summary is prepared in accordance with business plan format 7. Business plan is presented as per best practice |

**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.

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| --- | --- |
| **Variable** | **Range** |
| 1. Types of entrepreneurs may include but not limited to: | * Innovators * Imitators * Craft * Opportunistic * Speculators |
| 1. Characteristics of Entrepreneurs may include but not limited to: | * Creative * Innovative * Planner * Risk taker * Networker * Confident * Flexible * Persistent * Patient * Independent * Future oriented * Goal oriented |
| 1. Requirements for entry into self-employment may include but not limited to | * Technical skills * Management skills * Entrepreneurial skills * Resources * Infrastructure |
| 1. Internal and external motivation may include but not limited to: | * Interest * Passion * Freedom * Prestige * Rewards * Punishment * Enabling environment * Government policies |
| 1. Business environment may include but not limited to: | * External * Internal * Intermediate |
| 1. Forms of businesses may include but not limited to: | * Sole proprietorship * Partnership * Limited companies * Cooperatives |
| 1. Governing policies may include but not limited to: | * Increasing scope for finance * Promoting cooperation between entrepreneurs and private sector * Reducing regulatory burden on entrepreneurs * Developing IT tools for entrepreneurs |
| 1. Innovative business strategies may include but not limited to: | * New products * New methods of production * New markets * New sources of supplies * Change in industrialization |

**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
* Management
* Problem-solving
* Root-cause analysis
* Communication

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Decision making
* Business communication
* Change management
* Competition
* Risk
* Net working
* Time management
* Leadership
* Factors affecting entrepreneurship development
* Principles of Entrepreneurship
* Features and benefits of common operational practices, e. g., continuous improvement (kaizen), waste elimination,
* Conflict resolution
* Health, safety and environment (HSE) principles and requirements
* Customer care strategies
* Basic financial management
* Business strategic planning
* Impact of change on individuals, groups and industries
* Government and regulatory processes
* Local and international market trends
* Product promotion strategies
* Market and feasibility studies
* Government and regulatory processes
* Local and international business environment
* Relevant developments in other industries
* Regional/ County business expansion strategies

**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 | 1. Assessment requires evidence that the candidate: 2. Distinguished entrepreneurs and businesspersons correctly 3. Identified ways of becoming an entrepreneur appropriately 4. Explored factors affecting entrepreneurship development appropriately 5. Analysed importance of self-employment accurately 6. Identified requirements for entry into self-employment correctly 7. Identified sources of business ideas correctly 8. GeneratedBusiness ideas and opportunities correctly 9. Analysed business life cycle accurately 10. Identified legal aspects of business correctly 11. Assessed product demand accurately 12. Determined Internal and external motivation factors appropriately 13. Carried out communications effectively 14. Identified sources of business finance correctly 15. Determined Governing policy on small scale enterprise appropriately 16. Explored problems of starting and operating SSEs effectively 17. Developed Marketing, Organizational/Management, Production/Operation and Financial plans correctly 18. Prepared executive summary correctly 19. Determined business innovative strategies appropriately 20. Presented business plan effectively |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place |
| 1. Methods of Assessment | 1. Written tests 2. Oral questions 3. Third party report 4. Interviews 5. Portfolio of Evidence |
| 1. Context of Assessment | Competency may be assessed   1. On-the-job 2. Off-the –job 3. During Industrial attachment |
| 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:** ICT/OS/CP/BC/05/6/A

**UNIT DESCRIPTON**

This unit covers competencies required to demonstrate employability skills. It involves conducting self-management, demonstrating interpersonal communication, critical safe work habits, leading a workplace team, planning and organizing work, maintaining professional growth and development, demonstrating workplace learning, problem solving skills and managing ethical performance.

**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. Emotional intelligence is demonstrated 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 based on workplace instructions. 6. Self-esteem and a positive self-image are developed and maintained based on values. 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 based on personal objectives |
| 1. Demonstrate interpersonal communication | 1. Writing skills are demonstrated as per communication policy 2. Negotiation and persuasion skills are demonstrated as per communication policy 3. Internal and external stakeholders’ needs are identified and interpreted as per the communication policy 4. Communication networks are established based on workplace policy 5. Information is shared as per communication policy |
| 1. Demonstrate critical safe work habits | * 1. Stress is managed in accordance with workplace policy.   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. ***Resources*** are utilized in accordance with workplace policy.   5. Work priorities are set in accordance to workplace goals and objectives.   6. Leisure time is recognized and utilized in line with personal objectives.   7. ***Drugs and substances of abuse*** are identified and avoided based on workplace policy.   8. HIV and AIDS prevention awareness is demonstrated in line with workplace policy.   9. Safety consciousness is demonstrated in the workplace based on organization safety policy.   10. ***Emerging issues*** are identified and dealt with in accordance with organization policy. |
| 1. Lead a workplace team | 1. Performance targets for the ***team*** are set based on organization’s objectives 2. Duties are assigned in accordance with the organization policy. 3. ***Forms of communication*** in a team are established according to organization’s policy. 4. Team performance is evaluated based on set targets as per workplace policy. 5. Conflicts are resolved between team members in line with organization policy. 6. Gender related issues are identified and mainstreamed in accordance workplace policy. 7. Human rights and fundamental freedoms are identified and respected as Constitution of Kenya 2010. 8. Healthy relationships are developed and maintained in line with workplace. |
| 1. Plan and organize work | 1. Work plans are prepared based on activities and budget. 2. Assigned tasks are interpreted and expectations identified as per the workplace instructions. 3. Task occupational safety and health requirements are identified and observed regulations. 4. Work resources are identified, mobilized, allocated and utilized based on organization work plans. 5. Work activities are monitored and evaluated in line with work plans and workplace policy. 6. Work plans are reviewed based on target and available resources. |
| 1. Maintain professional growth and development | * 1. Personal training needs are identified and assessed in line with the requirements of the job.   2. ***Training and career opportunities*** are identified and utilized based on job requirements.   3. Resources for training are mobilized and allocated based organizations and individual skills needs.   4. Licensees and certifications relevant to job and career are obtained and renewed as per policy.   5. Work priorities and personal commitments are balanced and managed based on requirements of the job and personal objectives.   6. Recognitions are sought as proof of career advancement in line with professional requirements. |
| 1. Demonstrate workplace learning | * 1. Learning opportunities are sought and managed based on job requirement and organization policy.   2. Improvement in performance is demonstrated based on courses attended.   3. Application of learning is demonstrated in both technical and non-technical aspects based on requirements of the job   4. Time and effort is invested in learning new skills based on job requirements   5. Initiative is taken to create more effective and efficient processes and procedures in line with workplace policy.   6. New systems are developed and maintained in accordance with the requirements of the job.   7. Awareness of personal role in workplace ***innovation*** is demonstrated based on requirements of the job. |
| 1. Demonstrate problem solving skills | * 1. Creative, innovative and practical solutions are developed based on the problem   2. Independence and initiative in identifying and solving problems is demonstrated based on requirements of the job.   3. Team problems are solved as per the workplace guidelines   4. Problem solving strategies are applied as per the workplace guidelines   5. Problems are analyzed and assumptions tested as per the context of data and circumstances |
| 1. Manage ethical performance | * 1. Policies and guidelines are observed as per the workplace requirements   2. Self-worth and professionalism is exercised in line with personal goals and organizational policies   3. Code of conduct is observed as per the workplace requirements   4. Integrity is demonstrated as per legal requirement |

**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.

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| --- | --- |
| **Variable** | **Range** |
| 1. Drug and substance abuse may include but not limited to: | Commonly abused   * Alcohol * Tobacco * Miraa * Over-the-counter drugs * Cocaine * Bhang * Glue |
| 1. Feedback may include but not limited to: | * Verbal * Written * Informal * Formal |
| 1. Relationships may include but not limited to: | * Man/Woman * Trainer/trainee * Employee/employer * Client/service provider * Husband/wife * Boy/girl * Parent/child * Sibling relationships |
| 1. Forms of communication may include but not limited to: | * Written * Visual * Verbal * Non verbal * Formal and informal |
| 1. Team may include but not limited to: | * Small work group * Staff in a section/department * Inter-agency group |
| 1. Personal growth may include but not limited to: | * Growth in the job * Career mobility * Gains and exposure the job gives * Net workings * Benefits that accrue to the individual as a result of noteworthy performance |
| 1. Personal objectives may include but not limited to: | * Long term * Short term * Broad * Specific |
| 1. Trainings and career opportunities may includes but not limited to | * Participation in training programs * Serving as Resource Persons in conferences and workshops |
| 1. Resource may include may but not limited to: | * Human * Financial * Technology |
| 1. Innovation may include but not limited to: | * New ideas * Original ideas * Different ideas * Methods/procedures * Processes * New tools |
| 1. Emerging issues may include but not limited to: | * Terrorism * Social media * National cohesion * Open offices |
| 1. Range of media for learning may 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:

