

**REPUBLIC OF KENYA**

**NATIONAL OCCUPATIONAL STANDARD**

**FOR**

**APPLIED STATISTICIAN**

**LEVEL 6**

**OCCUPATIONAL STANDARD ISCED CODE:**

**First published 2024**

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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 the achievement of Kenya’s development blueprint, Vision 2030 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. These reforms resulted to the formulation of the Policy Framework for Reforming Education and Training (Sessional Paper No.14 of 2012). 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, certification be based on demonstration of competence and mode of delivery allows for multiple entry and exit in TVET programmes.

The reforms also demand that Industry takes a leading role in curriculum development to ensure the curriculum addresses its competence needs. This Occupational Standards will thus inform the development of Competency-Based Education and Training (CBET) curriculum for applied statistics level 6. This Occupational Standards will also be the basis for the assessment of an individual for competency certification.

It is my conviction that this Occupational Standard will play a great role in the development of a competent human resource for sustainable growth and development.

**Principal Secretary,**

**Ministry of Education,**

**State Department for technical**

**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 TVET Act CAP 210A and sessional paper No.14 of 2012 on Reforming Education and Training in Kenya, emphasized the need to reform curriculum development, assessment and certification. This called for a shift to CBET to address the mismatch between skills acquired through training and skills needed by the industry as well as increase the global competitiveness of the Kenyan labour force.

**ACKNOWLEDGMENT**

This Occupational Standard were developed through the combined effort of various stakeholders from private and public organizations. I am 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 input towards the development of this Occupational Standards.

I also thank all the individuals and organizations who participated in the validation of this Occupational Standard.

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# ACRONYMS

TENP The Eldoret National Polytechnic

ASCI Applied Science

NOS Occupational Standards

AS Applied Statistics

BUC Basic unit of Competency

COC Common unit of Competency

COR Core unit of Competency

CU Curriculum

2D Two Dimensional

HIV Human Immuno-Deficiency Virus

ICT Information Communication Technology

LCD Liquid Crystal Display

AIDS Acquired Immune Deficiency Syndrome

NEMA National Environmental Management Authority

OSHA Occupation Safety and Health Act

OSHS Occupation Safety and Health Standards

PESTEL Political Economic Social Technological Environmental and Legal

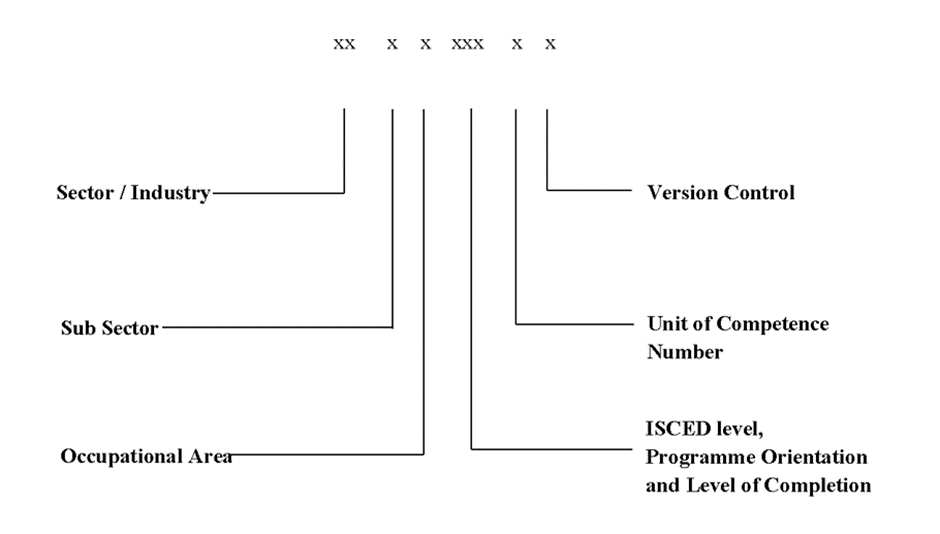
PPE Personal Protective Equipment

NSSAC National Sector Skills Advisory Committee

SWOT Strengths Weaknesses Opportunities and Threats

TVET Technical and Vocational Education and Training

# KEY TO UNIT CODE



**OCCUPATIONAL STANDARD OVERVIEW**

The applied statistics technician level 6 occupational standard consists of competencies that an individual requires to enable him/her to effectively work as an applied statistics technician. This occupational standard consists of the following competencies; preparation of research concept, design and data collection tools, collection and management of research data, descriptive data analysis, inferential data analysis, experimental research designs, improvement of industrial process quality. Other competencies relevant to the performance of the duties of applied statistics include apply statistical techniques, develop database management systems, manage statistical data, apply mathematics for science and apply research methods. In addition, communication skills, digital literacy, entrepreneurial skills and work ethics and practices are applicable.

Thus, the units of competency in this occupational standard comprising applied statistics level 6 qualification include the following basic, common and core competencies:

# SUMMARY OF UNITS OF COMPETENCY

|  |  |
| --- | --- |
| **BASIC UNITS OF COMPETENCY** | |
| **UNIT CODE** | **UNIT TITLE** |
| 0611 551 01A | Apply Digital Literacy |
| 0031 541 02A | Apply Communication Skills |
| 0417 541 03A | Apply Work Ethics and Practices |
| 0413 541 04A | Apply Entrepreneurial Skills |
| **COMMON UNITS OF COMPETENCY** | |
| 0542 551 08A | Apply Statistical Techniques |
| 0542 551 02A | Apply Research Methods |
| 0612 551 16A | Develop Database Management Systems |
| 0542 551 14A | Manage Statistical Data |
| 0542 551 09A | Apply Mathematics for Statistics |
| **CORE UNITS OF COMPETENCY** | |
| 0542 551 05A | Develop Research Concepts |
| 0542 551 03A | Collect and Manage Data |
| 0542 551 06A | Perform Descriptive Data Analysis and Presentation |
| 0542 551 15A | Perform Inferential Data Analysis and Presentation |
| 0542 551 13A | Design Research Experiments |
| 0542 551 17A | Conduct Reliability and Validity of Data |

**BASIC UNITS OF LEARNING**

**APPLY DIGITAL LITERACY**

**UNIT CODE :** 0611 551 01A

**UNIT DESCRIPTION :**

This unit covers the competencies required to demonstrate digital literacy. It involves operating computer devices, solving tasks using the Office suite, accessing online/offline data and information, performing online communication and collaboration, applying cybersecurity skills and performing jobs online. It also involves applying job entry techniques.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes that make up workplace functions | **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. Operate computer devices | * 1. C***omputer device*** usage is determined as per workplace requirements.   2. ***Computer hardware*** is identified according to job requirements.   3. ***Computer software*** is identified according to workplace requirements.   4. Computer devices are turned on or off as per the correct workplace procedure.   5. ***Mouse techniques*** are applied in solving tasks as per workplace requirements.   6. Keyboardtechniques are applied in solving tasks as per workplace requirements.   7. Computer files and folders are created and managed as per workplace requirements.   8. ***Internet connection option***s are identified and applied in connecting computer devices to the Internet.   9. ***External devices*** are identified and connected to the computer devices as per the job requirement. |
| 1. Solve tasks using Office suite | 1. ***Word processing concepts***are applied in solving workplace tasks as per job requirements. 2. Worksheet data is entered and prepared in accordance with work procedures. 3. Worksheet data is built and edited in accordance with workplace procedures. 4. ***Data manipulation*** on a worksheet is undertaken in accordance with work requirements. 5. Worksheets are saved and printed in accordance with job requirements. 6. ***Electronic presentation concepts***are applied in solving workplace tasks as per job requirements. |
| 1. Manage data and information | * 1. Office ***internet services*** are identified and applied in accordance with office procedures.   2. ***Internet access applications*** are determined in accordance with office operation procedures.   3. Internet search is performed as per job requirements.   4. Online digital content is downloaded in accordance with workplace requirements.   5. Digital content is identified and backed up in accordance with workplace procedures. |
| 1. Perform online communication and collaboration | * 1. Netiquette principles are observed as per work requirements.   2. Electronic mail communication is executed in accordance with workplace policy.   3. Digital content copyright and licenses are identified and applied according to workplace policies and regulatory requirements.   4. ***Online*** ***collaboration tools*** are applied in accordance with workplace policies and regulatory requirements. |
| 1. Apply cybersecurity skills | * 1. ***Data protection*** and ***privacy*** is classified in accordance with workplace policies and regulatory requirements.   2. ***Internet security threats*** are identified as per workplace policies and regulatory requirements.   3. Computer threats and crimes are detected in accordance to Information Management security guidelines   4. ***Cybersecurity control measures*** are applied in accordance with workplace policies and regulatory requirements. |
| 1. Perform online jobs | * 1. ***Online job platforms*** are identified as per the job requirements.   2. Online accounts and profiles are created in accordance with the work requirements.   3. Online jobs are identified according to the bidder’s skillset.   4. Online digital identity is managed according to industry best practices.   5. Online job bidding is done as per the specific job requirements.   6. Online tasks are executed according to the job requirements.   7. Personal online payment account is managed in accordance with financial regulations. |
| 1. Apply job entry techniques | * 1. ***Job opportunities*** are sought based on competencies.   2. A winning resume/CV is developed as per job advertisement.   3. An application/cover letter is developed based on the job advertisement.   4. ***Certificates and testimonials*** are organized as per resume.   5. ***Interview skills*** are demonstrated as per job advertisement. |

**RANGE**

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

| **Variable** | **Range** |
| --- | --- |
| 1. Computer devices may include but are not limited to: | * Desktops * Laptops * Smartphones * Tablets * Smartwatches |
| 1. Computer hardware may include but are not limited to: | * The System Unit E.g, Motherboard, CPU, casing, * Input Devices e.g., Pointing, keying, scanning, voice/speech recognition, direct data capture devices. * Output Devices e.g., hardcopy output and softcopy output * Storage Devices e.g., main memory e.g., RAM, secondary storage (Solid state devices, Hard Drives, CDs & DVDs, Memory cards, Flash drives * Computer Ports e.g., HDMI, DVI, VGA, USB type C etc. |
| 1. Computer software may include but are not limited to: | * System software e.g., Operating System (Windows, Macintosh, Linux, Android, iOS) * Application Software e.g., Word Processors, Spreadsheets, Presentations etc. * Utility Software e.g., Antivirus programs |
| 1. External devices may include but are not limited to: | * Printers * Projectors * Smart Boards * Speakers * External storage drives * Digital/Smart TVs |
| 1. Word processing concepts may include but are not limited to: | * Creating word documents * Editing word documents * Formatting word documents * Saving word documents * Printing word documents |
| 1. Mouse techniques may include but are not limited to: | * Clicking * Double-clicking * Right-clicking * Drag and drop |
| 1. Internet connection options may include but are not limited to: | * Mobile Networks/Data Plans * Wireless Hotspots * Cabled (Ethernet/Fiber) * Dial-Up * Satellite * ISDN (Integrated Services Digital Network) |
| 1. Data manipulation may include but are not limited to: | * Use of formulae * Use of functions * Sorting * Filtering * Visual representation using charts |
| 1. Electronic presentation concepts may include but are not limited to: | * Creating slides * Editing slides * Formatting slides * Applying slide effects and transitions * Creating and playing slideshows * Saving presentations * Printing slides and handouts |
| 1. Internet services may include but are not limited to: | * Communication Services * Information Retrieval Services * File Transfer * World Wide Web Services * Web Services * Directory Services * Automatic Network Address Configuration * News Group * Ecommerce |
| 1. Internet access applications/ software may include but are not limited to: | * Browsers * Email Apps * eCommerce Apps |
| 1. Online collaboration tools may include but are not limited to: | * Online Storage * Online productivity applications * Online meetings, * Online learning environments, * Online calendars * Social networks |
| 1. Data protection and privacy may include but not limited to: | * Confidentiality of data/information * Integrity of data/information * Availability of data/information |
| 1. Internet security threats may include but not limited to: | * Malware attacks * Social engineering attacks * Software supply chain attacks * Advanced persistent threats (APT) * Distributed denial of service (DDoS) * Man-in-the-middle attack (MitM) * Password attacks * IoT Attacks * [Phishing Attacks](https://onlinedegrees.sandiego.edu/top-cyber-security-threats/#phishing-attacks) * [Ransomware](https://onlinedegrees.sandiego.edu/top-cyber-security-threats/#ransomware) |
| 1. Security threats control measures may include but not limited to: | * Counter measures against cyber terrorism * Physical Controls * Technical/Logical Controls * Operational Controls |
| 1. Online job platforms may include but are not limited to: | * Remo task * Data annotation’s tech * Cloud worker * Upwork * Oneforma * Appen |
| 1. Job opportunities may include but not limited to: | * Self-employment * Service provision * Product development * Salaried employment |
| 1. Certificates and testimonialsmay include but not limited to: | * Academic credentials * Letters of previous employments/ services rendered * Letters of commendation * Certifications of participation * Awards |
| 1. Interview skills may include but not limited to: | * Listening skills * Grooming * Language command * Articulation of issues * Body language * Time management * Honesty * Generally knowledgeable in current affairs and technical area |

**REQUIRED KNOWLEDGE AND SKILLS**

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

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Computer Hardware and Software Concepts
* Computer Security Concepts (Data security and privacy)
* Cyber security threats and control measures
* Understanding Computer Crimes
* Detection and protection against computer crimes
* Laws governing protection of ICT in Kenya
* Digital Identity Management
* Netiquette Principles
* Fundamentals of Copyright and Licenses
* Word processing;
* Functions and concepts of word processing;
* Documents and tables creation and manipulations;
* Document editing;
* Document formatting;
* Word processing utilities
* Spreadsheets;
* Meaning, types and importance of spreadsheets;
* Components of spreadsheets;
* Functions, formulae, and charts, uses and layout;
* Data formulation, manipulation and application to cells;
* Editing & formatting spreadsheets;
* Presentation Packages;
* Types of presentation Packages.
* Creating, formulating, running, editing, printing and presenting slides and handouts
* Networking and Internet;
* Internet connectivity.
* Browser and digital content management;
* Managing data, information, and digital content
* Electronic mail and World Wide Web
* Fundamentals of Online Working;
* Online Profile Management;
* e-Portfolio Management;
* Online Jobs Bidding;
* Online Payment Systems;
* Job entry techniques
* Job searching sites
* Interview preparation skills
* Interview handling

**Required skills**

The individual needs to demonstrate the following skills:

* Active listening
* Keyboard Skills
* Mouse Skills
* Analytical skills
* Creativity
* Interpretation Skills
* Communication
* Spreadsheet operations (applying fundamental operations such as addition, subtraction, division and multiplication)
* Computer Use Safety Skills
* Document Editing Skills
* Document Formatting Skills
* Document Printing Skills
* Netiquette Skills
* Internet Browsing Skills
* Problem Solving Skills
* Online Collaboration Skills
* Cybersecurity Skills
* CV writing
* grooming

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical aspects of competency | ***Assessment requires evidence that the candidate:***   1. Operated computer devices as per workplace policies and regulations. 2. Solved tasks using the office suite as per workplace policies and regulations. 3. Manage data and information as per workplace policies and regulations. 4. Performed online communication and collaboration as per workplace policies and regulations. 5. Applied cybersecurity skills in accordance with workplace policies and regulations. 6. Executed online tasks according to the job requirements. 7. Searched for job opportunity based on competencies. 8. Prepared job requirement documentations based on job opportunity. 9. Demonstrated interview skills based on the job opportunity. |
| 1. Resource implications | The following resources should be provided:   1. Appropriately simulated environment where assessment can take place. 2. Access to relevant work environments where assessment can take place. 3. Resources relevant to the proposed activities or task. |
| 1. Methods of assessment | Competency in this unit may be assessed through:   * 1. Oral assessment   2. Portfolio of evidence   3. Third party report   4. Written assessment   5. Practical assessment   6. Project-Based Assessment |
| 1. Context of assessment | Competency may be assessed:   * 1. Workplace or simulated workplace. |
| 1. Guidance information for assessment | * 1. Holistic assessment with other units relevant to the industry sector and workplace job role is recommended. |