* Interpersonal
* Communication
* Critical thinking
* Organizational
* Negotiation
* Monitoring
* Evaluation
* Record keeping
* Problem solving
* Decision Making
* Resource utilization
* Resource mobilization

**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
* Workplace communication
* Concept of time
* Time management
* Decision making
* Types of resources
* Work planning
* Organizing work
* Monitoring and evaluation
* Record keeping
* Gender mainstreaming
* HIV and AIDS
* Drug and substance abuse
* Professional growth and development
* Technology in the workplace
* Innovation
* Emerging 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. Conducted self-management   2. Demonstrated interpersonal communication   3. Demonstrated critical safe work habits   4. Demonstrated the ability to lead a workplace team   5. Planned and organized work   6. Maintained professional growth and development   7. Demonstrated workplace learning   8. Demonstrated problem solving skills   9. Demonstrated the ability to manage performance ethically |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Observation 2. Oral questioning 3. Written test 4. Portfolio of Evidence 5. Interview 6. Third party report |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. Off-the –job 3. During Industrial attachment |
| 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:** ICT/OS/CP/BC/06/6/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to demonstrate environmental literacy. It involves, controlling environmental hazard and environmental pollution, demonstrating sustainable resource use, evaluating current practices in relation to resource usage, identifying environmental legislations/conventions for environmental concerns, implementing specific environmental programs, monitoring activities on environmental protection/Programs , analyzing resource use and developing resource conservation plans

**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 according to environmental regulations and OSHS. 3. ***PPE*** is used according to OSHS. |
| 1. Control environmental Pollution | * 1. Environmental pollution ***control measures*** are implemented in accordance with international protocols.   2. Procedures for solid waste management are observed according Environmental Management and Coordination Act 1999   3. Methods for minimizing noise pollution is complied with based on Noise and Excessive Vibration Pollution and Control Regulations, 2009 |
| 1. Demonstrate sustainable resource use | * 1. Methods for minimizing wastage are complied with based on organizational waste management guide   2. Waste management procedures are employed following principles of 3Rs (Reduce, Reuse, Recycle)   3. Methods for economizing and reducing resource consumption are practiced as per the Constitution of Kenya 2010 Article 69 . |
| 1. Evaluate current practices in relation to resource usage | * 1. Information on resource efficiency systems and procedures are collected and provided as per work groups/sector   2. Current resource usage is measured and recorded as per 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. |
| 1. Identify environmental legislations/conventions for environmental concerns | 1. Environmental legislations/conventions and local ordinances are identified according to the different environmental aspects/impact 2. Industrial standard/environmental practices are described according to the different environmental concerns |
| 1. Implement specific environmental programs | 1. Programs/Activities are identified according to organizations policies and guidelines. 2. Individual roles/responsibilities are determined and performed based on the activities identified. 3. Problems/constraints encountered are resolved in accordance with organizations’ policies and guidelines 4. Stakeholders are consulted based on company guidelines |
| 1. Monitor activities on Environmental protection/Programs | 1. Activities are periodically monitored and Evaluated according to the objectives of the environmental program 2. Feedback from stakeholders are gathered and considered in Proposing enhancements to the program based on consultations 3. Data gathered are analyzed based on Evaluation requirements 4. Recommendations are submitted based on the findings 5. Management support systems are set/established to sustain and enhance the program 6. Environmental incidents are monitored and reported to 7. concerned/proper authorities |
| 1. Analyze resource use | 1. All resource consuming processes are Identified as per the organizational work plan 2. Quantity and nature of resource consumed is determined based on processes 3. Resource flow is analyzed as per different parts of the process. 4. Wastes are classified according to NEMA regulations on waste management. |
| 1. Develop resource Conservation plans | 9.1. Efficiency of use/conversion of resources is determined according to industry protocol.  9.2. Causes of low efficiency of use of resources are Determined based on industry protocol.  9.3. Plans for increasing the efficiency of resource use are developed based on findings. |

**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.

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| **Variable** | **Range** |
| 1. PPE may include but not limited to | * + Mask   + Gloves   + Goggles   + Safety hat   + Overall * Hearing protector |
| 1. Control measures may include but not limited to | * Methods for minimizing or stopping spread and ingestion of airborne particles * Methods for minimizing or stopping spread and ingestion of gases and fumes * Methods for minimizing or stopping spread and ingestion of liquid wastes |

**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:

* Measuring
* Recording
* Analytical
* Monitoring
* Communication
* Writing

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* PPEs
* Environmental regulations
* OSHS
* Pollution
* Waste management
* Principle of 3Rs
* Types of resources
* Techniques in measuring current usage of resources
* Environmental hazards
* Regulatory requirements

**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. Controlled environmental hazard   2. Controlled environmental pollution   3. Demonstrated sustainable resource use   4. Evaluated current practices in relation to resource usage   5. Demonstrated knowledge of environmental legislations and local ordinances according to the different environmental issues /concerns.   6. Described industrial standard environmental practices according to the different environmental issues/concerns.   7. Resolved problems/ constraints encountered based on management standard procedures   8. Implemented and monitored environmental practices on a periodic basis as per company guidelines   9. Recommended solutions for the improvement of the program   10. Monitored and reported to proper authorities any environmental incidents |
| 1. Resource Implications | The following resources should be provided:   * 1. Workplace with storage facilities   2. Tools, materials and equipment relevant to the tasks (e.g. Cleaning tools, cleaning materials, trash bags)   3. PPE, manuals and references   4. Legislation, policies, procedures, protocols and local ordinances relating to environmental protection   5. Case studies/scenarios relating to environmental Protection |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Observation   2. Oral questioning   3. Written test   4. Portfolio of Evidence   5. Interview   6. Third party report |
| 1. Context of Assessment | Competency may be assessed   1. On-the-job 2. Off-the –job 3. During Industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# DEMONSTRATE OCCUPATIONAL SAFETY AND HEALTH PRACTICES

**UNIT CODE:** ICT/OS/CP/BC/07/6/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to demonstrate occupational health and safety practices. It involves identifying workplace hazards and risks, identifying and implementing appropriate control measures to hazards and risks and implementing OSH programs, procedures and policies/guidelines.

**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 workplace hazards and risk | 1.1 ***Hazards*** in the workplace are identified ***based their indicators***  1.2 Risks and hazards are evaluated based on legal requirements.  1.3 ***OSH concerns*** raised by workers are addressed as per legal requirements. |
| 1. Control OSH hazards | 2.1 Hazard prevention ***and control measures*** are implemented as per legal requirement.  2.2 Risk assessment is conductedand a risk matrix developed based on likely impact.  2.3 ***Contingency measures***, including ***emergency procedures*** during workplace ***incidents and emergencies*** are recognized and established in accordance with organization procedures. |
| 1. Implement OSH programs | 3.1 Company OSH program are identified, evaluated and reviewed based on legal requirements.  3.2 Company OSH programs are implemented as per legal requirements.  3.3 Workers are capacity built on OSH standards and procedures as per legal requirements  3.4 ***OSH-related records*** are maintained as per legal requirements. |