**APPLY COMMUNICATION SKILLS**

**UNIT CODE:** 0031 541 02A

**UNIT DESCRIPTION**

This unit covers the competencies required to demonstrate communication skills. It involves applying communication channels, written, non-verbal, oral, and group communication skills.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes that make up workplace function | **PERFORMANCE CRITERIA**  These are assessable statements that specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| --- | --- |
| 1. Apply communication channels | 1. Specific communication channels are identified and applied based on workplace requirements. 2. Challenges are identified and addressed as per the operational standards of the organization. 3. Communication channels are evaluated to meet workplace needs. |
| 1. Apply written communication skills | * 1. Types of written communication are identified and applied according to the workplace requirements.   2. Written communication needs are identified and implemented according to workplace procedures.   3. Written communication guidelines are analyzed, evaluated, and revised based on workplace needs. |
| 1. Apply non-verbal communication skills | 1. Existing non-verbal communication techniques are identified and applied based on organization policy. 2. Non-verbal communication techniques are articulated and modeled to enhance inclusivity according to workplace requirements. |
| 1. Apply oral communication skills | 1. Types of oral communication are identified and established as per organization policy. 2. Pathways of oral communication are identified and established as per organization policy. 3. Pathways of oral communication are reviewed according to organization procedures. 4. Pathways of oral communication are maintained according to the organization standards. |
| 1. Apply group communication skills | 1. Group communication strategies are appliedbased on the workplace needs. 2. Groups are organized in accordance with workplace procedures. 3. Effective questioning, listening and non-verbal communication techniques are used as per needs. 4. Group communication challenges are identified and addressed according to the workplace needs. |

**RANGE**

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

| **Variable** | **Range** |
| --- | --- |
| 1. Communication strategies may include but are not limited to: | * Language switch * Comprehension check * Repetition * Asking confirmation * Paraphrasing * Clarification request * Translation * Restructuring * Generalization |
| 1. Effective group interaction may include but not limited to: | * Identifying and evaluating what is occurring within an interaction in a non-judgmental 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 are not limited to: | * Establishing rapport * Eliciting facts and information * Facilitating resolution of issues * Developing action plans |

**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:

* Active listening
* Interpretation
* Negotiation
* Writing
* Oral skills
* Creative thinking
* Critical thinking
* Decision making
* Analytical
* Innovation
* Conflict skills
* Leadership
* Problem solving skills
* Management
* Organizational
* Teamwork

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Communication process
* Dynamics of groups
* Styles of group leadership
* Key elements of communications strategy
* Principles of effective communication
* Turn-taking techniques
* Conflict resolution techniques
* Work planning
* Work organization
* Company policies
* Company operations and procedure standards
* Fundamental rights at the workplace
* Personal hygiene
* Accountability
* Workplace problems and how to deal with them

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical aspects of Competency. | Assessment requires evidence that the candidate:   * 1. Identified and applied specific communication channels based on workplace requirements.   2. Identified and applied specific written communication correspondence according to the workplace requirements.   3. Applied and developed non-verbal strategies to communicate in all areas of the workplace requirements.   4. Established pathways of oral communication as per workplace policy.   5. Applied group communication strategies based on workplace needs. |
| 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. 3. Resources relevant to the proposed activity or tasks. |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Oral assessment   2. Portfolio of evidence   3. Third party report   4. Written assessment   5. Practical assessment   6. Project-Based Assessment |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. In a simulated work environment |
| 1. Guidance information for assessment | 1. Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**APPLY WORK ETHICS AND PRACTICES**

**UNIT CODE:** 0417 541 03A

**UNIT DESCRIPTION**

This unit covers competencies required to effectively apply work ethics and practices. It involves the ability to: conduct self-management, promote ethical work practices and values, promote teamwork, manage workplace conflicts, maintain professional and personal development, apply problem-solving and promote customer care.

**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 Range*** |
| --- | --- |
| 1. Apply self-management skills | 1. Personal vision, mission and goals are formulated based on potential and concerning organization objectives and strategic plan 2. Self-esteem and a positive self-image are developed and maintained based on value 3. Emotional intelligence and stress management are demonstrated as per workplace requirements. 4. Assertiveness is developed and maintained based on the requirements of the job. 5. Accountability and responsibility for one's actions are demonstrated based on workplace instructions. 6. Time management, attendance and punctuality are observed as per the organization’s policy. 7. Personal goals are managed as per the organization’s objective 8. Self-strengths and weaknesses are identified based on personal objectives 9. Motivation, initiative and proactivity are utilized as per the organization policy 10. Individual performance is evaluated and monitored according to the agreed targets. |
| 1. Promote ethical work practices and values | 1. Integrity is demonstrated as per acceptable norms 2. Codes of conduct is applied as per the workplace requirements 3. Policies and guidelines are observed as per the workplace requirements 4. Professionalism is exercised in line with organizational policies |
| 1. Promote Team work | * 1. ***Teams*** are formed to enhance productivity based on organization’s objectives   2. Duties are assigned to teams under the organization policy.   3. Team activities are managed and coordinated as per set objectives.   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 and diversity-related issues are identified and mainstreamed in accordance with workplace policy.   7. Healthy ***relationships*** are developed and maintained in line with the workplace.   8. Adaptability and flexibility are applied in dealing with team members as per workplace policies |
| 1. Maintain professional and personal development | 1. ***Personal growth and development*** 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 on organizations and individual skills needs. 4. Licenses and certifications relevant to the job and career are obtained and renewed as per policy. 5. Recognitions are sought as proof of career advancement in line with professional requirements. 6. Work priorities and personal commitments are balanced and managed based on the requirements of the job and personal objectives. 7. Dynamism and on-the-job learning are embraced in line with the organization’s goals and objectives. |
| 1. Apply Problem solving skills | 1. ***Creative, innovative*** and practical solutions are developed based on the problem    1. Independence and initiative in identifying and solving problems are demonstrated based on the requirements of the job.    2. Team problems are solved as per the workplace guidelines    3. Problem-solving strategies are applied as per the workplace guidelines    4. Problems are analyzed and assumptions tested as per the context of data and circumstances |
| 1. Promote Customer Care | 1. Customers' needs are identified based on their characteristics 2. Customer ***feedback*** is allowed and facilitated in line with organization policies. 3. Customer concerns and complaints are analyzed and resolved in line with the set organizational culture. 4. Proactive customer outreach programs are implemented as per organizational policies 5. Customer retention strategies are developed and implemented in line with the organizational policy |

**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. Feedback may include but not limited to: | * Verbal * Written * Informal * Formal |
| 1. Conflicts include but are not limited to: | * Interpersonal Conflict. * Intrapersonal Conflict. * Intergroup Conflict. * Intragroup Conflict. |
| 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. Team may include but not limited to: | * Small work group * Staff in a section/department * Inter-agency group * Virtual teams |
| 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 include but not limited to | * Participation in training programs * Serving as Resource Persons in conferences and workshops * Capacity building |
| 1. Resource may include may but not limited to: | * Human * Financial * Technology |
| 1. Creative and innovative 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: | * Artificial Intelligence * Data confidentiality * National cohesion * Open offices |

**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:

* Active listening
* Critical thinking
* Organizational
* Negotiation
* Monitoring
* Evaluation
* Problem solving
* Decision Making
* Leadership
* Creative/innovative thinking
* Adaptability
* Conflict management
* Emotional intelligence
* Teamwork

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Work values and ethics
* Company policies and procedures
* Company operations, procedures and standards
* Flexibility and adaptability
* Concept of time and leisure time
* Decision making
* Work planning
* Organizing work
* Monitoring and evaluation
* Record keeping
* Gender and diversity mainstreaming
* Drug and substance abuse
* Professional growth and development
* creativity
* Innovation
* problem solving
* customer care
* mentoring and coaching.
* 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 require evidence that the candidate:   * 1. Applied self-management skills as per organizational procedures.   2. Promoted ethical practices and values as per organizational procedures.   3. Promoted Teamwork as per workplace assignments.   4. Maintained professional and personal development as per organizational procedures.   5. Applied Problem-solving skills based on work requirements.   6. Identified customer needs based on their characteristics.   7. Gave back Customer feedback in line with organization policies. |
| 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. 3. Resources relevant to the proposed activity or tasks. |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Oral questioning 2. Written test 3. Project-Based Assessment 4. Portfolio of Evidence 5. Third party report |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. In a simulated work environment |
| 1. Guidance information for assessment | * 1. Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**APPLY ENTREPRENEURIAL SKILLS**