**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. Hazards may include but not limited to: | * Physical hazards – impact, illumination, pressure, noise, * vibration, extreme temperature, radiation * Biological hazards- bacteria, viruses, plants, parasites, mites, molds, fungi, insects * Chemical hazards – dusts, fibers, mists, fumes, smoke, gasses, vapors * Ergonomics * Psychological factors – over exertion/ excessive force,   awkward/static positions, fatigue, direct pressure,   * varying metabolic cycles * Physiological factors – monotony, personal relationship, work out cycle * Safety hazards (unsafe workplace condition) –confined space, excavations, falling objects, gas leaks, electrical, poor storage of materials and waste, spillage, waste and debris * Unsafe workers’ act (Smoking in off-limited areas, Substance and alcohol abuse at work) |
| 1. Indicators may include but not limited to: | * Increased of incidents of accidents, injuries * Increased occurrence of sickness or health complaints/ symptoms * Common complaints of workers related to OSH * High absenteeism for work-related reasons |
| 1. OSH concerns may include but not limited to: | * Workers’ experience/observance on presence of work hazards * Unsafe/unhealthy administrative arrangements (prolonged work hours, no break time, constant overtime, scheduling of tasks) * Reasons for compliance/non-compliance to use of PPEs or other OSH procedures/policies/guidelines |
| 1. Safety gears /PPE (Personal Protective Equipment) may include but not limited to: | * Arm/Hand guard, gloves * Eye protection (goggles, shield) * Hearing protection (ear muffs, ear plugs) * Hair Net/cap/bonnet * Hard hat * Face protection (mask, shield) * Apron/Gown/coverall/jump suit * Anti-static suits * High-visibility reflective vest |
| 1. Appropriate risk controls   may include but not limited to: | * Appropriate risk controls in order of impact are as follows: * Eliminate the hazard altogether (i.e., get rid of the dangerous machine) * Isolate the hazard from anyone who could be harmed (i.e., keep the machine in a closed room and operate it remotely; barricade an unsafe area off) * Substitute the hazard with a safer alternative (i.e., replace the machine with a safer one) * Use administrative controls to reduce the risk (i.e., train workers how to use equipment safely; train workers about the risks of harassment; issue signage) * Use engineering controls to reduce the risk (i.e., attach guards to the machine to protect users) * Use personal protective equipment (i.e., wear * gloves and goggles when using the machine) |
| 1. Contingency measures may include but not limited to: | * Evacuation * Isolation * Decontamination * (Calling designed) emergency personnel |
| 1. Incidents and emergencies may include but not limited to: | * Chemical spills * Equipment/vehicle accidents * Explosion * Fire * Gas leak * Injury to personnel * Structural collapse * Toxic and/or flammable vapors emission. |
| 1. OSH-related Records may include but not limited to: | * Medical/Health records * Incident/accident reports * Sickness notifications/sick leave application * OSH-related trainings obtained |

**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
* Interpersonal
* Presentation
* Risk assessment
* Evaluation
* Critical thinking
* Problem solving
* Negotiation

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* General OSH Principles
* Occupational hazards/risks recognition
* OSH organizations providing services on OSH evaluation and/or work environment measurements (WEM)
* National OSH regulations; company OSH policies and protocols
* Systematic gathering of OSH issues and concerns
* General OSH principles
* National OSH regulations
* Company OSH and recording protocols, procedures and policies/guidelines
* Training and/or counseling methodologies and strategies

**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 hazards in the workplace based their indicators 2. Evaluated workplace hazards based on legal requirements. 3. Addressed OSH concerns raised by workers as per legal requirements. 4. Implemented hazard prevention and control measures as per legal requirement. 5. Conducted risk assessment as per legal requirement. 6. Developed risk matrix based on likely impact. 7. Recognized and established contingency measures in accordance with organization procedures. 8. Identified, evaluated and reviewed company OSH program based on legal requirements. 9. Implemented company OSH programs as per legal requirements. 10. Capacity built workers on OSH standards and procedures as per legal requirements 11. Maintained OSH-related records as per legal requirements. |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Observation 2. Oral questioning 3. Written test 4. Portfolio of Evidence 5. Interview 6. Third party report |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. Off-the –job 3. During Industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# COMMON UNIT OF COMPETENCY

# APPLY BASIC ELECTRONIC SKILLS

**UNIT CODE:** ICT/OS/CP/CC/01/6/A

**Unit description**

This unit specifies the competencies required to apply basic electronics skills. It involves identifying electric circuits and electronic components, understanding semi-conductor theory, identifying and classifying memories, applying number systems and binary coding and identifying emerging trends in electronics.

**ELEMENTS AND PERFORMANCE CRETIRIA**

|  |  |
| --- | --- |
| **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 electrical circuits | * 1. Electrical circuit are identified   2. ***Electrical quantities and their units*** are identified   3. ***Types of electrical circuits*** are identified |
| 1. Identify electronic components | * 1. Identification of electrical components is done   2. Characteristic of electroniccomponents are identified   3. Application of electronic components are Identified   4. Characteristics of integrated circuit are identified |
| 1. Understand semi-conductor theory | 3.1 Explanation of semiconductor theory is done  3.2 Structure of matter is described  3.3 Electrons in conductors and semiconductors are explained  3.4 Types of semiconductor materials are identified  3.5 P-type and N-type materials are explained  3.6 Description of P-N junction diodes operations is done  3.7 ***Types and operations of transistors*** are identified |
| 1. Identify and classify memory | 4.1 ***Types of memories*** are identified  4.2 Memory hierarchy is identified  4.3 ***Levels of memory storage*** are identified  4.3 ***Classification of memories*** is done |
| 1. Apply number systems and binary coding | * 1. ***Types of number systems*** are identified   2. Base conversion is done   3. Binary arithmetic operations are done   4. ***Binary codes*** are identified   5. Representation of decimals in BCD is done   6. BCD arithmetic are performed |
| 1. Identify emerging trends in Electronics | * 1. Description of emerging trends is done   2. Challenges of emerging trends are explained   3. Explanation on coping with the emerging trends is done |

**RANGE**

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

| **Variable** | **Range** |
| --- | --- |
| 1. Electrical quantities and their unitsmay include but is not limited to: | E.M.F in volts   * + Power in watts   + Energy in joules   + Resistance in ohms   + Current in amperes |
| 1. Types of electrical circuits may include but is not limited to: | * + AC – Alternating Current   + DC – Direct Current |
| 1. Types and operations of transistors may include but is not limited to: | * + Types * PNP * NPN * Operations * Forward biasing * Reverse Biasing |
| 1. Types of memories may include but is not limited to: | * Semi-conductor * Magnetic * Optical |
| 1. Levels of memory storage may include but is not limited to: | * Internal * Main * Online * Offline bulk |
| 1. Classification of memories may include but is not limited to: | * RAM * ROM |
| 1. Types of number systems may include but is not limited to: | * Decimal * Binary * Octal * Hexadecimal * Binary Arithmetic’s |
| 1. Binary codes may include but is not limited to: | * 8421 BCD * Excess 3 * BCD arithmetic’s |

**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:

* Communications (verbal and written);
* Proficient in ICT
* Time management
* Problem solving
* Decision making
* First aid

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Electrical Components
* Electrical Quantities and units of measurement
* Electrical circuits
* Semiconductor theory
* Number systems
* Types of Computer memories

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Identified Electrical Components, quantities and their units of measurement   2. Constructed a simple circuit   3. Identified types of transistors and their operations   4. Categorized the memories according to their levels, types and hierarchy   5. Identified the number systems, binary codes and their operations. |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place |
| 1. Methods of Assessment | Competency may be assessed through:  3.1 Observation  3.2 Oral questioning  3.3 Practical demonstration |
| 1. Context of Assessment | Competency may be assessed   1. Off the job 2. on the job 3. During industrial attachment |
| 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

# UNDERSTAND COMPUTING BASICS

**UNIT CODE:** ICT/OS/CP/CR/01/6/A

**UNIT DESCRIPTION:**

This unit covers the competence to understand computing basics. It involves understanding computer system models, outlining computer components, demonstrating data representation techniques, understanding basic network concepts, recognizing ethical, legal and social issues in computing

**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. Understand computer system models | * 1. Computer system is defined   2. Computer systems are classified based on functions   3. Features of general-purpose computers are explained   4. Features of special purpose computers are explained. |
| 1. Outline computer components | * 1. Hardware and software are defined   2. ***Types of software*** are outlined   3. Functions of hardware are outlined according to manufacturer’s specifications   4. Functions of software are outlined according to manufacturer’s specifications   5. Troubleshooting of a computer is demonstrated |
| 1. Demonstrate data representation techniques | 1. Definition of terms is done 2. ***Data formats*** are explained 3. ***Methods of data representation*** are explained |
| 1. Understand basic network concepts | 1. Terms are defined 2. ***Components of a network*** are explained 3. ***Types of networks*** are explained 4. ***Network topologies*** are identified based on IEEE standards 5. Benefits of network are highlighted 6. Requirements for internet connection are explained 7. ***IP Address types*** are explained 8. Network troubleshooting is defined 9. Network troubleshooting tools are demonstrated |
| 1. Recognize ethical, social and legal issues in computing | 1. Definition of Computing Ethics is done 2. Legal and ethical issues in computing are identified based on guidelines of regulatory bodies 3. Social issues and emerging trends in computing are explained. |

**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. Types of softwaremay include but is not limited to: | * Application software * System software * Utility software * Language translators |
| 1. Data formats may include but is not limited to: | * Text * Audio * Images * Video |
| 1. Methods of data representation may include but is not limited to: | * Bit * Byte * Pattern |
| 1. Components of a network may include but is not limited to: | * + Hub   + Network interface card   + Switch   + Connecting media   + Network OS |
| 1. Types of networks may include but is not limited to: | * + LAN   + WAN   + MAN   + PAN |
| 1. Network topologies may include but is not limited to: | * + Star   + Bus   + Ring   + Mesh |
| 1. IP Address types may include but is not limited to: | * + Static   + Dynamic |

**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:

* Communications (verbal and written);
* Time management;
* Decision making
* Planning
* Research

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Components of a computer
* Computer system models
* Data representation techniques
* Basic concepts of networking
* Ethical, social and legal issues in computing.

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   1. Outlined functions of different components of a computer 2. Explained features of different classes of computer systems 3. Explained different methods of data representation 4. Outlined data representation techniques 5. Explained different types of networks 6. Explained requirements for internet connection. 7. Demonstrated use of basic networking troubleshooting tools 8. Demonstrated basic computer troubleshooting skills |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Oral test   2. Observation   3. Practical demonstration   4. Written test |
| 1. Context of Assessment | Competency may be assessed   1. Off the job 2. on the job 3. During industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# APPLY DISCRETE MATHEMATICAL CONCEPTS

**UNIT CODE:** ICT/OS/CP/CR/02/6/A

**UNIT DESCRIPTION:**

This unit covers the competence to apply discrete mathematical concepts. It involves illustrating Boolean Algebra expression, carrying out Set Theory operations, performing Matrix operations, illustrating Relations and Functions, carrying out Recursion, performing Sequences and Series and demonstrating Graph theory.

**ELEMENTS AND PERFORMANCE CRETIRIA**

|  |  |
| --- | --- |
| **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. Illustrate Boolean Algebra expressions | 1. Boolean algebra is defined 2. Purpose of Boolean algebra is outlined 3. ***Key terminology in Boolean algebra*** are explained 4. ***Basic Boolean operations*** are outlined 5. ***Secondary operations*** are outlined 6. Writing of Boolean Expressions is illustrated 7. ***Methods of simplifying Boolean expressions*** are illustrated 8. ***Boolean Laws and Theorems*** are illustrated 9. Simplification rules for Boolean expressions are illustrated |
| 1. Carry out Set Theory operations | 1. Set is defined 2. ***Characteristics of sets*** are outlined 3. ***Methods of Set representation*** are illustrated 4. Cardinality of a set explained 5. ***Types of sets*** are illustrated 6. Venn Diagrams are illustrated 7. ***Set Operations*** are illustrated |
| 1. Perform Matrix operations | 1. Matrix is defined 2. Matrix order is explained 3. ***Types of matrices*** are explained 4. Singular and non-singular matrices are explained 5. ***Matrix operations*** are illustrated 6. Transpose of a matrix is illustrated 7. Properties of transpose of a matrix are outlined 8. Adjoint of a square matrix is illustrated 9. Inverse of a square matrix is illustrated 10. Trace of a matrix is illustrated 11. Application of matrices are outlined |
| 1. Illustrate relations and functions | 1. Relation is defined 2. Domain and range of a Relation are illustrated 3. ***Types of Relations*** are illustrated 4. Function is defined 5. ***Types of Functions*** are illustrated |
| 1. Carry out recursion | 1. Recursion is defined 2. Recursion in exponents is illustrated 3. Recurrence Relations are illustrated 4. ***Types of Recursion Relations*** are illustrated |
| 1. Perform sequence and series | 1. ***Key terms of sequences*** are explained 2. Summation of a sequence is illustrated 3. Arithmetic series (Summation) is illustrated 4. Geometric series (Summation) is illustrated |
| 1. Demonstrate graph theory | 1. Graphs is defined 2. ***Key Graph terminologies*** are explained 3. ***Types of graphs*** are illustrated 4. ***Representation of graphs*** are illustrated 5. Application of graphs are outlined |

**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. Key terminology in Boolean algebramay include but is not limited to: | * Boolean value * Boolean function * Truth table * Logic gate * Digital logic |
| * + 1. Basic Boolean Operations may include but is not limited to: | * AND * OR * NOT |
| * + 1. Secondary Operations may include but is not limited to: | * NAND * NOR * X-OR * X-NOR |
| 1. Methods of simplifying Boolean expressions may include but is not limited to: | * Using algebraic functions * Using Truth tables * Using Karnaugh Maps |
| 1. Boolean Laws and Theorems may include but is not limited to: | * AND law * OR law * Inversion law * Commutative * Associative * Distributive * De-Morgan’s Theorems |
| 1. Characteristics of sets may include but is not limited to: | * Elements * Size |
| 1. Methods of Set representation may include but is not limited to: | * Statement form * Tabular form * Set builder notation |
| 1. Types of sets may include but is not limited to: | * Finite Set * Infinite Set * Subset * Proper Subset * Universal Set * Empty or Null * Equal * Equivalent Set * Singleton Set or Unit Set * Overlapping Set * Disjoint Set |
| 1. Set Operations may include but is not limited to: | * Set Union and Set Intersection * Set Difference/Relative Complement * Set Complement * Cartesian Product |
| 1. Types of matrices may include but is not limited to: | * Square * Symmetric * Skew-symmetric * Diagonal * Identity * Orthogonal * Idemponent * Involutary |
| 1. Matrix operations may include but is not limited to: | * Sum of two matrices * Sum of a matrix and a scalar * Matrix subtraction * Product of two matrices * Product of a matrix and a vector |
| 1. Types of Relations may include but is not limited to: | * Empty * Full * Identity * Reflexive * Irreflexive * Symmetric * Anti-symmetric * Transitive * Equivalence |
| 1. Types of Functions may include but is not limited to: | * One to one * Many to one |
| 1. Types of Recursion Relations may include but is not limited to: | * Linear * Binary * Multiple |
| 1. Key terms used in sequences may include but is not limited to: | * Sequence * Arithmetic Progression * Geometric Progression |
| 1. Key Graph Terminologies may include but is not limited to: | * Node * Edge * Adjacency * Vertex |
| 1. Types of graphs may include but is not limited to: | * Null * Simple * Multigraph * Directed graphs * Undirected |
| 1. Representations of graphs may include but is not limited to: | * Adjacency matrix * Adjacency list |

**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:

* Communications (verbal and written);
* Time management;
* Decision making;
* Research;
* Problem solving;

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Boolean Algebra
* Set Theory
* Matrices
* Relations and Functions
* Recursion
* Sequence and Series
* Graph Theory

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| * + 1. Critical Aspects of Competency | **Assessment requires evidence that the candidate:**   * 1. Performed Boolean algebra operations   2. Performed set operations   3. Performed matrix operations   4. Performed relations and functions operations   5. Performed recursion operations   6. Understood arithmetic and geometric sequences and series   7. Performed graph products |
| * + 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place |
| * + 1. Methods of Assessment | Competency may be assessed through:   1. Oral tests 2. Written tests |
| * + 1. Context of Assessment | Competency may be assessed   1. Off the job 2. on the job 3. During industrial attachment |
| * + 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# DEMONSTRATE PROGRAMMING CONCEPTS

**UNIT CODE:** ICT/OS/CP/CR/03/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required to program. It involves understanding programming basics, understanding the C# environment, performing data operations and using control statements.