**UNIT CODE:** 0413 541 04A

**UNIT DESCRIPTION**

This unit covers the competencies required to demonstrate an understanding of entrepreneurship. It involves demonstrating an understanding of financial literacy, applying entrepreneurial concepts identifying entrepreneurship opportunities, applying business legal aspects, developing business innovative strategies, and developing business plans.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes that make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements that specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in Range*** |
| --- | --- |
| 1. Apply Financial Literacy Skills | 1. ***Sources of personal and business******funds*** are identified as per financial procedures and standards 2. Personal finances are managed as per financial procedures and standards 3. Savings are managed as per financial procedures and standards 4. Debts are managed as per financial procedures and standards 5. Investments are undertaken as per financial procedures and standards 6. Insurance services are procured as per financial procedures and standards |
| 1. Apply entrepreneurial concept | 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. Salaried employment and self-employment are distinguished as per principles of entrepreneurship 6. ***Requirements for entry into self-employment*** are identified according to business procedures and standards 7. Roles of an Entrepreneur in an enterprise are determined according to business procedures and standards 8. ***Contributions of entrepreneurship*** to National development are identified as per business procedures and standards |
| 1. Identify entrepreneurial opportunities | 1. Business ideas are identified as per business procedures and standards 2. Factors to consider when evaluating business opportunity viability are explored based on business procedure and standards 3. Entrepreneurial opportunities are evaluated as per business procedures and standards 4. Business ideas and opportunities are generated as per business procedures and standards 5. Business life cycle is analysed as per business procedures and standards. |
| 1. Apply business legal aspects | 1. ***Forms of business ownership*** are identified as per legal procedures and practices 2. Business Registration and Licensing processes are identified as per legal procedures and practices 3. Types of Contracts and Agreements are analysed as per legal procedures and practices 4. Employment Laws are identified as per legal procedures and practices 5. Taxation laws are identified as per legal procedures and practices |
| 1. Innovate Business strategies | 1. Business innovation strategies are determined by the organization standards 2. Creativity in business development is demonstrated in accordance with business standards 3. ***Innovative business standards***  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. Business idea is described as per business procedures and standards 2. Business description is developed as per business plan format 3. Marketing plan is developed as per business plan format 4. Organizational/Management plan is prepared in accordance with business plan format 5. Production/operation plan is prepared in accordance with business plan format 6. Financial plan is prepared in accordance with the business plan format 7. Executive summary is prepared in accordance with business plan format 8. Business plan is presented as per best practice 9. Business ideas are incubated as per institutional policy. |

**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. Sources of personal funds mayinclude but not limited to: | * Salary/Wages * Investments * Savings * Inheritance * Government Benefits. |
| 1. Sources of business finance mayinclude but not limited to: | * Equity Financing * Debt Financing, * Personal Savings/Investment * Retained Earnings * Grants and Subsidies * Crowdfunding * supplier Credit: * Leasing and Asset Financing: |
| 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. Forms of businesses ownership may include but not limited to: | * Sole proprietorship * Partnership * Limited companies * Cooperatives |
| 1. Innovative business standards 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 standards
* 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 standards
* Market and feasibility studies
* Government and regulatory processes
* Local and international business environment
* Relevant developments in other industries
* Regional/ County business expansion standards

**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 Sources of personal and business finance as per financial procedures and standards 2. Managed Personal finances as per financial procedures and standards 3. Made Investment decisions as per financial procedures and standards 4. GeneratedBusiness ideas and opportunities based on business procedure and standards 5. Analysed business life cycle based on business procedure and standards 6. Determined business innovative standards as per business principles 7. Developed and presented a business plan as per regulatory framework. |
| 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. Written tests 2. Oral questions 3. Project Based Assessment 4. Third party report 5. Portfolio |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. In a simulated work environment |
| 1. Guidance information for assessment | * 1. Holistic assessment with other units relevant to the   industry sector, workplace and job role are recommended. |

# COMMON UNITS OF LEARNING

## APPLY STATISTICAL TECHNIQUES

**UNIT CODE:**

**UNIT DESCRIPTION**

This unit describes the skills, knowledge and competences required inapplying statistical concepts, applying statistical methods, applying statistical significance and applying statistics for business.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range.*** |
| 1. Apply statistical concepts | * 1. Key terms are defined as per the statistical concepts   2. Knowledge and limitations of statistical concepts are demonstrated as per required standard   3. Symbols used are demonstrated as per the concepts   4. Levels of measurements are demonstrated as per data type   5. ***Statistical*** ***data*** is classified as per the class and intervals   6. Data collection process is demonstrated as per the procedure   7. Data presentation is performed as per data type   8. Data compilation is performed as per the requirement   9. Calculations involving measures of central tendency are performed as per steps   10. Calculations involving measures of dispersion are performed as per the statistical procedures. |
| 2.Apply statistical methods I | * 1. Sampling is demonstrated as per the statistical procedures.   2. Calculations involving population and samples are performed as per the statistical procedures.   3. Sampling distributions is demonstrated as per the statistical procedures.   4. Calculations involving ***probability theory*** are performed as per the statistical procedures.   5. Calculations involving probability distributions are performed as per the statistical procedures.   6. Calculations involving moments are performed as per the statistical procedures.   7. Moment generating functions are performed as per the statistical procedures.   8. Calculations involving central limit theorem are performed as per the statistical procedures. |
| 2.Apply statistical methods II | * 1. Dependent and independent variables are identified as per the type of the statistical model   2. Calculations involving theory of estimation are performed as per the statistical procedures.   3. Pearson’s and spearman’s correlation coefficients are calculated as per the statistical procedures.   4. Coefficients of simple linear regression are calculated as per data set.   5. Linear regression model predictions are performed as per study data set.   6. Confidence intervals for regression coefficients are estimated as per study procedure.   7. Test for significance of linear regression model is estimated as per set objectives.   8. Goodness of fit for the linear model is determined as per sample distribution.   9. Coefficient of determination (R2) for the regression model is calculated as per study sample.   10. ***Multiple linear regression*** is performed as per variables   3***.***11 ***Logistic regression model*** is performed as per variables. |
| 4.Apply statistical significance | * 1. Confidence intervals are performed as per study hypotheses.   2. Rejection criteria in hypothesis testing is demonstrated as per significance level.   3. Relationships of categorical data are established as per the study procedure.   4. Test for normality assumptions is performed as per test procedure.   5. Mean comparison of two groups is performed as per test procedure.   6. Comparison of variances from two independent groups is performed as per test statistical procedures.   *4.7* ***Non parametric tests*** for non-normal data are performed as per test procedure. |
| 5.Apply statistics for business | * 1. Calculations involving simple index numbers are performed as per the statistical procedures.   2. Weighted averages are calculated as per the statistical procedure.   3. Problems in constructions of index numbers are demonstrated as per the index numbers   4. Aspects of time series data is demonstrated as per the procedure   5. Components of time series data are determined as per the statistical procedures.   6. Forecasting using time series data is performed as per the statistical procedures.   7. Economic concepts are defined as per the concept   8. Calculations involving demand and supply are performed as per the procedure   9. Calculation of statistical quality control is demonstrated as per the statistical procedures.   10. Sampling measurements in industrial production is performed as per workplace procedure.   11. Quality Control limits are determined as per the procedure.   12. Control charts are generated as per the data   13. Professional ethics in statistical consulting are demonstrated as per the institutional guidelines. |

**RANGE STATEMENT**

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. Statistical data may include but not limited to: | * Data variables * Observations * Facts * Objects ` |
| 2.Probability theory may include but not limited to: | * Normal distribution * Poison distribution * Uniform distribution * Binomial distribution * Negative binomial |
| 1. Multiple linear regression may include but not limited to: | * Linear regression * Multiple regression * Parameter values * Slope |
| 1. Logistic regression model may include but not limited to: | * Generalized linear models * Binary * Ordinal * Multinomial |
| 1. Non parametric tests may include but not limited to: | * Mann Whitney U-test * Wilcoxon signed rank test * Kruskal Wallis test |

**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:

* Logical thinking
* Problem solving
* Communication skills
* Statistical analysis

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Data presentation
* Data compilation
* Measures of dispersion
* Measures of central tendency
* Types of data
* Statistical Parameters
* Sampling statistical procedures.
* Sampling distributions
* Time series
* Probability distributions
* Moments and moments generating functions
* Central limit theorem
* Hypothesis testing

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:   1. Demonstrated data collection process as per study guidelines 2. Demonstrated data presentation techniques as per data type 3. Calculated measures of central tendency as per procedure 4. Calculated measures of dispersion as per procedure 5. Demonstrated sampling as per study statistical procedures. 6. Performed sampling distributions as per specified population 7. Generated coefficients of regression models as per data set 8. Calculated confidence intervals as per study hypotheses 9. Tested hypothesis as per significance level 10. Applied central limit theorem in calculation as per sample sizes 11. Predicted index numbers as per time series 12. Generated charts as per statistical quality control thresholds |
| 1. Resource Implications | The following resources should be provided;   * 1. Industrial quality control equipment   2. Data sets   3. Computers   4. Statistical packages   5. Stationary   6. Statistical tables   7. Internet |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Observation 2. Oral questioning 3. Portfolio of evidence 4. Interviews 5. Third party report 6. Written tests |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. Simulated work environment |
| 1. Guidance information for assessment | 1. Holistic assessment of other units relevant to the industry sector, workplace and job role is recommended |

## APPLY RESEARCH METHODS

**UNIT CODE:**

**UNIT DESCRIPTION**

This unit describe the skills, knowledge and competencies required in identifying the research problem, carrying out literature review, developing research objectives, developing research design and sample design, developing research budget proposal and time plan, collecting research data, analysing collected research data, interpreting findings and presenting findings.