**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. Understand programming basics | * 1. **Programming is defined**   2. ***Phases of program development* are explained**   3. ***Key terms used in programming*** are defined   4. ***Examples of programming languages*** are identified   5. ***Types of code*** are explained |
| 1. Understand the C# environment | * 1. C# installation is demonstrated   2. C# environment is explained   3. C# syntax is demonstrated |
| 1. Perform data operations | * 1. ***C# data types*** are outlined   2. Types of statements are explained   3. Variables and constants are explained   4. ***Data operations***are outlined   5. Program to perform specified operations is created. |
| 1. Use control statements | * 1. ***Types of Control Statements*** are identified   2. Uses of different control statements are demonstrated   3. Programs using control statements 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** |
| --- | --- |
| 1. Phases of program development may include but is not limited to: | * Establish program requirements * Design a program * Coding * Code test and debug * Document * Maintain |
| 1. Key terms used in programming may include but is not limited to: | * Algorithm * Source code * Executable * Compiling * Debugging |
| 1. Examples of programming languages may include but is not limited to: | * C++ * C# * Java |
| 1. Types of code may include but is not limited to: | * Source code * Object code * Machine code |
| 1. C# data types may include but is not limited to: | * float * integer * double |
| 1. Data operations may include but is not limited to: | * Number operations * String operations |
| 1. Types of control statements may include but is not limited to: | * Decision * Looping |

**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:

* Communications (verbal and written);
* Time management;
* Problem solving;
* Planning;
* Decision Making
* Research

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Programming concepts
* C++ environment
* Data operations
* Control statements

**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. Explained phases of program development   2. Demonstrated understanding of the C# environment   3. Created a program to perform data operations   4. Explained different types of control statements   5. Created a program using control statements   6. Carried out a project using C# |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place |
| 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   1. Off the job 2. on the job 3. During industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# DEMONSTRATE DATABASE DESIGN AND DEVELOPMENT

**UNIT CODE:** ICT/OS/CP/CR/04/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required to design and develop a database. It involves understanding database concepts, designing a database, performing data definition language operations, performing data manipulation language operations and using views.

**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. Understand database concepts | 1. **A database is defined** 2. ***Terminologies used with databases*** are defined 3. Reasons of using databases are explained 4. Relational Model is defined 5. Key concepts in relational modelling are outlined 6. Properties of a table/relation are explained 7. Relational Database Management Systems (RDBMSs) products are compared 8. Installation of MS SQL server is demonstrated 9. MS SQL server interface is explained 10. ***Properties of MS SQL server database*** are explained |
| 1. Design a database | 1. ***Phases of database design*** are explained 2. Entity modelling is explained 3. ***Entity model*** is designed using UML notation 4. Normalisation is defined 5. Normalisation is demonstrated 6. Validation of the model is done according to the requirements |
| 1. Perform data definition language operations | 1. Structured Query Language (SQL) is defined 2. ***Data definition queries*** are explained 3. A table is created using the SQL CREATE TABLE statement 4. ***CREATE TABLE statement constraints*** are demonstrated 5. The table schema is edited using the SQL ALTER statement 6. A table is dropped using the SQL DROP TABLE statement |
| 1. Perform data manipulation language operations | 1. ***Data manipulation query statements*** are explained 2. Records are retrieved using SELECT statement 3. Records are inserted using INSERT statement 4. Records are deleted using DELETE statement 5. Records are updated using UPDATE statement 6. SQL joins are explained 7. ***Types of joins*** are explained 8. A simple join is created |
| 1. Use views | * 1. Views are explained   2. Views are created using the CREATE VIEW statements   3. Views are updated using the REPLACE VIEW statements   4. Views are dropped using DROP VIEW statements |

**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** |
| --- | --- |
| 1. Terminologies used with databases may include but is not limited to: | * Table * Records * Field * DBMS |
| 1. Properties of MS SQL server database may include but is not limited to: | * Deleting a database * Deleting data or log files * Increasing database size * Shrinking database * Renaming database * Importing a database * Exporting a database |
| 1. Phases of database design may include but is not limited to: | * Conceptual design * Logical design * Physical design |
| 1. Entity model may include but is not limited to: | * Entity * Attribute * Relationship |
| 1. Data definition queries may include but is not limited to: | * CREATE * DROP * ALTER |
| 1. Create table statement constraints may include but is not limited to: | * Primary key * Foreign key * UNIQUE * CHECK * NOT NULL * DEFAULT |
| 1. Data manipulation query statements may include but is not limited to: | * INSERT * SELECT * UPDATE * DELETE |
| 1. Types of joins may include but is not limited to: | * Simple Join or Inner Join * Left Join * Right Join * Outer Join |

**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:

* Communications (verbal and written);
* Time management;
* Problem solving;
* Planning;
* Decision Making;
* Research;

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Database concepts
* Database design
* Data definition language operations
* Data manipulation language operations
* Views

**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. Explained reasons for using databases 2. Explained relational modeling concepts 3. Created an entity relationship model 4. Normalised database tables 5. Created, edited and dropped tables using SQL 6. Retrieved, added, removed and updated records using SQL statements 7. Retrieved data from several tables using joins 8. Created, edited and dropped views |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place |
| 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   1. Off the job 2. on the job 3. During industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# DESIGN ALGORITHMS AND DATA STRUCTURES

**UNIT CODE:** ICT/OS/CP/CR/05/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required to design algorithms and data structures. It involves understanding fundamental principles of algorithms and principles of data structures, demonstrating linked lists, representing stacks and queues, demonstrating search techniques, performing sorting techniques, illustrating graph data structure and tree data structure and performing recursion.

| **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. Understand fundamental principles of algorithms | * 1. An algorithm is defined   2. Characteristics of an Algorithm **are explained**   3. Algorithm **writing is demonstrated**   4. Algorithm Analysis is explained   5. ***Complexities of algorithms*** are explained   6. ***Greedy algorithms*** are outlined   7. Divide and conquer is demonstrated |
| 1. Understand fundamental concepts of data structures | * 1. ***Key concepts in data structures*** are explained   2. Arrays are explained   3. Array insertion operations are explained   4. Array delete, search and update are explained   5. Array operations are demonstrated using C# |
| 1. Demonstrate linked lists | * 1. Linked lists are explained   2. Doubly linked lists are explained.   3. Circular linked lists are explained.   4. ***Basic operations for the various linked lists*** are demonstrated using C# |
| 1. Represent stacks and queues | * 1. Stacks and queues are defined   2. Stack and queue representation are outlined   3. ***Basic operations in stacks*** are explained   4. ***Basic operations in Queue*** are explained   5. Basic operations in stacks and queue are demonstrated using C# |
| 1. Demonstrate search techniques | * 1. Search is defined   2. Linear Search is explained   3. Binary Search is explained   4. Search techniques are demonstrated using C# |
| 1. Perform sorting techniques | * 1. Sorting is defined   2. ***Categories of sorting techniques*** are outlined   3. ***Types of Sorting algorithms*** are explained   4. Sorting algorithms are demonstrated using C# |
| 1. Illustrate graph data structure | * 1. Graph Data Structure is explained   2. ***Graph Basic Operations*** are outlined   3. Traversals are explained   4. Shortest paths are explained   5. Shortest paths are demonstrated using C# |
| 1. Illustrate trees data structure | * 1. Trees Data Structure is explained   2. ***Tree Basic Operations*** are outlined   3. Tree Traversal is explained   4. Binary Search Tree is explained   5. Spanning trees are explained   6. Binary Search Tree is demonstrated using C# |
| 1. Perform recursion | * 1. Recursion is defined   2. ***Properties of a recursive function*** are explained   3. Recursion is demonstrated using C# |

**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** |
| --- | --- |
| * + 1. Complexitiesof algorithmsmay include but not limited to: | * Space * Time |
| * 1. Greedy algorithms may include but not limited to: | * Counting coins |
| * 1. Key concepts in data structures may include but not limited to: | * Data * Object * Type |
| * 1. Basic operations for various linked lists may include but not limited to: | * Insertion * Deletion * Reverse * Display |
| * 1. Basic operations in stacks may include but not limited to: | * Push * Pop |
| * 1. Basic operations in queues may include but not limited to: | * Enqueue * Dequeue |
| * 1. Categories of sorting techniques may include but not limited to: | * In place * Not in place * Stable * Not stable * Adaptive * Non-adaptive |
| * 1. Types of Sorting algorithms may include but not limited to: | * Bubble sort * Insertion sort * Selection sort |
| * 1. Graph basic operations may include but not limited to: | * AddNode * RemoveNode * Add Edge * Display Node |
| * 1. Tree basic operations may include but not limited to: | * Insert * Search |
| * 1. Properties of a recursive function may include but not limited to: | * Base criteria * Progressive approach |