**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 the Research Problem | * 1. Research problem is identified as per work place research guidelines.   2. Research problem is investigated as per work place research guidelines.   3. **Research restrictions** are identified according to work place research guidelines.   4. ***Research variables*** are stated as per work place research guidelines.   5. Research variables are specified according to work place research guidelines. |
| 1. Carry out Literature Review | * 1. Research topic is selected as per work place research guidelines.   2. Sources of literature are identified according to research topic.   3. Literature search is conducted as per identified sources   4. Literature results are grouped as per research themes. |
| 1. Develop research objectives | * 1. Research variables are identified as per research problem.   2. Research variables are categorized as per research problem.   3. Research objectives are formulated as per work place research guidelines. |
| 1. Develop Research Design and Sample Design | * 1. ***Research design*** is selected as per research gap   2. Type of data is determined according to work place research guidelines.   3. ***Data collection techniques*** are identified as per work place research guidelines.   4. Analysis method is selected according TO work place research guidelines. |
| 1. Develop research budget proposal & Time plan | * 1. Proposed activities are identified as per research study   2. Cost of proposed activities are determined as per prevailing market rates   3. Proposed activities are tabulated as per study timeframe |
| 1. Collect research Data | * 1. Type of data is determined according to research study   2. Method of data collection is selected as per data type   3. Data collection procedure is developed as per sources of data   4. ***Data collection tools*** are implemented as per sources of data |
| 1. Analyse research Data | * 1. Type of data is determined as per research study   2. Analysis methods are selected according to the data types   3. ***Data analysis*** is performed as per appropriate analysis methods |
| 1. Interpret research findings | * 1. Interpretation of research findings is conducted as per research questions   2. Interpretation of research findings is performed based on evidence   3. Interpretation of findings is conducted as per trends and patterns |
| 1. Present research findings | * 1. Research findings are selected according to the analysis outcomes   2. Presentation methods are selected based on research findings   3. Research findings are presented as per end user requirements |

**RANGE STATEMENT**

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. Research restrictions may include but not limited to: | * Logistics * Relevance in relation to time * Existing laws and policies |
| 1. Research variables may include but not limited to: | * Dependent * Independent * Moderating |
| 1. Research design may include but not limited to: | * Case study * Descriptive survey * Experimental * Correlation |
| 1. Data collection techniques may include but not limited to: | * Observation * Interviews * Survey |
| 1. Data collection tools may include but not limited to: | * Questionnaires * Interview schedule * Observation checklist |
| 1. Data analysis may include but not limited to: | * Descriptive * Inferential |

**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
* Report writing skills
* Computer skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Research problems
* Literature review
* Research objectives
* Research questions
* Research design
* Collecting data
* Data analysis

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:   * 1. Formulated research problems as per study objective   2. Developed research objectives as per study variables   3. Formulated research hypothesis as per research objectives   4. Reviewed literature as per study objectives   5. Employed research design as per nature of study   6. Demonstrated knowledge of research instruments as per study guidelines   7. Demonstrate knowledge of piloting of research instrument   8. Performed data analysis as per research objectives |
| 1. Resource Implications | The following resources should be provided:   1. Computer 2. Internet 3. Datasets 4. Stationery |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Observation 2. Oral questioning 3. Portfolio of evidence 4. Interviews 5. Third party report 6. Written tests |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. Simulated work environment |
| 1. Guidance information for assessment | 1. Holistic assessment of other units relevant to the industry sector, workplace and job role is recommended |

## DEVELOP DATABASE MANAGEMENT SYSTEMS

**UNIT CODE:**

**UNIT DESCRIPTION**

This unit describes the skills, knowledge and competencies required in identifying database management systems, designing of database, manipulating of database, testing database, implementing designed database, establishing transaction and concurrency mechanism and managing database security.

**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 database management system | * 1. ***Database requirements*** are established as per user needs.   2. Database systems are identified based on objectives   3. ***Database components*** are identified as per database system   4. Classification of databases is performed as per study objective   5. Functionality of databases is identified as per user requirements |
| 2.Design database system | * 1. ***Database structures*** are determined as per the purpose   2. Information required in the database is organized as per user needs   3. Primary keys are specified as per table relationship outcomes   4. Data model is designed as per user needs |
| 3.Manipulate database system | * 1. ***Data Attributes*** are identified as per organizational needs   2. Data relationships are established as per the tables created   3. Data is extracted from database using SQL as per objective |
| 4.Perform database testing | * 1. Test data is organized on the database as per user objective.   2. ***Data test run*** is carried out on database as per user objective   3. Test results are verified based on user objective.   4. Test results are validated as per expected output. |
| 5.Implement designed database | * 1. Scope is defined as per the designed database   2. Database project is organized according to time frame.   3. Database management system outputs are selected as per DBMS design.   4. Implementation schedule is developed as per time frame   5. Database is designed as per organizational needs.   6. Designed database is tested as per objective.   7. Conversion plan is developed as per objective.   8. Existing applications are converted as per DBMS needs   9. Database is fine-tuned as per user needs |
| 6.Establish transaction and concurrency mechanism | * 1. Isolation among transactions is enforced as per user objective.   2. Database consistency is preserved as per user needs   3. Transaction conflicts are resolved as per institutional policy. |
| 7.Manage database security | * 1. Physical database security is deployed as per organization objective.   2. Database servers are backed-up as per organizational policy   3. Real time database monitoring is employed as per organizational policy   4. Database firewall applications are employed as per organizational policy. |

**RANGE STATEMENT**

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. Database requirements may include but not limited to: | * Data attributes * Personnel * Tables * Database technology * Data modelling technology |
| 1. Database components may include but not limited to: | * Hardware * Software * Data * Statistical procedures. * Programming language |
| 1. Database structures may include but not limited to: | * Hierarchical Databases * Relational Database * Non-relational Database * Object Oriented Database |
| 1. Data test Run may include but not limited to: | * Database schema * Database codes * Field constrains |

**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);
* ICT
* Analytical
* Problem solving
* Decision making
* Programming

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Database systems
* Database creation
* Types of database testing
* Database testing
* Database structures
* Data Models, Attributes and relationships
* Input validation
* Database design and implementation methods
* Database security features

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:   * 1. Identified database management systems as per user needs   2. Designed database systems as per the purpose   3. Manipulated database systems as per objective   4. Performed database systems testing as per expected output   5. Implemented database systems as per DBMS procedure |
| 1. Resource Implications | The following resources should be provided:   1. Computer 2. internet 3. Servers 4. Personnel 5. Database software’s |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Observation 2. Oral questioning 3. Portfolio of evidence 4. Interviews 5. Third party report 6. Written tests |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. Simulated work environment |
| 1. Guidance information for assessment | 1. Holistic assessment of other units relevant to the industry sector, workplace and job role is recommended |

## MANAGE STATISTICAL DATA

**UNIT CODE:**

**UNIT DESCRIPTION**

This unit covers the skills, knowledge and competencies required in managing statistical data in excel, managing statistical data in R, managing statistical data in SPSS and managing statistical data in python.

**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. Manage statistical data in excel | * 1. ***Data*** is exported from other statistical packages to Excel as per guidelines.   2. Data management is carried out in Excel as per objectives.   3. ***Data manipulation*** is performed in Excel as per user needs   4. Statistical test in Excel is employed in line with user objectives.   5. Data analysis is performed in Excel as per objectives.   6. ***Statistical output*** in Excel is selected as per user needs   7. statistical output from excel is transferred to word document. |
| 1. Manage statistical data in R | 1. Data is exported from other statistical packages to R as per guidelines. 2. ***Data management*** is carried out in R as per objectives. 3. Data manipulation is performed in R as per user needs 4. ***Statistical test*** in R is employed in line with user objectives. 5. Data analysis is performed in R as per objectives. 6. Statistical output in R is selected as per user needs 7. Statistical output from R is transferred to word document. |
| 1. Manage statistical data in SPSS | 1. Data is exported from other statistical packages to SPSS as per guidelines. 2. Data management is carried out in SPSS as per objectives. 3. Data manipulation is performed in SPSS as per user needs 4. Statistical test in SPSS is employed in line with user objectives. 5. Data analysis is performed in SPSS as per objectives. 6. Statistical output in SPSS is selected as per user needs 7. statistical output from SPSS is transferred to word document. |
| 1. Manage statistical data in python | 1. Data is exported from other statistical packages to Python as per guidelines. 2. Data management is carried out in Python as per objectives. 3. Data manipulation is performed in Python as per user needs 4. Statistical test in Python is employed in line with user objectives. 5. Data analysis is performed in Python as per objectives. 6. Statistical output in Python is selected as per user needs 7. Statistical output from Python is transferred to word document. |

**RANGE STATEMENT**

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. Data may include but not limited to: | * Observations * Objects * Facts |
| 1. Data manipulation may include but not limited to: | * Variable coding * Variable labelling * Variable values * Variable transformation |
| 1. Statistical output may include but not limited to: | * Parameters * Tables * graphs * Charts |
| 1. Data management may include but not limited to: | * Data collection * Data storage * Data organization * Security * Backup |
| 1. Statistical test may include but not limited: | * Descriptive analysis * Hypothesis testing * Test statistic * sampling distributions * Inferential tests |

**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:

* Analytic skills
* Computer skills
* Communication skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Functions in statistical packages
* Data presentation techniques

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:   * 1. Managed statistical data in excel as per data type   2. Managed statistical data in R as per data type   3. Managed statistical data in SPSS as per data type   4. Managed statistical data in Python as per data type |
| 1. Resource Implications | The following resources should be provided:   1. Computer 2. Internet 3. Datasets 4. Stationery |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Observation 2. Portfolio of evidence 3. Interviews 4. Third party report 5. Written tests |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. Simulated work environment |
| 1. Guidance information for assessment | 1. Holistic assessment of other units relevant to the industry sector, workplace and job role is recommended |

**APPLY MATHEMATICS FOR SCIENCE**

**UNIT CODE:** 0531 551 05A

**UNIT DESCRIPTION**

This unit describes the competencies required by a science laboratory technologist in order to apply mathematics for science. It involves applying basic arithmetic operation; algebraic equation and expression; linear and non-linear graphs; indices and logarithm; binomial expansion; matrices; vectors; trigonometry; calculus; sequence and series and statistics.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace functions | **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 basic arithmetic operation | * 1. Addition and subtraction are performed as per arithmetic operation rules.   2. Multiplication and division are applied as per arithmetic operation rules.   3. Rational and irrational numbers are evaluated as per algebraic rules.   4. Ratios, ***proportions*** and percentages is applied as per algebraic rules. |
| 2. Apply algebraic equation and expression | * 1. Linear equations are solved as per prescribed methods   2. Simultaneous equations are solved as per the ***simultaneous method***required.   3. Formulation of a formula is applied as per the algebraic rules.   4. Quadratic equation is solved as per the ***quadratic methods***required. |
| 3. Apply linear and non-linear graphs | * 1. Linear and nonlinear graph is plotted as per the graphical rules.   2. Reduction of non-linear to linear graphs is performed as per the graphical rules.   3. Graph is interpreted as per the concept formulate Graphical Rules. |
| 4. Apply indices and logarithms | * 1. Indices are operated as per the Indices Rules.   2. ***Logarithm*** is defined as per the Logarithms Rules.   3. Change of base of logarithms is performed as per Logarithms Rules.   4. Logarithmic and exponential graph is plotted as per Logarithms Rules. |
| 5. Apply binomial expansions | 5.1Roots of numbers are determined using binomial theorem rules.   * 1. ***Errors*** of small changes are determined using binomial theorem rules.   2. Permutation and combination are applied using binomial theorem rules. |
| 6. Apply matrices | * 1. Determinant and inverse of 2x2 matrix is determined as per matrix Rules.   2. Simultaneous equations are solved as per matrix Rules.   3. Eigenvalues and Eigenvectors are determined as per matrix Rules. |
| 7. Apply vectors | * 1. Vectors and scalar quantities are obtained in two dimensions as per vector rules.   2. ***Operations*** on vectors are performed as per vector Rules.   3. Position of vectors are obtained as per vector rules.   4. Vector is resolved as per vector rules. |
| 8. Apply trigonometry | * 1. ***Trigonometric ratios*** are applied as per trigonometric rules.   2. Angles of elevation and depression are determined as per trigonometric rules.   3. Angles are determined as per compound angle formula   4. Sine and cosine waves are interpreted as per trigonometric rules. |
| 9. Apply Calculus | 9.1 Rate of change is determined as per ***differentiation rule.***  9.2 ***Stationary points*** of functions are determined as per differentiation rules.  9.3 Integrals of algebraic functions are determined as per  ***integration rules****.*  9.4 Integrals of logarithmic functions are determined as per integration rules. |
| 10. Apply sequences and series | 10.1 Arithmetic means and nth term of an arithmetic sequence is determined as per the sequence rules.  10.2 Sum of terms of a given ***arithmetic series*** are determined as per the sequence rules.  10.3 A geometric sequence is differentiated according to arithmetic sequence rules.  10.4 A finite geometric sequence is differentiated according to finite geometric sequence rules.  10.5 Geometric means and nth terms of a geometric sequence is determined as per geometric sequence rules.  10.6 Sum of finite and infinite geometric sequence is determined as per geometric sequence rules. |
| 11. Apply statistics methods | 11.**1 *Raw data* is *processed*** as per job requirement.  11.2 Interpretation of data is performed as per job requirement.  11.3 ***Data presentation*** is performed as per job requirement. |

**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. Proportions may include but not limited to: | * Direct proportion * Inverse proportion |
| 1. Simultaneous method may include but not limited to: | * Elimination method * Substitution * Graphical method |
| 1. Quadratic methods May include but not limited to: | * Factorization * Completing Square Method * Quadratic formula |
| 1. Logarithms may include but not limited to: | * + Operation   + Conversions   + Graph plotting |
| 1. Errors may include but not limited to: | * + Absolute   + Relative   + Percentage |
| 1. Trigonometric rules. May include but not limited to: | * + Sine rule   + Cosine rule   + Double angle formula |
| 1. Differentiation May include but not limited to: | * + First principles.   + High order functions   + Differential equations   + Inverse differentiation |
| 1. Differentiation rules. May include but not limited to: | * + Product rule   + Chain rule   + Quotient rule |
| 1. Stationary points May include but not limited to: | * + Maxima   + Minima   + Point of inflection |
| 1. Integration May include but not limited to: | * + Constant of integration   + Integral notation   + Indefinite and definite integrals |
| 1. Methods of integration May include but not limited to: | * + Standard form   + Substitution   + Integration by parts |
| 1. Currency table May include but not limited to: | * + Selling price   + Buying price |
| 1. Series May include but not limited to: | * + Arithmetic Progression   + Geometric Progression |
| 1. Raw data may include but not limited to: | * + Grouped data   + Ungrouped data |
| 1. Data processing may include but not limited to: | * + Mean   + Mode   + Median   + Range   + Quartile   + Standard deviation   + Variance |
| 1. Data presentation May include but not limited to: | * + Pictograms   + Histograms   + Pie charts   + Bar charts   + Frequency polygon |
| 1. Order of matrix May include but not limited to: | * + Singular   + Non-singular   + Identity   + Echelon |
| 1. Matrix operation May include but not limited to: | * + Compatibility   + Addition/subtraction   + Multiplication   + Multiplication by scalar |

**REQUIRED SKILLS AND KNOWLEDGE**

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

**Required Skills**

The individual needs to demonstrate the following skills:

* Applying fundamental operations (addition, subtraction, division, multiplication)
* Using and applying mathematical formulas
* Logical thinking
* Problem solving
* Applying statistics
* Drawing graphs
* Using different measuring tools

Required knowledge

The individual needs to demonstrate knowledge of:

* Fundamental operations (addition, subtraction, division, multiplication)
* Types and purpose of measuring instruments
* Units of measurement and abbreviations
* Rounding techniques
* Types of fractions
* Types of tables and graphs
* Presentation of data in tables and graphs
* Vector operations
* Matrix operations
* Data presentation