**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:

* Communications (verbal and written);
* Time management;
* Problem solving;
* Planning;
* Decision Making;
* Research;

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Fundamental principles of algorithms
* Fundamental principles of data structures
* Linked lists
* Stacks and queues
* Search techniques
* Sorting techniques
* Graph data structure
* Tree data structure
* Recursion

**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. Wrote an algorithm   2. Demonstrated array operations   3. Demonstrated basic operations for the various linked lists   4. Demonstrated basic operations in stacks and queues   5. Demonstrated search techniques   6. Demonstrated sorting algorithms   7. Explained different graph traversals   8. Demonstrated graph shortest paths   9. Explained tree traversals   10. Demonstrated Binary Search Trees   11. Demonstrated recursion |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Oral questioning   2. Practical tests   3. Observation   4. Written test |
| 1. Context of Assessment | Competency may be assessed   1. Off the job 2. on the job 3. During industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# APPLY OBJECT ORIENTED CONCEPTS USING JAVA

**UNIT CODE:** ICT/OS/CP/CR/06/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required to apply object-oriented programming concepts using Java. It involves understanding the concepts of object-oriented programming, creating classes and objects, implementing inheritance and polymorphism.

**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. Understand concepts of Object-Oriented Programming | * 1. Object oriented programming is defined   2. ***Key terminologies*** ***of object oriented programming*** are defined   3. Applications of object oriented programming are explained   4. Benefits of object oriented programming are outlined   5. Java Development Kit (JDK) is installed   6. Java programming environment is explained   7. Features of Java are outlined   8. ***Java syntax*** is explained |
| 1. Create classes and objects | * 1. ***Class components*** are explained   2. Access modifiers are explained.   3. Classes are designed from a set of requirements   4. Classes are created from the proposed design   5. Relevant objects are created from the classes   6. Proposed operations are performed using the class methods |
| 1. Implement inheritance | * 1. Concept of inheritance is explained   2. ***Key terminologies related to inheritance*** are defined   3. ***Types of inheritance*** are explained   4. Inheritance based designs are created from different requirements   5. Program solution is implemented from proposed design |
| 1. Implement polymorphism | * 1. Concept of polymorphism is explained   2. ***Key terminologies related to polymorphism*** are defined   3. ***Types of polymorphism*** are outlined   4. Method overriding and Method overloading are demonstrated   5. Polymorphic classes are designed from a set of requirements   6. Program solution is implemented from proposed design |

**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** |
| --- | --- |
| 1. Key terminologies of Object-oriented programming may include but not limited to: | * Object * Class * Inheritance * Polymorphism * Abstraction * Data Encapsulation |
| 1. Java syntax may include but not limited to: | * Data operations * Control structures * Functions |
| 1. Class components may include but not limited to: | * Attributes * Methods * Destructors * Constructors |
| 1. Key terminologies related to inheritance may include but not limited to: | * Base class * Derived class |
| 1. Types of inheritance may include but not limited to: | * Single inheritance * Hybrid * Hierarchical * Multilevel inheritance |
| 1. Key terminologies related to Polymorphism may include but not limited to: | * Polymorphic class * Abstract class * Virtual Method * Method overriding * Method overloading |
| 1. Types of Polymorphism may include but not limited to: | * Run time Polymorphism * Compile Time Polymorphism |

**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:

* Communications (verbal and written);
* Time management;
* Problem solving;
* Planning;
* Decision Making;
* Research;

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Concepts of Object oriented programming
* Classes and Objects
* Inheritance
* Polymorphism

**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. **Explained applications of Object Oriented Programming** 2. **Designed classes based on set requirements** 3. Developed a program to implement designed classes 4. Designed inheritance based classes from a set of requirements 5. Developed a program to implement inheritance design 6. Designed polymorphic classes from a set of requirements 7. Developed a program to implement polymorphic design |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Oral questioning   2. Practical tests   3. Observation   4. Written test |
| 1. Context of Assessment | Competency may be assessed   1. Off the job 2. on the job 3. During industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# APPLY EVENT DRIVEN PROGRAMMING CONCEPTS USING VB.Net

**UNIT CODE:** ICT/OS/CP/CR/07/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required to apply event driven programming concepts using VB.Net. It involves understanding event driven programming concepts, understanding the VB.Net environment, demonstrating VB.Net Syntax elements, using VB.Net basic controls, using events, using VB.Net dialogs, using advanced forms, understanding exception handling, connecting VB.NET applications to a database and deploying VB.Net applications.

**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. Understand event driven programming concepts | * 1. **Event Driven Programming approach is explained**   2. ***Key terminologies* in event driven programming are explained**   3. ***Phases of event driven programming*** are explained   4. Human Computer Interaction (HCI) concepts are explained |
| 1. Understand the VB.Net environment | * 1. The .Net framework is explained   2. Visual Studio is installed   3. ***Features of VB.Net*** are outlined   4. The IDE environment is explained   5. ***VB.Net program structure*** is explained   6. A VB.Net project is created and compiled |
| 1. Demonstrate VB.Net Syntax elements | * 1. ***Basic VB.Net data types*** are outlined   2. ***Type Conversion functions*** are outlined   3. Variables and Constants concepts and operations are demonstrated.   4. ***Decision making control structures*** are demonstrated   5. ***Looping control structures*** are demonstrated   6. Procedure is defined   7. ***Types of Procedures*** are explained   8. Sub Procedures are demonstrated   9. Functions are demonstrated   10. String class properties and methodsare demonstrated |
| 1. Use VB.Net basic controls | * 1. ***Basic VB.Net Controls*** are outlined   2. ***Elements of a control*** are explained   3. Basic VB.Net Controls’ Properties, Methods and Events are demonstrated |
| 1. Use Events | * 1. Event handler is defined   2. ***Types of events*** are explained   3. Mouse event handling is demonstrated   4. Keyboard event handling is demonstrated |
| 1. Use VB.Net dialogs Boxes | * 1. Uses of dialog boxes are explained   2. ***Key dialog classes, functions and methods*** are explained   3. ***Common Dialog classes*** are explained   4. Common Dialog classes’ properties and methods are demonstrated |
| 1. Use Advanced Forms | 7.1 ***VB.Net Menu and Sub Menu controls*** are demonstrated  7.2 Properties and events are added to the Menus and Sub Menus   * 1. Cutting, copying and pasting functionalities are demonstrated.   2. Modal forms are demonstrated |
| 1. Understand exception handling | * 1. Exception handling is explained   2. ***Exception handling keywords*** in VB.Net are outlined   3. ***Exception classes*** in the .Net framework are demonstrated.   4. User defined exceptions are demonstrated. |
| 1. Connect VB.Net applications to a database | * 1. ADO.Net object model is explained   2. Connection to a database using ***Data Provider components*** is demonstrated   3. Creation of tables using ***Dataset components*** is demonstrated |
| 1. Deploy VB.Net applications | 10.1 Deployment is explained  10.2 Deployment steps are outlined  10.3 deployment of a VB.Net project 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** |
| --- | --- |
| 1. **Key terminologies**may include but not limited to: | * Application * Event * Method * Object Property * Object * Control * Form * Design time * Run time |
| 1. Phases of event driven programming may include but not limited to: | * Design the user interface * Set object properties * Write event code * Test and debug application * Create an executable file * Deploy the application |
| 1. Features of VB.Net may include but not limited to: | * Modern, general purpose * Easy to learn * Compiled on a variety of platforms * Object Oriented * Component Oriented * Part of a .Net framework * Automatic Garbage Collection * Standard Library * Assembly Versioning * Delegates and Events Management * Easy-to-use Generics * Indexers * Conditional Compiling * Simple Multithreading |
| 1. VB.Net program structure may include but not limited to: | * Namespace declaration * Class or module * One or more procedures * Variables * The Main procedure * Statements and Expressions * Comments |
| 1. Basic VB.Net data types may include but not limited to: | * Strings * Floats * Integer * Boolean * Date * Byte * Character |
| 1. Type Conversion functions may include but not limited to: | * CDbl() * CDec() * Cint() * CDate() * CBool() |
| 1. Decision making control structures may include but not limited to: | * If.. Then statement * If..The..Else statement * If.. Else If.. Else statement * Nested If statements * Select Case statement * Nested Select Case statement |
| 1. Looping control structures may include but not limited to: | * Do..Loop * For..Next loop * Each..Next loop * While..End While Loop * With..End With loop * Nested Loop * Exit and Continue statement |
| 1. Types of procedures may include but not limited to: | * Functions * Sub Procedures |
| 1. Basic VB.Net controls may include but not limited to: | * Form * TextBox * Label * Button * ListBox * ComboBox * RadioButton * CheckBox * PictureBox * ProgressBar * ScrollBar * DateTimePicker * TreeView * ListView |
| 1. Elements of a control may include but not limited to: | * Properties * Methods * Events |
| 1. Types of events   may include but not limited to: | * Keyboard * Mouse |
| 1. Key dialog classes, functions and methods may include but not limited to: | * CommonDialog class * RunDialog() function * ShowDialog() method |
| 1. Common Dialog classes may include but not limited to: | * ColorDialog * FontDialog * FileDialog: OpenFileDialog, SaveFileDialog * PrintDialog * PageSetUpDialog |
| 1. VB.Net Menu and Sub Menu controls may include but not limited to: | * MenuStrip * StripMenuItem * ContextMenuStrip |
| 1. Exception Handling keywords may include but not limited to: | * Try * Catch * Finally * Throw |
| 1. Exception classes in the .Net framework may include but not limited to: | * System.IO.IOException * System.IndexOutOfRangeException * System.DividebyZeroException * System.OutOfMemoryException |
| 1. Data Provider Components may include but not limited to: | * Connection * Command * Data Reader * Data Adapter |
| 1. Data Set Components may include but not limited to: | * DataTableCollection * DataRelationCollection * DataTable * DataRowCollection * DataColumnCOllection * PrimaryKey |

**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:

* Communications (verbal and written);
* Time management;
* Problem solving;
* Planning;
* Decision Making
* Research

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Event driven programming concepts
* The VB.Net environment
* VB.NET syntax elements
* Basic controls
* Events
* VB.Net dialogs
* Advanced forms
* Exception handling
* Connecting VB.Net applications to a database
* Deploying VB.NET applications

**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. Explained event driven programming concepts   2. Demonstrated use of basic VB.NET syntax elements   3. Demonstrated interface design skills using basic controls   4. Demonstrated ability to set basic controls’ properties, use methods and initiate events   5. Demonstrated application of dialog boxes   6. Demonstrated use of Menu and Sub Menus in applications   7. Demonstrated Cutting, Copying and Pasting functionalities   8. Demonstrated application of modal forms   9. Demonstrated VB.Net exception handling techniques in application debugging   10. Demonstrated VB.Net applications’ connection to a database   11. Demonstrated deployment of VB.Net applications |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place |
| 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   1. Off the job 2. on the job 3. During industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# DEVELOP CLIENT-SIDE WEB APPLICATIONS

**UNIT CODE:** ICT/OS/CP/CR/08/6/A

**UNIT DESCRIPTION**

This unit specifies competencies required to develop client-side web applications. It involves understanding HTML basics, using HTML elements, demonstrating web page formatting, applying styles, understanding JavaScript basics, using JavaScript datatypes, using JavaScript functions and using JavaScript libraries

**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. Understand HTML basics | * 1. **HTML is defined**   2. ***Terminologies used in HTML*** are defined   3. A HTML file is created   4. ***HTML core elements*** are explained   5. HTML core elements are added to the file |
| * + 1. Use HTML elements | 1. ***Basic HTML elements*** are explained 2. Basic HTML elements are added to a HTML document 3. ***Attributes*** are defined 4. Attributes are added to elements |
| * + 1. Demonstrate web page formatting | 1. ***Layout elements*** are explained 2. Layout elements are added to the HTML document 3. ***Layout element attributes*** are added to the HTML document |
| * + 1. Apply styles | 1. ***Style concepts*** are explained 2. Internal styles are applied 3. External CSS file is created |
| * + 1. Understand JavaScript basics | 1. Purpose of JavaScript is highlighted 2. JavaScript syntax is outlined 3. Access to HTML element attributes is demonstrated using JavaScript Document Object Model (DOM) 4. Changing HTML element attributes is demonstrated using DOM |
| 1. Use JavaScript datatypes | 1. ***JavaScript datatypes*** are explained 2. Operations on the datatypes are demonstrated 3. ***Operations on arrays*** are demonstrated |
| 1. Use JavaScript functions | * 1. Structure of a JavaScript function is explained   2. A JavaScript function is created   3. A JavaScript function is invoked   4. Values are returned using functions |
| 1. Use JavaScript libraries | * 1. Concept of libraries is explained   2. JQuery framework is explained   3. Referencing of JQuery is demonstrated   4. JQuery syntax is demonstrated   5. ***JQuery events*** are explained   6. DOM Manipulation with JQuery 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** |
| --- | --- |
| 1. Terminologies used in HTML may include but not limited to: | * Document * Stylesheet * Element * Attribute |
| 1. HTML core elements may include but not limited to: | * <head> * <title> * <body> * <html> |
| 1. Basic HTML elements may include but not limited to: | * <p> * <br> * <h1> |
| 1. Attributes may include but not limited to: | * src * alt * href |
| 1. Layout elements may include but not limited to: | * <header> * <nav> * <section> * <footer> |
| 1. Layout element attributes may include but not limited to: | * Class * Id * name |
| 1. Style concepts may include but not limited to: | * Background * Padding * Alignment * Border |
| 1. JavaScript datatypes may include but not limited to: | * Strings * Numbers * Booleans |
| 1. Operations on arrays may include but not limited to: | * count() * pop() * push() |
| 1. JQuery events may include but not limited to: | * Mouse events * Keyboard events * Form events * Document / window events |

**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:

* Communications (verbal and written);
* Time management;
* Problem solving;
* Planning;
* Decision Making;
* Research;

**Required knowledge**

The individual needs to demonstrate knowledge of:

* HTML basics
* HTML elements
* Web page formatting
* Styling
* JavaScript basics
* JavaScript data types
* JavaScript functions
* JavaScript libraries

**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. Created a HTML document 2. Added attributes to HTML documents 3. Formatted a web page 4. Added styles to a web page 5. Explained the importance of JavaScript 6. Use JavaScript to change HTML elements 7. Demonstrated event handling in JQuery |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place |
| 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   1. Off the job 2. on the job 3. During industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**DEVELOP SERVER-SIDE WEB APPLICATIONS USING PHP**

**UNIT CODE:** ICT/OS/CP/CR/09/6/A

**UNIT DESCRIPTION**

This unit specifies competencies required to develop serve side web applications. It involves understanding server-side development concepts, understanding PHP basics, using PHP datatypes and their operators, using control statements, using arrays, using PHP Superglobals, developing forms, testing and debugging applications

**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. Understand server side development concepts | * 1. Server side development is explained   2. Key terminologies in server side development are defined   3. Server side development languages are outlined |
| * + - 1. Understand PHP basics | * 1. PHP is defined   2. An ***Apache distribution*** is installed   3. PHP syntax is outlined   4. A PHP file is created |
| * + - 1. Use PHP datatypes and their operators | * 1. ***PHP datatypes*** are explained   2. Variable declaration is demonstrated   3. Operators are demonstrated   4. PHP applications using data types are created |
| * + - 1. Use control statements | * 1. ***Types of Control Statements*** are identified   2. Uses of different control statements are demonstrated   3. PHP applications using control statements are created |
| * + - 1. Use arrays | * 1. Arraysare defined   2. Different ***types of arrays*** are created   3. ***Array functions*** are demonstrated   4. ***Array data processing*** ***operations*** is demonstrated.   5. PHP applications using arrays are created |
| 1. Use PHP Super globals | * 1. ***PHP Superglobals*** are defined   2. Uses of Superglobals are explained   3. $\_SESSION variable is demonstrated   4. PHP applications using Superglobals are created |
| 1. Develop forms | * 1. PHP forms are defined   2. Requirements of a form are explained   3. ***Form methods*** are demonstrated   4. Form validation is defined   5. ***Form validation functions*** are demonstrated   6. A contact form with attachment is created   7. Database storage is demonstrated |
| 1. Test and debug applications | * 1. Test parameters are identified   2. Test data is acquired   3. ***Types of errors*** are outlined   4. Error handling methods are demonstrated   5. Code profiling is done |