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:   * 1. Applied Ratios, proportions and percentages as per algebraic rules.   2. Interpreted graph as per formulated graphical rules.   3. Plotted logarithmic and exponential graph as per logarithmic rules.   4. Solved Simultaneous equations as per matrix concept   5. Performed operations on vectors as per vector rules.   6. Determined angles of elevation and depression as per trigonometric rules.   7. Determined rate of change as per differentiation concept   8. Differentiated finite geometric sequence as per finite geometric sequence rules.   9. Determined sum of terms of geometric sequence as per the geometric sequence rules.   10. Interpreted data as per work requirement.   11. Presented data as per job requirement. |
| 1. Resource Implications | The following resources should be provided:   * 1. Appropriately simulated environment where assessment can take place   2. Access to relevant work environment   3. Resources relevant to the proposed activities or tasks |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Written assessment   2. Oral assessment |
| 1. Context of Assessment | 1. Competency may be assessed individually in the actual workplace or simulated environment |
| 1. Guidance information for assessment | 1. Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# CORE UNITS OF LEARNING

## DEVELOP RESEARCH CONCEPTS

**UNIT CODE:**

**UNIT DESCRIPTION**

This unit describes the skills, knowledge and competences required in formulating a research problem, developing research objectives, developing sampling statistical procedures., developing data collection tools, developing data analysis framework, developing research budget proposal and time plan and piloting data collection tools.

**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 research problem | * 1. Specific ***area of interest*** is identified as per research problem   2. Literature review is conducted according to research problem   3. Research variables are defined as per the research problem   4. Research variables are identified according to the research problem |
| 1. Develop research objective/research questions | * 1. Research variables are categorized as specific and general objective   2. Research objectives are developed as SMART objectives   3. Research questions are developed as per research objectives |
| 1. Develop sampling statistical procedures. | * 1. Target population is defined as per ***research interest***   2. Sampling design is identified as per target population   3. Representative sample is taken in accordance to existing sampling frame   4. Sampling technique is specified as per the sampling frame   5. Sample size is determined as per ***scientific approaches*** |
| 1. Develop data collection tools | * 1. Data types are identified as per research objectives   2. Data collection tools are designed as per Data types   3. Research questions are arranged as per research objectives |
| 1. Develop data analysis framework | * 1. Code book is created as per data types   2. ***Data analytics*** are selected according to designed purposes   3. Data tools are visualized as per trends or patterns |
| 1. Develop research budget proposal & Time plan | * 1. Research activities are identified as per the study   2. Costs of research activities are estimated according to prevailing market rates   3. ***Budget Proposal*** is tabulated as per the costed items   4. Research activities are itemized as per the study timeframe |
| 1. Pilot data collection tools | * 1. Pilot study site is identified based on the characteristics of the main study site   2. Pilot tools are administered as per set criteria   3. Pilot data tools are tested as per the research objectives   4. Pilot data is analysed according to set criteria |

**RANGE STATEMENT**

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. Area of interest may include but not limited: | * Subject area * Organizational activities * Identified problems |
| 1. Research interest may include but not limited to: | * Relevance * Score |
| 1. Scientific approaches may include but not limited to: | * Scientific method/technique * Scientific formula * Scientific procedure * Scholarly justification |
| 1. Data analytics may include but not limited to: | * Collection of data * Transformation of data * Organizational data |
| 1. Budget proposal may include but not limited to: | * Proposal development * Data collection tools preparation * Data collection statistical procedures. * Data analysis * Data report |

**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:

* Numeracy skills
* Analytical skills
* Digital literacy skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Use of Internet
* Data collection techniques
* Development of data collection tools

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| * + 1. Critical aspects of Competency | Assessment requires evidence that the candidate:   1. Identified research variables as per research problem 2. Developed research objectives according to research objectives 3. Developed sampling statistical procedures. as per target population 4. Developed data collection tools as per research objectives 5. Developed data analysis tools as per types of data 6. Piloted data collection tools as per the main research study |
| * + 1. Resource Implications | The following resources should be provided:   1. Computer 2. Printer 3. Stationery 4. Internet |
| * + 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Observation 2. Oral questioning 3. Portfolio of evidence 4. Interviews 5. Written tests |
| * + 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. Simulated work environment |
| * + 1. Guidance information for assessment | 1. Holistic assessment of other units relevant to the industry sector, workplace and job role is recommended |

## COLLECT AND MANAGE DATA

**UNIT CODE:**

**UNIT DESCRIPTION**

This unit describes the skills, knowledge and competences required in preparing data collection tools and equipment, selecting representative sample, carrying out data collection, preparing code book, performing data cleaning and managing data files.

**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. Prepare data collection tools and equipment | * 1. Data collection tools are identified as per research type   2. Equipment is tested for functionality according to specifications   3. ***Data collection instruments*** are prioritized according to data collection activities |
| * + 1. Select representative sample | * 1. Target population is determined as per the research question   2. Sampling method is selected according to the target population   3. Sample size is determined as per margin error   4. Sampling techniques are selected based on natureof the population   5. ***Sample*** is evaluated according to characteristics of the target population |
| * + 1. Carry out data collection | * 1. Permits are sought as per relevant authorities   2. Data collection methods are selected according to the type of research questions   3. Data collection methods are administered as per data collection procedure   4. Data collected is evaluated as per quality standards |
| * + 1. Prepare code book | * 1. Codes are prepared as per variable and responses.   2. Codebook is prepared as per data variables.   4.3 Code book is tested as per ***coding rules*** |
| * + 1. Perform data cleaning | * 1. Raw data is cleaned as per the data clean up statistical procedures.   2. Data errors are corrected as per data clean-up statistical procedures.   3. Quality assurance checks are performed as per set standards |
| * + 1. Manage data files | * 1. Data management toolkits are developed as per institutional resources   2. Collected data are sorted as per organizational formats   3. Data is documented as per context of data files   4. Data repository is generated as per usability of data   5. Files created are stored according to preservation plan |

**RANGE STATEMENT**

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. Data collection instruments may include but not limited to: | * Questionnaires * Interviews * Observation * Focus group discussions * Document review |
| 1. Samples may include but not limited to: | * Number of participants * Selected respondents * Portion of the target population |
| 1. Coding rules may include but not limited to: | * Coding steps * Coding statistical procedures. * Coding regulations * Coding criteria |

**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:

* Organisational skills
* Problem solving skills
* Data collection skills
* ICT literacy skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Organization work procedure and processes
* Research methods
* sampling
* data collection methods

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:   1. Prepared data collection instruments as per data to be collected 2. Selected sample size according to target population 3. Carried out data collection as per the data collection statistical procedures. 4. Prepared code book as per coding statistical procedures. 5. Performed data cleaning as per data cleaner statistical procedures. 6. Managed data files as per institutional preservation plan |
| 1. Resource Implications | The following resources should be provided:   1. Computer 2. Printer 3. Stationery |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Observation 2. Oral questioning 3. Portfolio of evidence 4. Interviews 5. Written tests |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. Simulated work environment |
| 1. Guidance information for assessment | 1. Holistic assessment of other units relevant to the industry sector, workplace and job role is recommended |

## PERFORM DESCRIPTIVE DATA ANALYSIS AND PRESENTATION

**UNIT CODE:**

**UNIT DESCRIPTION**

This unit describes the skills, knowledge and competences required in performing data exploration, selecting descriptive methods, performing descriptive statistical methods, presenting descriptive statistical output, interpreting descriptive statistical output and preparing descriptive statistical output.

**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. Perform data exploration | * 1. ***Nature of the variables*** are identified as per the study   2. Trends and patterns of the variables are investigated as per the study objectives   3. Variables are checked for outliers and missing values according to the study statistical procedures. |
| 1. Select descriptive methods | * 1. Measures of central tendency are selected according to the research objectives   2. Measures of dispersion are selected according to the research objectives   3. Categorical data are presented using frequency distribution tables and charts |
| 3. Perform descriptive statistical methods | * 1. Measures of central tendency are generated based on the study statistical procedures.   2. Measures of dispersion are generated based on the study statistical procedures.   3. Categorical data output are tabulated as per the study statistical procedures. |
| 4.Present descriptive statistical output | * 1. Numerical values of measures of central tendency are presented based on the study statistical procedures.   2. Numerical values of measures of dispersion are presented based on the study statistical procedures.   3. Categorical data output is presented as per the study statistical procedures. |
| 5.Interpret descriptive statistical output | * 1. Numerical values of measures of central tendency are interpreted based on the study statistical procedures.   2. Numerical values of measures of dispersion are interpreted based on the study statistical procedures.   3. Categorical data output is interpreted as per the study statistical procedures.   4. Assumptions are documented as per study procedure |
| 6.Prepare descriptive statistical output | * 1. Descriptive statistical output report is prepared as per study objectives   2. Dissemination plan is prepared as per study timeframe   3. Report is disseminated as per the study guidelines |

**RANGE STATEMENT**

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. Nature of the variables may include but not limited to: | * Independent variables * Dependent variables * Intervening/moderating variables |

**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
* Problem solving
* Presentation skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Measures of central tendency
* Descriptive analysis methods
* Descriptive data presentation methods

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:   1. Performed data exploration as per study statistical procedures. 2. Selected descriptive methods as per research objective 3. Performed descriptive analysis as per descriptive statistical methods 4. Interpreted descriptive statistical analysis output as per study objectives |
| 1. Resource Implications | The following resources should be provided:   1. Computer 2. Stationery 3. Printer 4. Data |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Observation 2. Oral questioning 3. Portfolio of evidence 4. Interviews 5. Written tests 6. Output report |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. Simulated work environment |
| 1. Guidance information for assessment | 1. Holistic assessment of other units relevant to the industry sector, workplace and job role is recommended |

## PERFORM INFERENTIAL DATA ANALYSIS AND PRESENTATION

**UNIT CODE:**

**UNIT DESCRIPTION**

This unit describes the skills, knowledge and competences required in carrying out data transformation techniques,creating new variables, implementing statistical model and interpreting inferential results.

**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. Carry out data transformation techniques | * 1. Assumptions of the variables are formulated as per the study objectives   2. Variables are transformed as per the study objectives   3. ***Transformation techniques*** are identified as per the study objectives   4. Transformation techniques are applied as per the study objectives |
| 1. Create new variables. | * 1. Existing variables are identified as per the study objectives   2. New variables are created as per as per existing variables   3. New variables are aligned as per study objectives |
| 1. Implement statistical model | * 1. Statistical models are identified as per study objective   2. Statistical models are selected as per study objectives   3. Statistical models are checked for appropriateness as per study objectives   4. Statistical models are performed based on study objectives |
| 1. Interpret inferential results. | * 1. ***Inferential thresholds*** are identified as per standards   2. Inferential tests are reported as per outcomes   3. Inferential outcomes are determined as per standards   4. ***Parameter estimates*** are interpreted as per the statistical model output |

**RANGE STATEMENT**

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. Transformation techniques may include but not limited to: | * Transformation methods * Transformation statistical procedures. * Replacement of variables |
| 1. Inferential thresholds may include but not limited to: | * P-values * Significant levels |
| 1. Parameter estimates may include but not limited to: | * Analysed outcomes * Obtained values |

**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:

* Computer skills
* Analytical skills
* Presentation skills
* Reporting skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Variable types
* Statistical models
* Statistical tables
* Data analysis software
* Parametric tests
* PowerPoint presentation

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:   1. Carried out data transformation as per data transformation techniques 2. Created new variables from existing variables as per study objectives 3. Implemented statistical models as per study objectives 4. Interpreted inferential outputs as per inferential thresholds |
| 1. Resource Implications | The following resources should be provided:   1. Statistical packages 2. Internet 3. Printer Stationery |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Observation 2. Oral questioning 3. Portfolio of evidence 4. Interviews 5. Third party report 6. Written tests |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. Simulated work environment |
| 1. Guidance information for assessment | 1. Holistic assessment of other units relevant to the industry sector, workplace and job role is recommended |

## DESIGN RESEARCH EXPERIMENTS

**UNIT CODE:**

**UNIT DESCRIPTION**

This unit describes the skills, knowledge and competences required in developing experimental design, conducting the experimental design and analysing experimental data.

**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. Develop experimental design | * 1. ***Experimental design type*** is identified as per research problem   2. Factors are identified as per research objectives   3. Hypotheses are stated as per the research objectives   4. Experimental treatment(s) are designed according to research factors   5. ***levels of treatment(s)*** are determined based on research objectives   6. Outcome variables are determined as per hypothesis |
| 1. Conduct the experimental design | * 1. Site is selected based on treatment levels   2. Experimental plots are randomized based on samples   3. Treatments are applied to experimental plots based on experimental design   4. Outcome variables are measured based on the treatments   5. Data is recorded as per treatment type |
| 1. Analyse experimental data | * 1. ANOVA Assumptions are tested as per methods.   2. ANOVA is performed as per experimental design   3. ANOVA output is interpreted as per research objective   4. Sources of variation are determined as per experimental treatments   5. Conclusions are drawn as per experimental treatments outcome |

**RANGE STATEMENT**

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. Experimental design type may include but not limited to: | * Pre-experimental research design * True experimental research design * Quasi-experimental research design |
| 1. levels of treatment(s) may include but not limited to: | * Amount * Magnitude |

**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:

* Creative thinking
* Analytical skills
* Numeracy skills
* Reporting skills
* Computer skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Assumptions in using ANOVA
* Randomisation
* Completely randomised block design
* Experiments with random factors
* ANOVA in CRBD
* Pooling variance (within and between samples)

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:   1. Developed experimental research design as per research problem 2. Determined levels of treatment as per outcome variables 3. Conducted experimental design as per treatment levels 4. Analysed experimental data as per experimental treatment outcome 5. Drawn conclusions as per analysed experimental data |
| 1. Resource Implications | The following resources should be provided:   1. Computer 2. Printer 3. Stationery 4. Internet |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Observation 2. Interviews 3. Portfolio of evidence 4. Third party report 5. Written tests |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. Simulated work environment |
| 1. Guidance information for assessment | 1. Holistic assessment of other units relevant to the industry sector, workplace and job role is recommended |

## CONDUCT RELIABILITY AND VALIDITY OF DATA

**UNIT CODE:**

**UNIT DESCRIPTION**

This unit describes the skills, knowledge and competences required in carrying out pilot study, conducting reliability test, conducting validity test and comparing validity and reliability results with threshold.

**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. Carry out pilot study | * 1. Sample size is selected as per ***scientific justification***   2. Pilot study steps are determined as per objectives of the study   3. ***Measurement instruments*** are tested as per the study   4. Data entry and analysis are performed as per data set |
| 1. Conduct reliability test | 2.1 Reliability assessments are determined according to data type  2.2 Reliability tests are conducted as per conditions of pilot survey  2.3 Reliability scales are determined as per study variables  2.4 ***Reliability coefficients*** are interpreted as per test scores |
| 1. Conduct validity test | 3.1 Validity methods are selected as per ***uniform guidelines***  3.2 Validation statistical procedures. are identified according to the accepted standards  3.3 Validity outcomes are interpreted as per test manuals  3.4 Validity reports are developed according to professional guidelines |
| 1. Compare validity and reliability results with threshold | 4.1 Validity and reliability thresholds are identified as per standards  4.2 Validity and reliability tests are reported as per outcomes  4.3 Validity and reliability outcomes are determined as per thresholds  4.4 Validity and reliability tests are evaluated according to standards |

**RANGE STATEMENT**

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. Scientific justification May include but not limited to: | * Scholarly evidence * Academic justification * Scientific proofs |
| 2. Measurement instruments May include but not limited to: | * Literature review * Expert advice * Statistical applications |
| 3. Reliability coefficients May include but not limited to: | * Variance estimates * Alpha values |
| 4. Uniform guidelines May include but not limited to: | * Selection statistical procedures. * Content validity * Criteria |

**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
* Computer skills
* Communication skills
* Interpretation skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Analytical methods
* Data measurement methods and instruments
* Data variation
* Data collection processes

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:   1. Carried out pilot study as per sample size 2. Conducted reliability tests as per study variables 3. Conducted validity tests as per study variables 4. Evaluated validity and reliability results according to thresholds |
| 1. Resource Implications | The following resources should be provided:   1. Computer 2. Printer 3. Stationery 4. Internet |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Observation 2. Portfolio of evidence 3. Interviews 4. Third party report 5. Written tests |
| 1. Context of Assessment | Competency may be assessed:   1. On-the-job 2. Simulated work environment |
| 1. Guidance information for assessment | 1. Holistic assessment of other units relevant to the industry sector, workplace and job role is recommended |