**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** |
| --- | --- |
| 1. Apache distribution may include but not limited to: | * XAMPP * WAMP * EasyPhp |
| 1. PHP datatypes may include but not limited to: | * Strings * Numbers * Array * Objects |
| 1. Types of control statements may include but not limited to: | * Decision(If….else if….else, switch) * Loops(for, while) |
| 1. Types of Arrays may include but not limited to: | * Associative arrays * Multi-dimensional arrays * Indexed arrays |
| 1. Array functions may include but not limited to: | * Pop * Push * Shift |
| 1. Array data processing operations may include but not limited to: | * + Arithmetic   + Calculation of array totals   + Calculation of array average   + Finding a value   + Finding largest and smallest values |
| 1. PHP Superglobals may include but not limited to: | * $\_GET * $\_POST * $\_SESSION * $\_SERVER |
| 1. Form methods may include but not limited to: | * POST * GET |
| 1. Form validation functions may include but not limited to: | * + stripslashes()   + htmlspecialchars()   + isset()   + isempty()   + preg\_match()   + filter\_var() |
| 1. Types of errors may include but not limited to: | * Syntax * Logic * Semantic |

**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:

* Communications (verbal and written);
* Time management;
* Problem solving;
* Planning;
* Decision Making;
* Research;
* Database

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Server side development concepts
* PHP basics
* PHP data types
* Control statements
* Arrays
* Superglobals
* Forms
* Testing and debugging applications

**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. Explained server side development concepts   2. Created a PHP file   3. Demonstrated use of PHP datatypes   4. Demonstrated use of control statements   5. Performed array operations   6. Created a contact form   7. Tested the contact form by retrieving data from the submitted form in PHP |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place |
| 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   1. Off the job 2. on the job 3. During industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# DEVELOP MOBILE APPLICATIONS

**UNIT CODE:** ICT/OS/CP/CR/10/6/A

**UNIT DESCRIPTION**

This unit specifies competencies required to develop mobile applications**.** It involves understanding mobile application concepts, understanding the mobile application development environment, identify application design issues, developing a mobile application, testing the developed mobile applications, publishing and commercializing the developed application.

**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. Understand mobile application concepts | * 1. Mobile application is defined   2. ***Mobile application development platforms*** are identified   3. ***Mobile application development approaches*** are identified   4. Reasons for mobile application development are identified. |
| 1. Understand mobile application development environment | * 1. Mobile Application Architecture and Design is identified   2. Mobile application development frameworks and tools are identified   3. Techniques and methodologies for mobile application development are introduced |
| 1. Identify application design issues | * 1. Mobile development lifecycle is explained   2. Overarching Design principles and Guidelines are explained   3. Mobile application ***navigation patterns*** are identified   4. User interface design is explained |
| 1. Develop mobile application | * 1. Design specification is created as per client needs   2. Appropriate mobile development software is installed   3. Configuration of the google play SDK is done   4. Creation of the project structure is done as per the design specification   5. Configuration of the AndroidManifest.XML file is done   6. ***Resources*** are defined in XML.   7. ***Framework components*** are defined   8. Project prototype is created as per the design specification.   9. Build the project prototype into a debug APK |
| 1. Test the developed mobile application | * 1. Testing techniques and procedures are identified   2. Debugging techniques are demonstrated   3. Testing and debugging of the application is done as per the design specification |
| 1. Publish and Commercialize the developed Application | * 1. Application distribution through application stores is done   2. Monetizing applications is done according to store terms   3. Routine upgrading and patching of the application is done |

**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** |
| --- | --- |
| 1. Mobile application development platformsmay include but not limited to: | * Xamarin * Flutter * Nativescript |
| 1. Mobile application development approaches may include but not limited to: | * + Native   + Hybrid Native   + Hybrid web   + Progressive web |
| 1. Navigation patterns may include but not limited to: | * Tabbed * Carousel * Modal * Master Detail |
| 1. Resources may include but not limited to: | * Images * Audio files * Video |
| 1. Framework components may include but not limited to: | * Activity * Services * Broadcast receiver * Content provider |

**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:

* Communications (verbal and written);
* Time management;
* Problem solving;
* Analytical
* Planning;
* Decision Making;
* Research;

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Mobile Application Concepts
* Mobile Application Development Environment
* Application design issues
* Developing a mobile application
* Testing the developed mobile application
* Publishing and commercializing of developed application

**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 Mobile application development approaches 2. Identified Mobile application development frameworks and tools 3. Built the project prototype into a debug APK. 4. Tested and Debugged the Application 5. Published the Application |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Oral test   2. Observation   3. Practical demonstration   4. Written test |
| 1. Context of Assessment | Competency may be assessed   1. Off the job 2. on the job 3. During industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# UNDERSTAND AGILE DEVELOPMENT CONCEPTS

**UNIT CODE:** ICT/OS/CP/CR/11/6/A

**UNIT DESCRIPTION**

This unit specifies competencies required to understand agile development concepts**.** It involves outlining agile concepts, outlining DSDM Atern concepts, identifying team roles, responsibilities, exploring risk and quality control techniques.

**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. Outline agile concepts | 1. Agile Software Development is defined 2. Underpinning themes of Agile Development are outlined 3. Agile manifesto is outlined 4. Benefits of Agile Development are explained 5. Various ***agile methodologies*** are described |
| 1. Outline DSDM Atern concepts | * 1. DSDM is defined   2. ***Principles of DSDM*** are outlined   3. Benefits of using DSDM are outlined   4. ***DSDM key Techniques*** are explained |
| 1. Identify team roles and responsibilities | * 1. Characteristics of agile teams are outlined   2. ***Types of team roles*** are outlined   3. ***Team Roles*** and responsibilities are explained |
| 1. Explore risk and quality control techniques | * 1. Risk is defined   2. DSDM’s risk management approachis explained   3. Quality is defined   4. Role of testing in quality assurance is explained   5. ***DSDM’s testing concepts*** are outlined |

**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** |
| --- | --- |
| * + 1. Agile methodologiesmay include but is not limited to: | * eXtreme Programming * SCRUM * Feature Driven Development * DSDM * Lean Development |
| * + 1. Principles of DSDM may include but is not limited to: | * Focus on business need * Deliver on time * Collaborate * Never Compromise Quality * Build incrementally from firm foundations * Develop iteratively * Communicate continuously and clearly * Demonstrate control |
| * + 1. DSDM key Techniques may include but is not limited to: | * MoSCoW Prioritisation (of Requirements) * Modelling * Facilitated Workshops * Time Boxing * Iterative Development |
| * + 1. Types of team roles may include but is not limited to: | * Business * Management * Solution (Technical) |
| * + 1. Team Roles may include but is not limited to: | * Business Sponsor * Business Ambassador * Business Analyst * Project Manager * Technical Coordinator * Solution Developer * Solution Tester * Workshop Facilitator |
| * + 1. DSDM’s testing concepts may include but is not limited to: | * Fail fast * Collaborative testing * Independent testing * Prioritised testing * Test driven testing * Risk based testing |

**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:

* Communications (verbal and written);
* Time management;
* Problem solving;
* Planning;
* Decision Making;
* Research

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Agile concepts
* Features of various development methodologies
* Principles and techniques used in DSDM
* Essential characteristics of an agile team
* Key roles and responsibilities in an agile team
* Effectiveness of agile methodologies in managing project risk and assuring quality

**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. **Explained underpinning principles of agile methodologies**   2. **Demonstrated application of DSDM principles and techniques in a case scenario**   3. Identified suitable personnel for various roles in a case scenario   4. Identified risk management and testing techniques for a case scenario |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Oral questioning   2. Case study   3. Observation   4. Written test |
| 1. Context of Assessment | Competency may be assessed   1. Off the job 2. on the job 3. During industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |