

**REPUBLIC OF KENYA**

**COMPETENCY BASED MODULAR CURRICULUM**

**FOR**

**APPLIED STATICTICS**

**KNQF LEVEL 6**

**PROGRAMME ISCED CODE:** **0542554A**

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**FOREWORD**

Provision of quality education and training is fundamental to the Government’s overall strategy for socio-economic development. Quality education and training contribute to achievement focused on Kenya’s development blueprint and sustainable development goals.

Reforms in the education and training sector are necessary for achievement of Kenya Vision 2030 and meeting the provisions the Constitution of Kenya. The education sector had to be aligned to the Constitution and this resulted in formulation of the Policy Framework for Reforming Education and Training (Sessional Paper No. 1 of 2019). A key feature of this policy is the change in the design and delivery of TVET training. This policy document requires that training in TVET be competency based, curriculum development be industry led, certification be based on demonstration of competence and mode of delivery that allows for multiple entry and exit in TVET programs.

These reforms demand that Industry takes a leading role in curriculum development to ensure the curriculum addresses its competence needs. It is against this background that this curriculum has been developed. For trainees to build their skills on foundational hands-on activities of the occupation, units of learning are grouped in modules. This has eliminated duplication of content and streamlined exemptions based on skills acquired as a trainee progresses in the up-skilling process, while at the same time allowing trainees to be employable in the shortest time possible through the acquisition of part qualifications.

It is my conviction that this curriculum will play a great role towards development of competent human resource for the applied statistics sector’s growth and sustainable development.

**PRINCIPAL SECRETARY**

**STATE DEPARTMENT FOR TVET**

**MINISTRY OF EDUCATION**

**PREFACE**

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

TVET Act CAP 210A and Sessional Paper No. 1 of 2019 on Reforming Education and Training in Kenya for Sustainable Development 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 industry, as well as increase the global competitiveness of the Kenyan labour force.

This curriculum has been developed in adherence to the Kenya National Qualifications Framework and CBETA standards and guidelines. The curriculum is designed and organized into Units of Learning with Learning Outcomes, suggested delivery methods, learning resources, and methods of assessing the trainee’s achievement. In addition, the units of learning have been grouped in modules to concretize the skills acquisition process and streamline upskilling.

I am grateful to all expert trainers and everyone who played a role in translating the Occupational Standards into this competency-based modular curriculum.

**CHAIRPERSON**

**ACKNOWLEDGEMENT**

This curriculum has been designed for competency-based training and has independent units of learning that allow the trainee flexibility in entry and exit. In developing the curriculum, significant involvement and support were received from expert trainers, institutions and organizations.

I recognize with appreciation the role of the Applied Statistics National Sector Skills Committee (NSSC) in ensuring that competencies required by the industry are addressed in the curriculum. I also thank all stakeholders in the industrial sector for their valuable input and everyone who participated in developing this curriculum.

I am convinced that this curriculum will go a long way in ensuring that individuals aspiring to work in the applied sector acquire competencies to perform their work more efficiently and effectively.

**COUNCIL SECRETARY/CEO**

**QAIs**

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# ABBREVIATIONS AND ACRONYMS

AIC Akaike Information Criterion

ANOVA Analysis of Variance

CBET Competency Based Education and Training

CBETA Competency Based Education and Training and Assessment

CPU Central Processing Unit

GDP Gross Domestic Product

GLMS Generalized Linear Models

GNP Gross National Product

KNQA Kenya National Qualifications Authority

LCD Liquid Crystal Display

NNP Nyeri National Polytechnic

ODK Open Data Kit

OLS Ordinary Least Squares

RAM Random Access Memory

SPSS Statistical Package for Social Sciences

SQL Structured Query Language

TVET Technical and Vocational Education and Training

# KEY TO ISCED UNIT CODE



# CURRICULUM OVERVIEW

The applied statistics technology level 6 consists of competencies that an individual must have to effectively perform duties of an applied statistics technician. It involves 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.

# MODULAR UNIT SUMMARY

|  |  |  |  |
| --- | --- | --- | --- |
| **UNIT CODE** | **UNIT NAME** | **DURATION (HOURS)** | **CREDIT FACTOR** |
| **MODULE I** | | | |
| 0417 541 01A | Work Ethics and Practices | 40 | 4 |
| 0542 551 02A | Research Methods | 200 | 20 |
| 0542 551 03A | Collect and Manage Data | 180 | 18 |
|  |  |  |  |
| **MODULE II** | | | |
| 0611 541 04A | Digital Literacy | 40 | 4 |
| 0542 551 05A | Research Concepts | 200 | 20 |
| 0542 551 06A | Descriptive Data Analysis and Presentation | 110 | 11 |
|  |  |  |  |
| **MODULE III** | | | |
| 0031 541 07A | Communication Skills | 40 | 4 |
| 0542 551 08A | Statistical Techniques | 200 | 20 |
| 0542 551 10A | Descriptive Data Analysis and Presentation | 90 | 9 |
|  |  |  |  |
| **MODULE IV** | | | |
| 0413 541 11A | Entrepreneurial skills | 40 | 4 |
| 0542 551 12A | Mathematics for Statistics | 200 | 20 |
| 0542 551 13A | Designing Research Experiments | 180 | 18 |
|  |  |  |  |
| **MODULE V** | | | |
| 0542 551 14A | Manage Statistical Data | 180 | 18 |
| 0542 551 15A | Inferential Data Analysis and Presentation | 200 | 20 |
|  |  |  |  |
| **MODULE VI** | | | |
| 0612 551 16A | Database Management Systems | 200 | 20 |
| 0542 551 17A | Reliability and Validity of Data | 180 | 18 |
| **TOTAL** | | **2,350** | **235** |
| **INDUSTRIAL TRAINING** | | **480** | **48** |
| **GRAND TOTAL** | | **2,830** | **283** |

Total number of hours is **2,830 hours** inclusive of **480** hours of industrial attachment.

# ENTRY REQUIREMENTS

An individual entering this course should have any of the following minimum requirements:

1. Kenya Certificate of Secondary Education (KCSE) mean grade C-.

**Or**

1. Equivalent qualifications as determined by TVETA.

**Trainer Qualification**

Qualifications of a trainer for this course include:

1. Possession of at least Applied Statistics level 7 or in related trade area;
2. Be registered by TVETA.

# INDUSTRY TRAINING

An individual enrolled in this course will be required to undergo Industry training for a minimum period of 480 hours in applied statistics sector. The industrial training may be taken after completion of all modules for those pursuing the full qualification or be distributed equally in each module for those pursuing part qualifications. In the case of dual training model, industrial training shall be as guided by the dual training policy.

# ASSESSMENT

The course will be assessed both in formative and summative as follows:

1. During formative assessment all performance criteria shall be assessed based on performance criteria weighting.
2. During summative assessment basic and common units shall be integrated in the core units.
3. Summative assessment shall involve practical assessment focusing more on critical aspects of the respective unit of competency.
4. Theoretical and practical weight shall be 40:60 respectively for each unit of learning;
5. Formative and summative assessments shall be weighted at 60% and 40% respectively in the overall unit of learning score

For a candidate to be declared competent in a unit of competency, the candidate must meet the following conditions:

1. Obtained at least 40% in theory assessment in formative and summative assessments.
2. Obtained at least 60% in practical assessment in formative and summative assessment where applicable.
3. Obtained at least 50% in the weighted results between formative assessment and summative assessment where the former constitutes 60% and the latter 40% of the overall score.
4. Assessment performance rating for each unit of competency shall be as follows:

|  |  |
| --- | --- |
| **MARKS** | **COMPETENCE RATING** |
| 80 -100 | Attained Mastery |
| 65 - 79 | Proficient |
| 50 - 64 | Competent |
| 49 and below | Not Yet Competent |
| Y | Assessment Malpractice/irregularities |

1. Assessment for Recognition of Prior Learning (RPL) may lead to award of part and/or full qualification.

**Certification**

A candidate will be issued with a Certificate of Competency upon demonstration of competence in a core Unit of Competency. To be issued with KenyaNational TVET Certificate in Applied Statistics Technology level 6, the candidate must demonstrate competence in all the Units of Competency as given in the qualification pack. A Statement of Attainment certificate may be issued upon demonstration of competence in a certifiable element within a unit.

The certificates will be issued by the Qualification Awarding Institution

# MODULE I: UNITS OF LEARNING

This Module consists of competencies that an individual must achieve to enable him/her to apply statistics in a work place. It entails preparation collection and management of research data. It consists of the following units of learning;

|  |  |  |  |
| --- | --- | --- | --- |
| **UNIT CODE** | **UNIT NAME** | **ELEMENTS** | **DURATION**  **(HOURS)** |
| 0417 541 01A | Apply Work Ethics and Practices | Apply Self-Management Skills | **10** |
| Promote Ethical Practices and Values | **4** |
| Promote Teamwork | **10** |
| Maintain Professional and Personal Development | **10** |
| Apply Problem-Solving Skills | **4** |
| Promote Customer Care | **2** |
| **TOTAL** | **40** |
| 0542 551 02A | Apply Research Methods | Formulating the Research Problem | **40** |
| Carry out Literature Review | **30** |
| Develop research objectives | **20** |
| Develop Research Design and Sample Design | **20** |
| Develop research budget proposal & Time plan | **10** |
| Collecting research Data | **30** |
| Analysis of collected research Data | 30 |
| Interpretation of Research Findings | **20** |
| Presentation of research findings | **10** |
| **TOTAL** | **200** |
| 0542 551 03A | Collect and Manage Data | Prepare data collection tools and equipment | **40** |
| Select a representative sample | **20** |
| Carry out data collection | **40** |
| Prepare code book | **20** |
| Perform data cleaning | **30** |
| Manage data files | **30** |
| **TOTAL** | **180** |
| **TOTAL** | | | **430** |

**WORK ETHICS AND PRACTICES**

**UNIT CODE:** 0417 541 12A

**UNIT DURATION:** 40 hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: **Apply work ethics and practices.**

**Unit Description**

This unit covers competencies required to demonstrate employability skills. 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.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Apply self-management skills | **10** |
|  | Promote ethical work practices and values | **4** |
|  | Promote Team work | **10** |
|  | Maintain professional and personal development | **10** |
|  | Apply Problem solving skills | **4** |
|  | Promote Customer Care | **2** |
| **Total** | | **40** |

**Learning Outcomes, Content, and Suggested Assessment Methods**

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| 1. Apply Self-Management Skills | 1. Personal vision mission and goals    * 1. definition of terms      2. develop a personal vision, mission and goal 2. Formulating personal vision, mission, and goals 3. Healthy lifestyle practices 4. Strategies for overcoming work challenges 5. Emotional intelligence 6. Coping with Work Stress. 7. Assertiveness versus aggressiveness and passiveness 8. Developing and maintaining high self-esteem 9. Developing and maintaining positive self-image 10. Time management 11. Setting performance targets 12. Monitoring and evaluating performance targets | * Observation * Portfolio of evidence * Project * Practical * Written assessment * Oral assessment |
| 1. Promote Ethical Work Practices and Values | * 1. Integrity   2. Core Values, ethics and beliefs   3. Patriotism   4. Professionalism   5. Organizational codes of conduct   6. Industry policies and procedures | * Portfolio of evidence * Project * Practical * Observation * Written assessment * Oral assessment |
| 1. Promote Teamwork | * 1. Types of teams   2. Team building   3. Individual responsibilities in a team   4. Determination of team roles and objectives   5. Team parameters and relationships   6. Benefits of teamwork   3.7 Qualities of a team player  3.8 Leading a team  3.9 Team performance and evaluation  3.10 Conflicts and conflict resolution  3.11 Gender and diversity mainstreaming  3.12 Developing Healthy workplace relationships  3.13 Adaptability and flexibility  3.14 Coaching and mentoring skills | * Observation * Written assessment * Oral assessment * Portfolio of evidence * Project * Practical |
| 1. Maintain Professional and Personal Development | 1. Personal vs professional development and growth 2. Avenues for professional growth 3. Recognizing career advancement 4. Training and career opportunities 5. Assessing training needs 6. Mobilizing training resources 7. Licenses and certifications for professional growth and development 8. Pursuing personal and organizational goals 9. Managing work priorities and commitments 10. Dynamism and on-the-job learning | * Project * Practical * Observation * Written assessment * Oral assessment * Portfolio of evidence |
| 1. Apply Problem-Solving Skills | 1. Causes of problems 2. Methods of solving problems 3. Problem-solving process 4. Decision making 5. Creative thinking and critical thinking process in development of innovative and practical solutions | * Observation * Project * Portfolio of evidence * Practical * Written assessment * Oral assessment |
| 1. Promote Customer Care | 1. Identifying customer needs 2. Qualities of good customer service 3. Customer feedback methods 4. Resolving customer concerns 5. Customer outreach programs 6. Customer retention | * Observation * Project * Practical * Portfolio of evidence * Written assessment * Oral assessment |

**Suggested Methods of Instruction**

* Practical
* Demonstrations
* Project
* Group discussion
* Direct instruction

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** |  |  |  |
|  | Textbooks |  | 5 pcs | 1:5 |
|  | PowerPoint presentations | For trainer’s use |  |  |
|  | Case studies |  | 5 | 1:5 |
|  | Business plan templates |  | 5 | 1:5 |
|  | Newspapers and Handouts |  | 5 | 1:5 |
|  | Business Journals |  | 5 | 1:5 |
|  | Video clips | Assorted | 5 sets | 3:5 |
|  | Audio tapes | Assorted | 5 sets | 3:5 |
|  | Whiteboard |  | 1 | 1:25 |
|  | Rolls flip charts |  | 1 | 1:25 |
|  | Assorted color of whiteboard markers | For trainers Use | 1 | 1:25 |
| **B** | **Learning Facilities & infrastructure** |  |  |  |
|  | Lecture/theory room |  | 1 | 1:25 |
| **C** | **Consumable materials** |  |  |  |
|  | Printing papers |  | enough | - |
|  | Stationery |  | 25 pcs | 1:1 |
|  | Printing ink cartilages | assorted | - | - |
|  | Internet |  | 200mbps | - |
| **D** | **Tools and Equipment** |  |  |  |
|  | Computers | For trainer’s use |  |  |
|  | Printer | For trainer’s use |  |  |
|  | LCD Overhead projector | For trainer’s use |  |  |

## **RESEARCH METHODS**

**UNIT CODE:** 0542 551 02A

**UNIT DURATION:** 200 hours

**Relationship to Occupational Standards**

This unit addresses the unit of competency: **Apply Research methods**

**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, analyzing collected research data, interpreting findings and presenting findings.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Formulating the Research Problem | **40** |
|  | Carry out Literature Review | **30** |
|  | Develop research objectives | **20** |
|  | Develop Research Design and Sample Design | **20** |
|  | Develop research budget proposal & Time plan | **10** |
|  | Collecting research Data | **30** |
|  | Analysis of collected research Data | 30 |
|  | Interpretation of Research Findings | **20** |
|  | Presentation of research findings | **10** |
| **Total** | | **200** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning outcome** | **Content** | **Suggested assessment**  **methods** |
| 1. Identifying the Research Problem | 1. Definition of research Philosophies 2. Types of research 3. Characteristics of research 4. Validity and reliability 5. The research processes 6. Identification of a research problem 7. Sources of research problems 8. Identification of a research problem 9. Formulation of research problems | * Observation * Oral questioning * Portfolio of evidence * Interviews * Third party report * Written tests |
| 2. Carry out literature review | 1. Reviewing the literature 2. Sources of literature 3. Theoretical framework 4. Conceptual framework 5. Referencing and citations 6. Introduction to Google scholar, research gate 7. Internet search engines | * Observation * Oral questioning * Portfolio of evidence * Interviews * Third party report * Written tests |
| 3. Develop research objectives | 1. Formulation of objectives 2. Main objectives 3. Sub-objectives 4. Characteristics of objectives 5. Characteristics of research hypothesis 6. Formulation of research hypothesis | * Observation * Oral questioning * Portfolio of evidence * Interviews * Third party report * Written tests |
| 4. Develop Research Design and Sample Design | 1. Preparing the research design 2. Identifying Variables 3. Measurement scales 4. Study research design    1. Observational    2. Interventional    3. Data collection techniques       1. Observation       2. Interviews       3. Survey    4. Types of Sampling techniques    5. Probability and non- probability    6. Sample size       1. Determination       2. Analysis methods | * Observation * Oral questioning * Portfolio of evidence * Interviews * Third party report * Written tests |
| 5. Develop research budget proposal and time plan | 1. Budget and Costing Development    * 1. Direct costs      2. Indirect costs 2. Factors to consider when costing    * 1. Materials and equipment    1. Logistics    2. Administrative 3. Development of Time plan 4. Gant charts | * Observation * Oral questioning * Portfolio of evidence * Interviews * Third party report * Written tests |
| 6. Collect research Data | 6.1. Types of data  6.2. Methods of Data Collection and their limitations  6.3. Research instruments/ data collection tools  6.4. Types of  6.5. Questionnaires  6.6. Design of questionnaires  6.7 Constructing questionnaires  6.8 Digitizing questionnaires  Mobile technology (ODK)  6.9 Piloting the Questionnaire  Ethical issues concerning research participants  6.10 Ethical issues relating to the researcher | * Observation * Oral questioning * Portfolio of evidence * Interviews * Third party report   Written tests |
| 7. Analyze research data | 1. Data Processing 2. Data management.   7.3 Data Analysis Methods | * Observation * Oral questioning * Portfolio of evidence * Interviews * Third party report   Written tests |
| 8. Interpret research findings | 1. Interpretations of parameters   8.2 Predicting of values | * Observation * Oral questioning * Portfolio of evidence * Interviews * Third party report   Written tests |
| 9. Presentation of findings | 1. Reporting of findings 2. Research Project Report Format 3. List of References   9.4 Bibliography | * Observation * Oral questioning * Portfolio of evidence * Interviews * Third party report   Written tests |

**Suggested Methods Instructions**

* 1. Practical
  2. Projects
  3. Group discussions
  4. Demonstration by trainer
  5. Direct guidance

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
| 1 | Graph book | A4/A5 Size | 25 | 1:1 |
|  | Notes | - | 1 | 1:25 |
|  | Mathematical table | SMP tables | 25 | 1:1 |
|  | Scientific calculator | FX 82 MS/FX 570 MS | 25 | 1:1 |
|  | Data presentation charts | Manilla charts | 1 | 1:25 |
|  | Statistical tables | Test tables: F, T, Z and Chi-square tables | 1 | 1:1 |
|  | Squared exercise book | A4 Size | 25 | 1:1 |
|  | Datasets | - | 5 | 1:5 |
|  | Teaching aids (Dice, coins, cards etc.) | - | 5 | 1:5 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Lecture/theory room | 72m2 | 1 | 1:25 |
|  | Whiteboard/Plotting grid | 2M by 1M | 1 | 1:25 |
|  | Computers | 4GB/8GB RAM/with internet connection | 25 | 1:1 |
|  | Statistical software | SPSS, STATA, R PROGRAMME,  Advanced Excel, ODK | 25 | 1:1 |
|  | Printers | Ink Jet | 1 | 1:25 |
|  | Projector | LCD High resolution | 1 | 1:25 |
| **C** | **Consumable materials** | | | |
|  | Stationery | Pens, pencils, printing papers etc. | Enough for 25 | 1:1 |
|  | Assorted whiteboard markers | Non-permanent | 3 | 3:25 |
|  |  |  |  |  |
| **D** | **Tools and Equipment** | | | |
|  | Mathematical set | Oxford | 25 | 1:1 |
|  | White board protractor, compass, ruler, set squares | Wooden/plastic | 1 per item | 1:25 |

## **COLLECT AND MANAGE DATA**

**UNIT CODE:** 0542 551 03A

**UNIT DURATION:** 180 hours

**Relationship to Occupational Standards**

This unit addresses the unit of competency: **Collect and manage research data**

**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.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Prepare data collection tools and equipment | **40** |
|  | Select a representative sample | **20** |
|  | Carry out data collection | **40** |
|  | Prepare code book | **20** |
|  | Perform data cleaning | **30** |
|  | Manage data files | **30** |
| **Total** | | **180** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested**  **Assessment Methods** |
| 1. Prepare data collection tools and equipment | * 1. Data collection tools   2. Questionnaires   3. Interviews   4. Observation   5. Focus group discussions   6. Document review   7. Equipment testing | * Observation * Oral questioning * Portfolio of evidence * Interviews * Third party report * Written tests |
| 1. Select a representative sample | 1. Target population 2. Sampling Methods 3. Determination of sample size 4. Sampling techniques 5. Sample evaluation | * Observation * Oral questioning * Portfolio of evidence * Interviews * Third party report * Written tests |
| 1. Carry out data collection | 1. Permits in data collection 2. Data collection methods 3. Data evaluation | * Observation * Oral questioning * Portfolio of evidence * Interviews * Third party report * Written tests |
| 1. Prepare a code book | 1. Coding of variables 2. Template preparation    * 1. Manual (PAPI)      2. Electronic (CAPI)      3. Coding rule      4. Coding steps    1. Coding statistical procedures    2. Coding regulations    3. Coding criteria | * Observation * Oral questioning * Portfolio of evidence * Interviews * Third party report * Written tests |
| 1. Perform data clean-up | 1. Editing of outliers 2. Missing variables 3. Verification of data entries 4. Inconsistencies 5. Removing duplicates | * Observation * Oral questioning * Portfolio of evidence * Interviews * Third party report * Written tests |
| 1. Manage data files | 1. Data management toolkits 2. Data sorting 3. Documentation 4. Data repositories    * 1. CD writing      2. Cloud computing      3. Filling      4. Databases | * Observation * Oral questioning * Portfolio of evidence * Interviews * Third party report * Written tests |

**Suggested Methods of Instructions**

* 1. Practical
  2. Projects
  3. Group discussions
  4. Demonstration by trainer
  5. Direct guidance

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | Notes | - | 1 | 1:25 |
|  | Datasets | - | 5 | 1:5 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Lecture/theory room | 72m2 | 1 | 1:25 |
|  | Whiteboard/Plotting grid | 2M by 1M | 1 | 1:25 |
|  | Computers | 4GB/8GB RAM/with internet connection | 25 | 1:1 |
|  | Statistical software | SPSS, STATA, R PROGRAMME,  Advanced Excel, ODK | 25 | 1:1 |
|  | Printers | Ink Jet | 1 | 1:25 |
|  | Projector | LCD High resolution | 1 | 1:25 |
| **C** | **Consumable materials** | | | |
|  | Stationery | Pens, pencils, printing papers etc. | Enough for 25 | 1:1 |
|  | Assorted whiteboard markers | Non-permanent | 3 | 3:25 |
| **D** | **Tools and Equipment** | | | |
|  | White board protractor, compass, ruler, set squares | Wooden/plastic | 1 per item | 1:25 |

# MODULE II: UNITS OF LEARNING

This module consists of competencies that an individual must achieve to enable him/her to apply statistics in a work place. It entails preparation of research concept and descriptive data analysis. It consists of the following units of learning;

|  |  |  |  |
| --- | --- | --- | --- |
| **UNIT CODE** | **UNIT NAME** | **ELEMENTS** | **DURATION (HOURS)** |
| 0611 541 04A | Digital Literacy | Operate Computer Devices | **6** |
| Solve Tasks Using Office Suite | **14** |
| Manage Data and Information | **6** |
| Perform Online Communication and Collaboration | **4** |
| Apply Cybersecurity Skills | **4** |
| Perform Online Jobs | **4** |
| Apply job entry techniques | **2** |
| **TOTAL** | **40** |
| 0542 551 05A | Research Concepts | Identify research problem | **30** |
| Develop research objective/research questions | **20** |
| Develop sampling statistical procedures | **30** |
| Develop data collection tools | **40** |
| Develop data analysis framework | **40** |
| Develop research budget proposal & Time plan | **10** |
| Pilot Data Collection Tools | **30** |
| **TOTAL** | **200** |
| 0542 551 06A | Descriptive Data Analysis and Presentation | Perform data exploration | **30** |
| Select descriptive methods | **40** |
| Perform descriptive statistical methods | 40 |
|  | **110** |
| **TOTAL** | | | **390** |

**DIGITAL LITERACY**

**UNIT CODE:** 0611 541 09A

**UNIT DURATION:** 40 Hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: **Apply Digital Literacy**

**Unit Description**

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

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Operate computer devices | **6** |
|  | Solve tasks using Office suite | **14** |
|  | Manage data and information | **6** |
|  | Perform online communication and collaboration | **4** |
|  | Apply cyber security skills | **4** |
|  | Perform online jobs | **4** |
|  | Apply job entry techniques | **2** |
| **Total** | | **40** |

**Learning Outcomes, Content, and Suggested Assessment Methods**

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| 1. Operate computer devices | * 1. Meaning and importance of digital literacy   2. Functions and Uses of Computers   3. Classification of computers   4. Components of a computer system   5. Computer devices      1. Desktops      2. Laptops      3. Smartphones      4. Tablets      5. Smartwatches   6. Computer Hardware   1.7.1 The System Unit E.g. Motherboard, CPU, casing  1.7.2 Input Devices e.g. Pointing, keying, scanning, voice/speech recognition, direct data capture devices.  1.7.3 Output Devices e.g. hardcopy output and softcopy output  1.7.4 Storage Devices e.g. main memory e.g. RAM, secondary storage (Solid state devices, Hard Drives, CDs & DVDs, Memory cards, Flash drives  1.7.5 Computer Ports e.g. HDMI, DVI, VGA, USB type C etc.  1.8 Classification of computer software  1.8.1 System software e.g. Operating System (Windows, Macintosh, Linux, Android, iOS)  1.8.2 Application Software e.g. Word Processors, Spreadsheets, Presentations etc.  1.8.3 Utility Software e.g. Antivirus programs  1.9 Operating system functions  1.9.1 Procedure for turning/off a computer  1.10 Mouse use techniques  1.10.1 Clicking  1.10.2 Double-clicking  1.10.3 Right-clicking  1.10.4 Drag and drop  1.11 Keyboard Parts and Use Techniques  1.12 Desktop Customization  1.13 File and Files Management using an operating system  1.14 Computer Internet Connection Options   * + 1. Mobile Networks/Data Plans     2. Wireless Hotspots     3. Cabled (Ethernet/Fiber)     4. Dial-Up     5. Satellite     6. ISDN (Integrated Services Digital Network)   1.15 Computer external devices management   1. Printers 2. Projectors 3. Smart Boards 4. Speakers 5. External storage drives 6. Digital/Smart TVs | * Observation * Portfolio of Evidence * Project * Written assessment * Practical assessment * Oral assessment |
| 1. Solve tasks using Office suite | 1. Meaning and Importance of Word Processing 2. Examples of Word Processors 3. Working with word documents 4. Open and close word processor 5. Create a new document 6. Save a document 7. Switch between open documents 8. Enhancing productivity 9. Set basic options/preference 10. Help resources 11. Use magnification/zoom tools 12. Display, hide built-in tool bar 13. Using navigation tools 14. Typing Text 15. Document editing (copy, cut, paste commands, spelling and Grammar check) 16. Document formatting 17. Formatting text 18. Formatting paragraph 19. Formatting styles 20. Alignment 21. Creating tables 22. Formatting tables 23. Graphical objects 24. Insert object (picture, drawn object) 25. Select an object 26. Edit an object 27. Format an object 28. Saving word document     * 1. save       2. Save as 29. Document Print setup   2.9.1 Page layout,  2.9.2 Margins set up  2.9.3 Orientation.   1. Word Document Printing   **Work sheet**   1. Meaning & Importance of electronic spreadsheets 2. Components of Spreadsheets 3. Application areas of spreadsheets 4. Using spreadsheet application 5. Parts of Excel screen: ribbon, formula bar, active cell, name box, column letter, row number, Quick Access Toolbar. 6. Cell Data Types 7. Block operations 8. Arithmetic operators (formula bar (-, +, 9. Cell Referencing 10. Data Manipulation 11. Using Functions (Sum, Average, SumIF, Count, Max, Max, IF, Rank, Product, mode etc) 12. Using Formulae 13. Sorting data 14. Filtering data 15. Visual representation using charts 16. Worksheet printing     1. Electronic Presentations     2. Meaning and Importance of electronic presentations     3. Examples of Presentation Software     4. Using the electronic presentation application 17. Parts of the PowerPoint screen (slide navigation pane, slide pane, notes, the ribbon, quick access toolbar, and scroll bars). 18. Open and close presentations 19. Creating Slides (Insert new slides, duplicate, or reuse slides.) 20. Text Management (insert, delete, copy, cut and paste, drag and drop, format, and use spell check). 21. Use magnification/zoom tools 22. Apply or change a theme. 23. Save a presentation 24. Switch between open presentations     1. Developing a presentation 25. Presentation views 26. Slides 27. Master slide     1. Text 28. Editing text 29. Formatting 30. Tables     1. Charts 31. Using charts 32. Organization charts     1. Graphical objects 33. Insert, manipulate 34. Drawings     1. Prepare outputs 35. Applying slide effects and transitions     1. Check and deliver 36. Spell check a presentation 37. Slide orientation 38. Slide shows, navigation   2.26 Print presentations (slides and handouts) | * Observation * Portfolio of Evidence * Project * Written assessment * Practical assessment * Oral assessment |
| 1. Manage Data and Information | 1. Meaning of Data and information 2. Importance and Uses of data and information 3. Types of internet services    1. Communication Services    2. Information Retrieval Services    3. File Transfer    4. World Wide Web Services    5. Web Services    6. Automatic Network Address Configuration    7. News Group    8. Ecommerce    9. Types of Internet Access Applications       1. Browsers       2. Email Apps       3. e-commerce Apps   **internet search**   * 1. Web browsing concepts   2. Key concepts   3. Security and safety   4. Web browsing   5. Using the web browser   6. Tools and settings   7. Clearing Cache and cookies   8. URIs   9. Bookmarks   10. Web outputs   11. Web based information   12. Search   13. Critical evaluation of information   14. Copyright, data protection   15. Downloads Management   16. Performing Digital Data Backup (Online and Offline)   17. Emerging issues in internet | * Observation * Portfolio of Evidence * Project * Written assessment * Practical assessment * Oral assessment |
| 1. Perform online communication and collaboration | * Netiquette principles * Communication concepts   1. Online communities   2. Communication tools   3. Email concepts * Using email   1. Sending email   2. Receiving email   3. Tools and settings   4. Organizing email * Digital content copyright and licenses * Online collaboration tools   1. Online Storage (Google Drive)   2. Online productivity applications (Google Docs & Forms)   3. Online meetings (Google Meet/Zoom)   4. Online learning environments   5. Online calendars (Google Calendars)   6. Social networks (Facebook/Twitter - Settings & Privacy) * Preparation for online collaboration   1. Common setup features   2. Setup * Mobile collaboration   1. Key concepts   2. Using mobile devices   3. Applications   Synchronization | * Observation * Portfolio of Evidence * Project * Written assessment * Practical assessment * Oral assessment |
| 1. Apply cybersecurity skills | 1. Data protection and privacy    1. Confidentiality of data/information    2. Integrity of data/information    3. Availability of data/information    4. Internet security threats    5. Malware attacks    6. Social engineering attacks    7. Distributed denial of service (DDoS)    8. Man-in-the-middle attack (MitM)    9. Password attacks    10. IoT Attacks    11. [Phishing Attacks](https://onlinedegrees.sandiego.edu/top-cyber-security-threats/#phishing-attacks)    12. [Ransomware](https://onlinedegrees.sandiego.edu/top-cyber-security-threats/#ransomware)    13. Computer threats and crimes    14. Cybersecurity control measures 2. Physical Controls 3. Technical/Logical Controls (Passwords, PINs, Biometrics) 4. Operational Controls    1. Laws governing protection of ICT in Kenya 5. The Computer Misuse and Cybercrimes Act No. 5 of 2018 6. The Data Protection Act No. 24 Of 2019 | * Observation * Portfolio of Evidence * Project * Written assessment * Practical assessment * Oral assessment |
| 1. Perform Online Jobs | 1. Introduction to online working 2. Types of online Jobs 3. Online job platforms    1. Remotask    2. Data annotation tech    3. Cloud worker    4. Upwork    5. Oneforma    6. Appen 4. Online account and profile management 5. Identifying online jobs/job bidding 6. Online digital identity 7. Executing online tasks 8. Management of online payment accounts. | * + Observation   + Oral assessment   + Portfolio of evidence   + Third party report   + Written assessment |
| 1. Apply job entry techniques | * Types of job opportunities  1. Self-employment 2. Service provision 3. product development 4. salaried employment  * Sources of job opportunities * Resume/ curriculum vitae  1. What is a CV 2. How long should a CV be 3. What to include in a AC 4. Format of CV 5. How to write a good CV 6. Don’ts of writing a CV    1. Job application letter 7. What to include 8. Addressing a cover letter 9. Signing off a cover letter    1. Portfolio of Evidence 10. Academic credentials 11. Letters of commendations 12. Certification of participations 13. Awards and decorations     1. Interview skills 14. Listening skills 15. Grooming 16. Language command 17. Articulation of issues 18. Body language 19. Time management 20. Honesty     1. Generally knowledgeable in current affairs and technical area | * + Observation   + Oral assessment   + Portfolio of evidence   + Written assessment |

**Suggested Methods Instruction**

* + Instructor-led facilitation using active learning strategies
  + Demonstration
  + Practical work by trainees
  + Viewing of related videos
  + Group discussions
  + Project
  + Role play
  + Case study

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| A | **Learning Materials** | | | |
|  | Power point presentations | For trainer’s use | 1 | 1:25 |
|  | Report writing templates | Trainees | 5 | 1:5 |
| B | **Learning Facilities & infrastructure** | | | |
|  | Lecture/theory room | For Trainer/trainee’s use | 1 | 1:25 |
|  | Computers with OS | Trainees | 25 | 1:1 |
|  | Internet connection | Trainees and Trainers | 1 connection | 1:25 |
|  |  |  |  |  |
|  | Whiteboard | For trainer’s use | 1 | 1:25 |
| C | **Consumable materials** | | | |
|  | Printing papers | For trainer and trainee use | Varies | Varies |
|  | Assorted whiteboard markers | For trainer’s use | Varies | Varies |
| D | **Tools and Equipment** | | | |
|  | Printers | For trainer’s use | 2 | 1:12 |
|  | Mobile phones | For trainer’s use | 25 | 1;1 |
|  | Projector | For trainer’s use | 1 | 1:25 |
|  | External storage media | For trainer and trainee use | Varies | 1:1 or 1:5 depending on need |

## **RESEARCH CONCEPTS**

**UNIT CODE:** 0542 551 05A

**UNIT DURATION:** 200 hours

**Relationship to Occupational Standards**

This unit addresses the unit of competency: **Develop Research Concepts.**

**Unit Description**

This unit describes the skills, knowledge and competences required in identifying 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.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Identify research problem | **30** |
|  | Develop research objective/research questions | **20** |
|  | Develop sampling statistical procedures | **30** |
|  | Develop data collection tools | **40** |
|  | Develop data analysis framework | **40** |
|  | Develop research budget proposal & Time plan | **10** |
|  | Pilot Data Collection Tools | **30** |
| **Total** | | **200** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment**  **Methods** |
| 1. Identify research problem | * 1. Research problem   2. Definitions of terms   3. Problem identification   4. Examples of research problems   5. Literature review  1. Sources of literature 2. Theoretical framework 3. Conceptual framework 4. Internet search engines    1. Research variables       1. Dependent       2. Independent | * Oral questioning * Portfolio of evidence * Interviews * Written tests |
| 1. Develop research objective/research questions | 1. Characteristics of objectives   2.1.1 SMART   1. Formulate objectives/hypothesis   2.2.1 General  2.2.2 Specific   1. Develop Research questions | * Oral questioning * Interviews * Written tests |
| 1. Develop sampling statistical procedures. | 3.1Identify target population   * + 1. Population     2. Sample   1. Sampling design/frame   2. Sampling and sampling techniques   3. Sample size determination   4. Means   5. Proportions | * Oral questioning * Portfolio of evidence * Interviews * Written tests |
| 1. Develop data collection tools | 1. Data types 2. Integer (int) 3. Boolean (bool) 4. Character (char)    1. Data collection tools    2. Questionnaire (open and closed ended)    3. Interviews guides    4. Audio    5. Document analysis guide    6. ODK (mobile based data collection tools)    7. Google forms | * Oral questioning * Portfolio of evidence * Interviews * Written tests |
| 1. Develop data analysis framework | 1. Code book development 2. Data analysis tools    1. Statistical software    2. Calculators    3. Description of statistical methods/models    4. Correlation    5. Regression | * Oral questioning * Portfolio of evidence * Interviews * Written tests |
| 1. Develop research budget proposal & Time plan | 1. Research activities 2. Budget and Costing Development 3. Direct costs 4. Indirect costs    1. Budget proposal | * Oral questioning * Portfolio of evidence * Interviews * Written tests |
| 1. Prepare Pilot data collection tools | 1. Pilot study site 2. Pilot tools administration 3. Testing of pilot tools 4. Analysis of pilot data | * Oral questioning * Portfolio of evidence * Interviews * Written tests |

**Suggested Methods of Instructions**

1. Practical
2. Projects
3. Group discussions
4. Demonstration by trainer
5. Direct guidance

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | Notes | - | 1 | 1:25 |
|  | Datasets | - | 5 | 1:5 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Lecture/theory room | 72m2 | 1 | 1:25 |
|  | Whiteboard/Plotting grid | 2M by 1M | 1 | 1:25 |
|  | Computers | 4GB/8GB RAM/with internet connection | 25 | 1:1 |
|  | Statistical software | SPSS, STATA, R PROGRAMME,  Advanced Excel, ODK | 25 | 1:1 |
|  | Printers | Ink Jet | 1 | 1:25 |
|  | Projector | LCD High resolution | 1 | 1:25 |
| **C** | **Consumable materials** | | | |
|  | Stationery | Pens, pencils, printing papers etc. | Enough for 25 | 1:1 |
|  | Assorted whiteboard markers | Non-permanent | 3 | 3:25 |
| **D** | **Tools and Equipment** | | | |
|  | White board protractor, compass, ruler, set squares | Wooden/plastic | 1 per item | 1:25 |

## **DESCRIPTIVE DATA ANALYSIS AND PRESENTATION**

**UNIT CODE:** 0542 551 06A

**UNIT DURATION:** 110 hours

**Relationship to Occupational Standards**

This unit addresses the unit of competency: **Perform descriptive data analysis**

**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.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Perform data exploration | 30 |
|  | Select descriptive methods | 40 |
|  | Perform descriptive statistical methods | 40 |
| **Total** | | **150** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment**  **Methods** |
| 1. Perform data exploration | 1. Data variables 2. Independent variables 3. Dependent variables 4. Intervening/moderating variables 5. Variable trends and patterns 6. Data cleanup | * Oral questioning * Portfolio of evidence * Interviews * Written tests |
| 1. Select descriptive methods | 1. Measures of central tendency 2. Mean 3. Median 4. Mode 5. Measures of dispersion 6. Categorical data presentation 7. Frequency tables   Charts | * Oral questioning * Portfolio of evidence * Interviews * Written tests |
| 1. Perform descriptive statistical methods | 1. Data summaries 2. Measures of central tendency 3. Mode, Median and Mean 4. Grouped 5. Interval data 6. Class boundaries 7. Class limits 8. Estimation formulae 9. Measures of variations/dispersion 10. Range, Variance & standard deviation 11. Coefficient of variation (*CV*)     1. Presentation of Results   Tables   1. Ordinary/Simple tables 2. Cross tabulation 3. Custom tables 4. Charts/Graphs 5. Histograms/stem & leaf displays 6. Frequency polygons 7. Bar and Pie charts 8. Cumulative frequency curves 9. Percentiles/Box & Whisker plots   Pivot tables | * Oral questioning * Portfolio of evidence * Interviews   Written tests |

**Suggested Methods of Instructions**

1. Practical
2. Projects
3. Group discussions
4. Demonstration by trainer
5. Direct guidance

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | Notes | - | 1 | 1:25 |
|  | Datasets | - | 5 | 1:5 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Lecture/theory room | 72m2 | 1 | 1:25 |
|  | Whiteboard/Plotting grid | 2M by 1M | 1 | 1:25 |
|  | Computers | 4GB/8GB RAM/with internet connection | 25 | 1:1 |
|  | Statistical software | SPSS, STATA, R PROGRAMME,  Advanced Excel, ODK | 25 | 1:1 |
|  | Printers | Ink Jet | 1 | 1:25 |
|  | Projector | LCD High resolution | 1 | 1:25 |
| **C** | **Consumable materials** | | | |
|  | Stationery | Pens, pencils, printing papers etc. | Enough for 25 | 1:1 |
|  | Assorted whiteboard markers | Non-permanent | 3 | 3:25 |
| **D** | **Tools and Equipment** | | | |
|  | White board protractor, compass, ruler, set squares | Wooden/plastic | 1 per item | 1:25 |

# MODULE III: UNITS OF LEARNING

This Module consists of competencies that an individual must achieve to enable him/her to apply statistics in a work place. It entails descriptive data analysis.

It consists of the following units of learning;

|  |  |  |  |
| --- | --- | --- | --- |
| **UNIT CODE** | **UNIT NAME** | **ELEMENTS** | **DURATION (HOURS)** |
| 0031 541 07A | Apply Communication Skills | Apply communication channels | **10** |
| Apply written communication skills | **12** |
| Apply non-verbal skills. | **4** |
| Apply oral communication skills. | **4** |
| Apply group communication skills | **10** |
| **TOTAL** | **40** |
| 0542 551 08A | Statistical Techniques | Apply statistical concepts | **50** |
| Apply statistical methods I | **50** |
| Apply statistical methods II | **40** |
| Apply statistical significance | **30** |
| Apply statistics for business | **30** |
| **TOTAL** | **200** |
| **TOTAL** | **100** |
| 0542 551 10A | Descriptive Data Analysis and Presentation | Present descriptive statistical output | **30** |
| Interpret descriptive statistical output | **30** |
| Prepare descriptive statistical output | **30** |
| **TOTAL** | **90** |
| **TOTAL** | | | **330** |

## **COMMUNICATION SKILLS**

**UNIT CODE:** 0031 541 06A

**UNIT DURATION:** 40 hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Apply Communication Skills

**Unit Description**

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

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Apply communication channels | **10** |
|  | Apply written communication skills | **12** |
|  | Apply non-verbal communication skills | **4** |
|  | Apply oral communication skills | **4** |
|  | Apply group communication skills | **10** |
| **Total** | | **40** |

**Learning Outcomes, Content, and Suggested Assessment Methods**

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| 1. Apply communication channels | * 1. Communication process      1. Principles of effective communication   2. Channels/medium/modes of communication      1. Factors to consider when selecting a channel of communication      2. Barriers to effective communication   3. Flow/patterns of communication      1. Sources of information      2. Organizational policies | * Observation * Portfolio of Evidence * Practical assessment * Oral questions * Written assessment |
| 1. Apply written communication skills | * 1. Types of written communication   2. Written communication needs   3. Organization requirements for written communication | * Observation * Portfolio of Evidence * Practical assessment * Oral assessment * Written assessment |
| 1. Apply non-verbal communication skills | * 1. Utilization of body language and gestures   2. Identification of body posture   3. Identification of workplace dressing code | * Observation * Portfolio of Evidence * Practical assessment * Oral assessment   Written assessment |
| 1. Apply oral communication skills | * 1. Types of oral communication pathways   2. Effective questioning techniques   3. Oral communication pathways   4. Review oral communication pathway   5. Maintain oral communication pathway   6. Workplace etiquette | * Oral assessment * Written assessment * Observation * Portfolio of Evidence * Practical assessment |
| 1. Apply group discussion skills | * 1. Group communication strategies      1. Language switch      2. Comprehension check      3. Repetition      4. Asking confirmation      5. Paraphrasing      6. Clarification request      7. Translation      8. Restructuring      9. Generalization   2. Establishment of rapport   3. Facilitation of resolution of issues   4. Develop action plans   5. Group organization techniques   6. Use of questing listening and non-verbal techniques   7. Turn-taking techniques   8. Conflict resolution techniques   9. Team-work   10. Group communication challenges | * Oral assessment * Written assessment * Observation * Portfolio of Evidence * Practical assessment |

**Suggested Methods of Instruction**

* Discussion
* Roleplaying
* Simulation
* Direct instruction
* Demonstration
* Field trips

**Recommended Resources for 25 Trainees**

|  |  |  |
| --- | --- | --- |
| **General Resources** | **Tools and Equipment** | **Materials and Supplies** |
| * 25 Desktop computers/laptops | Mobile phones | Flashcards |
| * Internet connection |  | Flip charts |
| * 1 Projector * 1 Printer |  | 2 packets of assorted colors of whiteboard marker pens |
| * 1 Whiteboard |  | Printing papers |
| * Report writing templates |  |  |

## **STATISTICAL TECHNIQUES**

**UNIT CODE:** 0542 551 08A

**UNIT DURATION:** 200 hours

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Apply Statistical Techniques

**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.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Apply statistical concepts | **50** |
|  | Apply statistical methods I | **50** |
|  | Apply statistical methods II | **40** |
|  | Apply statistical significance | **30** |
|  | Apply statistics for business | **30** |
| **Total** | | **200** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning outcome** | **Content** | **Suggested**  **delivery methods** |
| Apply statistical concepts | * 1. Definitions   2. Branches of statistics   3. Types of statistics   4. Importance of statistics   5. Limitation of statistics   6. Terms and symbols in statistics   7. BLevels of measurements   8. Nominal   9. Ordinal   10. Likert   11. Ratio   12. Data collection   13. Sources of data   14. Methods of data collection   15. Data organization  1. Classification 2. Tabulation | * Practical assessment * Projects * Portfolio of evidence * Oral assessment * Written assessment |

|  |  |  |
| --- | --- | --- |
|  | * 1. Measures of central tendency   2. Mean   3. Mode   4. Median   5. Measures of dispersion   6. Range   7. Quartiles   8. Percentiles   9. Variance   10. SD   11. Skewness   12. Kurtosis   13. Data presentation   14. Histogram   15. Frequency tables   16. Pie charts   17. Bar charts   18. Line graphs   19. Polygons   20. Data compilation       1. Data clean-up       2. Checking response level       3. Editing raw data       4. Disseminating raw data |  |

|  |  |  |
| --- | --- | --- |
| 1. Statistical methods I | 1. Probability distributions 2. Discrete 3. Binomial 4. Poisson 5. Negative Binomial 6. Uniform 7. Continuous 8. Normal 9. Exponential 10. Mathematical expectation     1. Moments     2. Moments generating functions 11. Central limit theorem |  |
| 1. Apply statistical methods II | 1. Types of variables 2. Theory of estimation 3. Correlation 4. Pearson’s 5. Spearman’s    1. Statistical inference 6. Introduction 7. Normality test 8. Test for heteroscedasticity    1. One sample mean       1. n < 30       2. n is greater | * Practical assessment * Projects * Portfolio of evidence * Oral assessment * Written assessment |
|  | than or equal |
|  | to 30   * 1. Comparing two variances   2. Comparing two |
|  | independent group means |
|  | 3.7.1Wedge sample test |
|  | 3.7.2 Pooled variance |
|  |  |
|  | 3.8 Comparing two dependent |
|  | sample means   * + 1. One sample proportion     2. Two sample proportion     3. Contingency tables     4. Chi-square statistics   3.9 Non-parametric |
|  | 3.9.1 One sample Wilcoxon test |
|  | 3.9.2 Two sample Wilcoxon test (Man Whitney test) |

|  |  |  |
| --- | --- | --- |
| 1. Apply statistical significance | * 1. Confidence intervals and hypothesis testing (reference to statistical tables)   2. Regression analysis   4.2.1 Simple linear regression  4.2.2 Scatter plots  4.2.3Regression  4.2..4 Parameter Estimates   * 1. Test of hypothesis on the regression parameters   Confidence intervals on regression parameters   * 1. ANOVA for simple linear regression   4.4.1 Goodness of fit  4.4.2 Coefficient of determination   * 1. Alternative measures for the goodness of fit e.g. AIC   Prediction of response variable   * 1. Model validation   Multiple linear regression   * 1. Variable selection   4.7.1 Introduction to regression with binary or count response variable (GLMs) logistics  4.7.2 Experimental design  One way &Two way | * Practical assessment * Projects * Portfolio of evidence * Oral assessment * Written assessment |

|  |  |  |  |
| --- | --- | --- | --- |
| 1. Apply Statistics for Business | |  | | --- | | * 1. Index numbers   Introduction   1. What are index number s? 2. Uses of index numbers 3. Types of index numbers    1. Simple index numbers    2. Composite index numbers 4. Simple aggregative price/quantity index 5. Index of average price/quantity relatives 6. Weighted aggregative price/quantity 7. Index of weighted average of price/quantity relatives 8. Test of adequacy of index numbers 9. Special issues in the construction of index numbers 10. Problems of constructing index numbers     1. Time series 11. time series data 12. Components of time series 13. Application of time series     1. Introduction to economic statistics   5.5.1 Definitions economic statistics  5.5.2 National income equation   * + 1. GDP and GNP   5.5.4 Demand and supply   * + 1. Quantity demanded     2. Quantity supplied   5.5.7 Applications economic statistics matrix   * 1. Statistical quality control charts   2. Control limits   3. Sampling plans   4. Statistical consulting   5. Professional ethics   6. Customer service | | * Practical assessment * Projects * Portfolio of evidence * Oral assessment * Written assessment |

**Suggested Methods Instructions**

* 1. Practical
  2. Projects
  3. Group discussions
  4. Demonstrations
  5. Direct instruction

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | Graph book | A4/A5 Size | 25 | 1:1 |
|  | Mathematical table | SMP tables | 25 | 1:1 |
|  | Scientific calculator | FX 82 MS/FX 570 MS | 25 | 1:1 |
|  | Data presentation charts | Manilla charts | 1 | 1:25 |
|  | Statistical tables | Test tables: F, T, Z and Chi-square tables | 1 | 1:1 |
|  | Squared exercise book | A4 Size | 25 | 1:1 |
|  | Datasets | - | 5 | 1:5 |
|  | Teaching aids (Dice, coins, cards etc.) | - | 5 | 1:5 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Lecture/theory room | 72m2 | 1 | 1:25 |
|  | Whiteboard/Plotting grid | 2M by 1M | 1 | 1:25 |
|  | Computers | 4GB/8GB RAM/with internet connection | 25 | 1:1 |
|  | Statistical software | SPSS, R | 25 | 1:1 |
|  | Printers | Ink Jet | 1 | 1:25 |
|  | Projector | LCD High resolution | 1 | 1:25 |
| **C** | **Consumable materials** | | | |
|  | Stationery | Pens, pencils, printing papers etc. | Enough for 25 | 1:1 |
|  | Assorted whiteboard markers | Non-permanent | 3 | 3:25 |
|  |  |  |  |  |
| **D** | **Tools and Equipment** | | | |
|  | Mathematical set | Oxford | 25 | 1:1 |
|  | White board protractor, compass, ruler, set squares | Wooden/plastic | 1 per item | 1:25 |

## **DESCRIPTIVE DATA ANALYSIS AND PRESENTATION**

**UNIT CODE:** 0542 551 10A

**UNIT DURATION:** 90 hours

**Relationship to Occupational Standards**

This unit addresses the unit of competency: **Perform descriptive data analysis**

**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.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Present descriptive statistical output | **30** |
|  | Interpret descriptive statistical output | **30** |
|  | Prepare descriptive statistical output | **30** |
| **Total** | | **150** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment**  **Methods** |

|  |  |  |
| --- | --- | --- |
| 1. Present descriptive statistical output | * 1. Numerical outputs presentation  1. Mean 2. Median 3. Mode   1.2 Numerical outputs presentation   1. Variance 2. Standard deviation    1. Categorical data presentation | * Oral questioning * Portfolio of evidence * Interviews   Written tests |
| 2. Interpret descriptive statistical output | 1. Interpretation of numerical values 2. Mean 3. Median 4. Mode    1. Interpretation of numerical values 5. Variance 6. Standard Deviation    1. Interpretation of categorical data outputs    2. Documentation of assumptions | * Oral questioning * Portfolio of evidence * Interviews * Written tests |
| 3.Prepare Descriptive statistical output | 1. Preparation of a descriptive statistical output report 2. Preparation of a dissemination plan 3. Report dissemination | * Oral questioning * Portfolio of evidence * Interviews * Written tests |

**Suggested Methods of Instructions**

1. Practical
2. Projects
3. Group discussions
4. Demonstration by trainer
5. Direct guidance

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | Notes | - | 1 | 1:25 |
|  | Datasets | - | 5 | 1:5 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Lecture/theory room | 72m2 | 1 | 1:25 |
|  | Whiteboard/Plotting grid | 2M by 1M | 1 | 1:25 |
|  | Computers | 4GB/8GB RAM/with internet connection | 25 | 1:1 |
|  | Statistical software | SPSS, STATA, R PROGRAMME,  Advanced Excel, ODK | 25 | 1:1 |
|  | Printers | Ink Jet | 1 | 1:25 |
|  | Projector | LCD High resolution | 1 | 1:25 |
| **C** | **Consumable materials** | | | |
|  | Stationery | Pens, pencils, printing papers etc. | Enough for 25 | 1:1 |
|  | Assorted whiteboard markers | Non-permanent | 3 | 3:25 |
| **D** | **Tools and Equipment** | | | |
|  | White board protractor, compass, ruler, set squares | Wooden/plastic | 1 per item | 1:25 |

# MODULE IV: UNITS OF LEARNING

This Module consists of competencies that an individual must achieve to enable him/her to apply statistics in a work place. It entails experimental research designs.

It consists of the following units of learning;

|  |  |  |  |
| --- | --- | --- | --- |
| **UNIT CODE** | **UNIT NAME** | **ELEMENTS** | **DURATION (HOURS)** |
| 0413 541 11A | Apply Entrepreneurial Skills | Apply Financial Literacy | **6** |
| Apply the Entrepreneurial Concept | **4** |
| Identify Entrepreneurship Opportunities | **6** |
| Apply Business Legal Aspects | **6** |
| Innovate Business Strategies | **6** |
| Develop A Business Plan | **12** |
| **TOTAL** | **40** |
| 0542 441 12A | Mathematics for Statistics | Apply Algebra | **10** |
| Apply Trigonometry and hyperbolic functions | **20** |
| Apply complex numbers | **20** |
| Apply Coordinate Geometry | **10** |
| Apply Matrix | **20** |
| Apply Vector theory | **10** |
| Carry out Binomial Expansion | **10** |
| Apply Numerical methods | **20** |
| Apply Calculus | **40** |
| Solve Ordinary differential equations | **30** |
| Apply Power Series | **10** |
| **TOTAL** | **200** |
| 0542 551 13A | Design Research Experiments | Develop experimental design | **70** |
| Conduct the experimental design | **70** |
| Analyze experimental data | **40** |
| **TOTAL** | **180** |
| **TOTAL** | | | **4200** |

**ENTREPRENEURIAL SKILLS**

**UNIT CODE:** 0413 541 15A

**UNIT DURATION:** 40 hours

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Apply Entrepreneurial skills.

**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, and developing business innovative strategies and business plans.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Apply Financial Literacy Skills | **6** |
|  | Apply entrepreneurial concept | **4** |
|  | Identify entrepreneurial opportunities | **6** |
|  | Apply business legal aspects | **6** |
|  | Innovate Business strategies | **6** |
|  | Develop Business Plan | **12** |
| **Total** | | **40** |

**Learning Outcomes, Content and Suggested Assessment Methods**

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| 1. Apply Financial Literacy | 1. Personal finance management 2. Balancing between needs and wants 3. Budget Preparation 4. Saving management 5. Factors to consider when deciding where to save 6. Debt management 7. Factors to consider before taking a loan 8. Investment decisions 9. Types of investments 10. Factors to consider when investing money 11. Insurance services 12. Insurance products available in the market 13. Insurable risks | * Observation * Project * Written assessment * Oral assessment * Interviews |
| 1. Apply Entrepreneurial Concept | 1. Difference between Entrepreneurs and Business persons 2. Types of entrepreneurs 3. Ways of becoming an entrepreneur 4. Characteristics of Entrepreneurs 5. Salaried employment and self-employment 6. Requirements for entry into self-employment 7. Roles of an Entrepreneur in an enterprise 8. Contributions of Entrepreneurship | * Observation * Project * Written assessment * Oral assessment |
| 1. Identify Entrepreneurship Opportunities | 1. Sources of business ideas 2. Factors to consider when evaluating business opportunity 3. Business life cycle | * Observation * Project * Written assessment * Oral assessment |
| 1. Apply Business Legal Aspects | 1. Forms of business ownership 2. Business registration and licensing processing 3. Types of contracts and agreements 4. Employment laws 5. Taxation laws | * Observation * Project * Written assessment * Oral assessment |
| 1. Innovate Business Strategies | 1. Creativity in business 2. Innovative business strategies 3. Entrepreneurial Linkages 4. ICT in business growth and development | * Observation * Project * Written assessment * Oral assessment |
| 1. Develop Business Plan | 1. Business description 2. Marketing plan 3. Organizational/Management   plan   1. Production/operation plan 2. Financial plan 3. Executive summary 4. Business plan presentation 5. Business idea incubation | * Observation * Written assessment * Project * Oral assessment |

**Suggested Methods of Instruction**

* Practical
* Demonstrations
* Project
* Group discussion
* Direct instruction
* Guest speakers

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** |  |  |  |
|  | Textbooks |  | 5 pcs | 1:5 |
|  | Overhead Projector | LCD | 1 | 1:25 |
|  | Case studies |  | 5 | 1:5 |
|  | Business plan templates |  | 5 | 1:5 |
|  | Newspapers and Handouts |  | 5 | 1:5 |
|  | Business Journals |  | 5 | 1:5 |
|  | Video clips | Assorted | 25 sets | 1:1 |
|  | Whiteboard |  | 1 | 1:25 |
|  | Rolls flip charts | For trainer’s use | - | - |
|  | Assorted color of whiteboard markers | For trainers Use |  |  |
| **B** | **Learning Facilities & infrastructure** |  |  |  |
|  | Lecture/theory room |  | 1 | 1:25 |
| **C** | **Consumable materials** |  |  |  |
|  | Printing papers |  | enough |  |
|  | Printing ink cartilages | assorted | - | - |
|  | Internet |  | 200mbps | - |
| **D** | **Tools and Equipment** |  |  |  |
|  | Computers | For trainer’s use |  |  |
|  | Printer | For trainer’s use |  |  |

## **MATHEMATICS FOR STATISTICS**

**UNIT CODE:** 0542 551 09A

**UNIT DURATION:** 200 HOURS

**Relationship to Occupational Standards**

This unit addresses the unit of competency: **Apply mathematics for statistics**

**Unit Description**

This unit describes the competencies required by an applied statistician in applying algebra concepts, applying trigonometry and hyperbolic functions, applying complex numbers, applying coordinate geometry, carrying out binomial expansion, applying calculus, solving ordinary differential equations, applying power series, applying statistics, applying numerical methods, applying vector theory and applying matrices.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Apply Algebra | **10** |
|  | Apply Trigonometry and hyperbolic functions | **20** |
|  | Apply complex numbers | **20** |
|  | Apply Coordinate Geometry | **10** |
|  | Apply Matrix | **20** |
|  | Apply Vector theory | **10** |
|  | Carry out Binomial Expansion | **10** |
|  | Apply Numerical methods | **20** |
|  | Apply Calculus | **40** |
|  | Solve Ordinary differential equations | **30** |
|  | Apply Power Series | **10** |
| **Total** | | **200** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Learning outcome** | | **Content** | | **Suggested assessment**  **methods** | |
| * 1. Apply   Algebra Concepts | | 1. Indices 2. Law of indices 3. Indicial equations 4. Logarithms 5. Laws of logarithms 6. Logarithmic equations 7. Conversion of bases 8. Use of scientific calculator | | * Written tests * Oral questioning * Portfolio of evidence * Interviews | |

|  |  |  |
| --- | --- | --- |
| **Learning outcome** | **Content** | **Suggested assessment**  **methods** |
|  | 1. Solutions of system of linear equations in three unknowns 2. Solutions to quadratic equations 3. Solutions of problems involving sequence and series |  |
| 2. Apply  Trigonometry and hyperbolic functions | 1. Trigonometric rules calculations 2. Trigonometric ratios and identities 3. Trigonometric equations 4. Trigonometric functions 5. Sine and cosine rules 6. Hyperbolic functions calculations  * Sinh x  1. Cosh x 2. Tanh x 3. Sech x 4. Cosech x 5. Coth x 6. hyperbolic equations 7. Properties of hyperbolic functions 8. Osborne’s Rule 9. One-to-one relationship in functions 10. Application of trigonometry to obtain area and perimeter of shapes and     1. Solids 11. Hyperbolic identities calculations | * Written tests * Oral questioning * Portfolio of evidence * Interviews |

|  |  |  |
| --- | --- | --- |
| **Learning outcome** | **Content** | **Suggested assessment**  **methods** |
| 3. Apply  complex numbers | 1. Representation of complex numbers in Argand diagrams 2. Cartesian form 3. Cartesian equations 4. Polar form 5. Polar equations 6. Exponential form 7. Arithmetic operation of complex numbers 8. Addition 9. Subtraction 10. Multiplication 11. Division 12. Calculation of conjugate, argument and Modulus in complex numbers. 13. Application of De Moivre’s theorem in complex numbers. | * Written tests * Oral questioning * Portfolio of evidence * Interviews |
| 4. Apply  Coordinate Geometry | 1. Solution of polar equations 2. Graphs of polar equations 3. Determine normal and tangents | * Written tests * Oral questioning * Portfolio of evidence * Interviews |
| 1. Carry out Binomial Expansion | 1. Determine roots of numbers using binomial theorem 2. Estimation of errors of small changes using binomial theorem. 3. Power series using binomial theorem | * Written tests * Oral questioning * Portfolio of evidence * Interviews |

|  |  |  |
| --- | --- | --- |
| 1. Apply vector theory | 1. Vectors and scalar in two dimensions 2. Vectors and scalar in three dimensions 3. Vectors operations 4. Resolution of vectors | * Written tests * Oral questioning * Portfolio of evidence * Interviews |
| 1. Apply Matrices | 1. Determinant of 3x3 matrix 2. Inverse of 3x3 matrix 3. Solution of linear simultaneous equations in three unknowns using matrix rules 4. Inverse matrix method 5. Determinants Method 6. Cramer’s Rule 7. Application of matrices | * Written tests * Oral questioning * Portfolio of evidence * Interviews |

|  |  |  |
| --- | --- | --- |
| 1. Apply   Calculus concepts | * 1. Differential Calculus  1. Functional notation 2. Standard differentiation 3. Derivatives of functions 4. Methods of differentiation 5. Applications 6. Normal and tangents 7. Turning points 8. Rates of change 9. Small changes    1. Parametric functions    2. Implicit functions    3. Partial derivatives       1. Stationary points for functions with two variables    4. Derivatives of hyperbolic functions    5. Derivatives of inverse trigonometric functions    6. Integral calculus       1. Standard integration       2. Integrals of algebraic functions       3. Integrals of trigonometric functions       4. Integrals of logarithmic functions       5. Integrals of hyperbolic and inverse functions       6. Methods of integration       7. Applications       8. Area under a curve       9. Means and root mean squares       10. Volume of revolution       11. Centroids | * Written tests * Oral questioning * Portfolio of evidence * Interviews |

|  |  |  |
| --- | --- | --- |
| **Learning outcome** | **Content** | **Suggested assessment**  **methods** |
| 1. Ordinary differential equations | * 1. First order differential equations      1. Types of first order equations      2. Solutions of first order equations      3. Application of first order differential equations.   2. Second order differential equations      1. Homogeneous and non-homogeneous second order equations      2. Solution of second order differential equations   3. Solutions of heat equations | * Written tests * Oral questioning * Portfolio of evidence * Interviews |
| 1. Apply Power Series | * 1. Power series using Taylor’s series   2. Power series using Taylor’s theorem   3. Power series using Maclaurin’s theorem   4. Application of Maclaurin’s theorems in numerical integrals. | * Written tests * Oral questioning * Portfolio of evidence * Interviews |
| 1. Apply   Numerical methods | 4.1Roots of polynomials by iterative numerical methods.   * 1. Interpolation numerical methods      1. Newton Raphson   4.2.2 Gregory Newton  4.3Extrapolation numerical methods | * Written tests * Oral questioning * Portfolio of evidence * Interviews |

**Suggested Methods Instructions**

* 1. Projects
  2. Demonstration by trainer
  3. Practice by the trainee
  4. Discussion

**Recommended Resources for 25 Trainees #**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | Graph book | A4/A5 Size | 25 | 1:1 |
|  | Mathematical table | SMP tables | 25 | 1:1 |
|  | Scientific calculator | FX 82 MS/FX 570 MS | 25 | 1:1 |
|  | Data presentation charts | Manilla charts | 1 | 1:25 |
|  | Squared exercise book | A4 Size | 25 | 1:1 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Lecture/theory room | 72m2 | 1 | 1:25 |
|  | Whiteboard/Plotting grid | 2M by 1M | 1 | 1:25 |
|  | Computers | 4GB/8GB RAM/with internet connection | 25 | 1:1 |
|  | Printers | Ink Jet | 1 | 1:25 |
|  | Projector | LCD High resolution | 1 | 1:25 |
| **C** | **Consumable materials** | | | |
|  | Stationery | Pens, pencils, printing papers etc. | Enough for 25 | 1:1 |
|  | Assorted whiteboard markers | Non-permanent | 3 | 3:25 |
|  |  |  |  |  |
| **D** | **Tools and Equipment** | | | |
|  | Mathematical set | Oxford | 25 | 1:1 |
|  | White board protractor, compass, ruler, set squares | Wooden/plastic | 1 per item | 1:25 |

## **DESIGNING RESEARCH EXPERIMENTS**

**UNIT CODE:** 0542 551 13A

**UNIT DURATION:** 180 hours

**Relationship to Occupational Standards**

This unit addresses the unit of competency: **Design research experiments.**

**Unit Description**

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

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Develop experimental design | **70** |
|  | Conduct the experimental design | **70** |
|  | Analyze experimental data | **40** |
| **Total** | | **180** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Develop experimental design | 1. Experimental design types 2. Pre-experimental research design 3. True experimental research design 4. Quasi-experimental research design 5. Factor identification 6. Statement of Hypotheses 7. Experimental treatments 8. Levels of treatments 9. Amount 10. Magnitude   1.6 Variable outcomes | * Oral questioning * Portfolio of evidence * Interviews * Written tests |

|  |  |  |
| --- | --- | --- |
| 2. Conduct the experimental design | 1. Site selection 2. Randomization of experimental plots 3. Application of treatments 4. Variable outcome measurement 5. Data recording | * Oral questioning * Portfolio of evidence * Interviews * Written tests |
| 3.Analyze experimental data | 1. Testing of ANOVA assumptions 2. Choice of statistical technique    1. Reasons    2. Assumptions of technique    3. Principles of experimental design    4. Randomization    5. Replication    6. Blocking    7. Statistical data Analysis   T-test Analysis  ANOVA   * 1. ANOVA as a special case of regression   2. Sources of variation   3. Interpretation | * Oral questioning * Portfolio of evidence * Interviews * Written tests |

**Suggested Methods of Instructions**

* + Projects
  + Practical
  + Demonstration
  + Group discussions
  + Direct instruction

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | Notes | - | 1 | 1:25 |
|  | Datasets | - | 5 | 1:5 |
|  | Video clips | - | 1 | 1:25 |
|  | Case studies | - | 25 | 1:1 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Lecture/theory room | 72m2 | 1 | 1:25 |
|  | Whiteboard/Plotting grid | 2M by 1M | 1 | 1:25 |
|  | Computers | 4GB/8GB RAM/with internet connection | 25 | 1:1 |
|  | Mobile phones | Android/smart | 25 | 1:1 |
|  | Statistical software | SPSS, STATA, R PROGRAMME,  Advanced Excel, ODK | 25 | 1:1 |
|  | Printers | Ink Jet | 1 | 1:25 |
| **C** | **Consumable materials** | | | |
|  | Stationery | Pens, pencils, printing papers etc. | Enough for 25 | 1:1 |
|  | Assorted whiteboard markers | Non-permanent | 3 | 3:25 |
| **D** | **Tools and Equipment** | | | |
|  | White board protractor, compass, ruler, set squares | Wooden/plastic | 1 per item | 1:25 |
|  | Projector | LCD High resolution | 1 | 1:25 |

# MODULE V: UNITS OF LEARNING

This module consists of competencies that an individual must achieve to enable him/her to apply statistics in a work place. It entails inferential data analysis. It consists of the following Units of learning;

|  |  |  |  |
| --- | --- | --- | --- |
| **UNIT CODE** | **UNIT NAME** | **ELEMENTS** | **DURATION (HOURS)** |
| 0542 551 14A | Manage Statistical Data | Manage statistical data in excel | **40** |
| Manage statistical data in R | **40** |
| Manage statistical data in SPSS | **40** |
| Manage statistical data in Python | **60** |
| **TOTAL** | **180** |
| 0542 551 15A | Inferential Data Analysis and Presentation | Carry out data transformation techniques | **60** |
| Create new variables | **60** |
| Implement statistical model | **40** |
| Interpret inferential results | **40** |
| **TOTAL** | **200** |
| **TOTAL** | | | **380** |

## **MANAGE STATISTICAL DATA**

**UNIT CODE:** 0542 551 14A

**UNIT DURATION:** 180 HOURS

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Manage Statistical Data

**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.

**Summary of Learning Outcomes:**

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Manage statistical data in excel | **40** |
|  | Manage statistical data in R | **40** |
|  | Manage statistical data in SPSS | **40** |
|  | Manage statistical data in Python | **60** |
| **Total** | | **180** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested**  **Assessment Method** |
| 1. To manage statistical data on excel spreadsheet | 1. Excel Environment 2. Worksheets 3. Workbooks    1. Data labelling, coding and entry    2. validation    3. Multiple-key sorting    4. Sorting of data based on custom lists    5. creating single- and multi- level subtotals    6. Filtering of data using text, numeric, date    7. Filtering of tables using slicers    8. Advanced Filter    9. eliminating duplicate | 1. Practical assessment 2. Projects 3. Portfolio of evidence 4. Oral assessment 5. Written assessment |

|  |  |  |
| --- | --- | --- |
|  | 1.3.10 Use of SUMIF and related functions for quick data analysis of Index & Match  1.3.11 Conditional Formatting  1.3.12 Filtering & Sorting  1.3.13 Find & Replace  1.4 Data Analysis in Excel   1. Descriptive statistics 2. Correlation & Covariance 3. ANOVA 4. Regression 5. T-test & Z-test 6. Random numbers 7. Data Presentation   Pivot Table & Charts   1. CSV conversion |  |
| 1. To manage statistical data in R | 1. Installing R and R studio 2. Getting started with R 3. Data structures in R 4. Data entry in R    1. Arrays    2. Data frames    3. Lists    4. Vectors    5. Matrices    6. Creating R projects    7. Importing data into R    8. Installing R packages    9. Data manipulation in R       1. Sorting       2. Merging       3. Aggregating       4. Creating new variables       5. Indexing       6. Sub setting       7. Exporting    10. Exploratory data analysis   2.9.1 Scatter plot  2.9.2 Line graphs | * Oral questioning * Portfolio of evidence * Interviews * Written tests. |

|  |  |  |
| --- | --- | --- |
|  | 2.9.3 Histogram  2.9.4 Density plot  2.9.5 Pie charts  2.9.6 Bar charts   * + 1. Box plot   2.10 Descriptive statistics   * 1. Mean   2. Mode   3. Median   4. Dispersion   2.11 Statistical inference  2.12 Regression analysis  2.13 Time series analysis in R  2.14 Probability distribution in R  2.15 Random numbers  2.16 R commander  2.17 Built-in functions in R |  |
| 3. Manage statistical data on SPSS | 1. Installing SPSS 2. SPSS Environment    1. Data views    2. Variable views    3. Output Window    4. Data transformations    5. Creation of variable & data coding    6. Data entry    7. SPSS syntax    8. Data Analysis in SPSS    9. Descriptive statistics       1. Mean       2. Frequencies       3. Cumulative Frequencies    10. Pearson Correlation & Covariance    11. ANOVA    12. Regression    13. T-test & Z-test    14. Random numbers    15. Data Presentation    16. Table & Charts | * Oral questioning * Portfolio of evidence * Interviews * Written tests |

|  |  |  |
| --- | --- | --- |
| 4. Manage statistical data on Python | 1. Python Basics   4.1.1Running Python  Literals   * + 1. Python Comments     2. Data Types     3. Variables     4. Writing a Python Module     5. print () Function     6. Named Arguments     7. Collecting User Input     8. Getting Help   1. Functions and Modules  1. Defining Functions 2. Variable Scope 3. Global Variables 4. Function Parameters 5. Returning Values 6. Importing Modules    1. Math in Python    2. Arithmetic Operators    3. Modulus and Floor Division    4. Assignment Operators    5. Built-in Math Functions    6. The math Module    7. The random Module    8. Seeding    9. Python Strings    10. Quotation Marks and Special Characters    11. String Indexing    12. Slicing Strings    13. Concatenation and Repetition    14. Common String Methods    15. String Formatting    16. Built-in String Functions | * Oral questioning * Portfolio of evidence * Interviews * Written tests |

|  |  |  |
| --- | --- | --- |
|  | * 1. Sequences, Dictionaries, and Sets   2. Definitions   3. Sequences   4. Unpacking Sequences   5. Dictionaries   6. The Len () Function   7. Sets   8. \*args and \*\*kwargs   9. Flow Control   10. Conditional Statements   11. The is and is not Operators   12. Python's Ternary Operator   13. Loops in Python   14. The enumerate () Function   15. Generators   16. List Comprehensions   17. File Processing   18. Opening Files   19. The os and os.path Modules   20. Exception Handling   21. Wildcard except Clauses   22. Getting Information on Exceptions   23. The else Clause   24. The finally Clause   25. Using Exceptions for Flow Control   26. Exception Hierarchy   27. Dates and Times   28. Understanding Time   29. The time Module   30. The date-time Module   31. Running Python Scripts from the Command Line  1. The sys Module 2. sys.argv |  |

**Suggested Methods of Instructions**

* + Projects
  + Practical
  + Demonstration
  + Discussions
  + Direct instruction

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | Graph book | A4/A5 Size | 25 | 1:1 |
|  | Notes | - | 1 | 1:25 |
|  | Mathematical table | SMP tables | 25 | 1:1 |
|  | Scientific calculator | FX 82 MS/FX 570 MS | 25 | 1:1 |
|  | Data presentation charts | Manilla charts | 1 | 1:25 |
|  | Statistical tables | Test tables: F, T, Z and Chi-square tables | 1 | 1:1 |
|  | Squared exercise book | A4 Size | 25 | 1:1 |
|  | Datasets | - | 5 | 1:5 |
|  | Teaching aids (Dice, coins, cards etc.) | - | 5 | 1:5 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Lecture/theory room | 72m2 | 1 | 1:25 |
|  | Whiteboard/Plotting grid | 2M by 1M | 1 | 1:25 |
|  | Computers | 4GB/8GB RAM/with internet connection | 25 | 1:1 |
|  | Statistical software | SPSS,R,PYTHON | 25 | 1:1 |
|  | Printers | Ink Jet | 1 | 1:25 |
| **C** | **Consumable materials** | | | |
|  | Stationery | Pens, pencils, printing papers etc. | Enough for 25 | 1:1 |
|  | Assorted whiteboard markers | Non-permanent | 3 | 3:25 |
| **D** | **Tools and Equipment** | | | |
|  | Mathematical set | Oxford | 25 | 1:1 |
|  | White board protractor, compass, ruler, set squares | Wooden/plastic | 1 per item | 1:25 |
|  | Projector | LCD High resolution | 1 | 1:25 |

## **INFERENTIAL DATA ANALYSIS AND PRESENTATION**

**UNIT CODE:** 0542 551 15A

**UNIT DURATION:** 200 hours

**Relationship to Occupational Standards**

This unit addresses the unit of competency: **Perform inferential data analysis**

**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.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Carry out data transformation techniques | **60** |
|  | Create new variables | **60** |
|  | Implement statistical model | **40** |
|  | Interpret inferential results | **40** |
| **Total** | | **200** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment**  **Methods** |
| 1. Carry out data transformation techniques | 1. Variable Assumptions 2. Variable transformation techniques 3. Transformation methods 4. Transformation statistical procedures 5. Replacement of variables    1. Application of transformation techniques | * Oral questioning * Portfolio of evidence * Interviews * Written tests |
| 2. Create new variables | 1. Creating new variables 2. Alignment of new variables | * Oral questioning * Portfolio of evidence * Interviews * Written tests |

|  |  |  |
| --- | --- | --- |
| 3. Implement statistical model | 1. Statistical Modelling 2. Definition of terms 3. Theory 4. Independent & dependent variables 5. Type of variables 6. Practice 7. Practical examples & illustrations 8. Simulations   3.2 Statistical models   1. Generalized linear models (GLM) 2. simple and 3. Multiple regression 4. Non-linear models 5. Logistic regressions    1. Choice of statistical models | * Oral questioning * Portfolio of evidence * Interviews * Written tests |
| 4. Interpret inferential results. | 1. Inferential thresholds 2. P-values 3. Significant levels 4. Reporting of inferential tests 5. Estimation of Model Parameters and Its Inferences    1. Mean (µ)    2. Standard deviation (δ)    3. Proportion (ƿ) in Binomial distribution    4. Difference of Mean (µ1 - µ2) 6. Confidence Intervals (CI)    1. 95% CI    2. 99% CI   4.5Coefficients for simple linear and multiple linear regression   * + 1. OLS | * Oral questioning * Portfolio of evidence * Interviews * Written tests |

**Suggested Methods of Instructions**

* 1. Practical
  2. Projects
  3. Group discussions
  4. Demonstration by trainer
  5. Direct guidance

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | Notes | - | 1 | 1:25 |
|  | Datasets | - | 5 | 1:5 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Lecture/theory room | 72m2 | 1 | 1:25 |
|  | Whiteboard/Plotting grid | 2M by 1M | 1 | 1:25 |
|  | Computers | 4GB/8GB RAM/with internet connection | 25 | 1:1 |
|  | Statistical software | SPSS, STATA, R PROGRAMME,  Advanced Excel, ODK | 25 | 1:1 |
|  | Printers | Ink Jet | 1 | 1:25 |
|  | Projector | LCD High resolution | 1 | 1:25 |
| **C** | **Consumable materials** | | | |
|  | Stationery | Pens, pencils, printing papers etc. | Enough for 25 | 1:1 |
|  | Assorted whiteboard markers | Non-permanent | 3 | 3:25 |
| **D** | **Tools and Equipment** | | | |
|  | White board protractor, compass, ruler, set squares | Wooden/plastic | 1 per item | 1:25 |

# MODULE VI: UNITS OF LEARNING

This Module consists of competencies that an individual must achieve to enable him/her to apply statistics in a work place. It entails Reliability and validity of statistical data.

It consists of the following Units of learning;

|  |  |  |  |
| --- | --- | --- | --- |
| **UNIT CODE** | **UNIT NAME** | **ELEMENTS** | **DURATION (HOURS)** |
| 0612 551 16A | Develop Database Management Systems | Identify database management system | **30** |
| Design database | **60** |
| Create and manipulate database | **30** |
| Perform database testing e.g. using dummy data | **10** |
| Implement designed database (roll out) | **20** |
| Establish transaction and concurrency mechanism | **20** |
| Manage database security | **30** |
| **TOTAL** | **200** |
| 0541 551 17A | Conduct Reliability and Validity of Data | Carry out pilot study | **40** |
| Conduct reliability test | **50** |
| Conduct validity test | **50** |
| Compare validity and reliability results with threshold | **40** |
| **TOTAL** | **180** |
| **TOTAL** | | | **380** |

## **DATABASE MANAGEMENT SYSTEM**

**UNIT CODE:** 0612 551 16A

**UNIT DURATION:** 200 HOURS

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Develop database Management System

**Unit Description:**

This unit specifies competencies required to manage database system. They include identification of database management systems, designing of database, Creation and manipulation of database, database testing e.g. using dummy data, implementation of the designed database, establishing transaction and concurrency mechanism and managing database security

**Summary of Learning Outcomes:**

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Identify database management system | **30** |
|  | Design database | **60** |
|  | Create and manipulate database | **30** |
|  | Perform database testing e.g. using dummy data | **10** |
|  | Implement designed database (roll out) | **20** |
|  | Establish transaction and concurrency mechanism | **20** |
|  | Manage database security | **30** |
| **Total** | | **200** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Method** |
| 1. Identify database management system | 1. Define database management system, components and terminologies 2. Classification of databases 3. Understand various database management system 4. Introduction to database management systems    1. Excel    2. Access    3. SQL | * Practical assessment * Projects * Portfolio of evidence * Oral assessment * Written assessment |

|  |  |  |
| --- | --- | --- |
| 2. Design database system | 1. Define data abstraction, instances and schemas 2. Types of Database structures 3. Database operations   2.3.1 INSERT  2.3.2 SELECT  2.3.3 UPDATE   * + 1. DELETE   2.4 Data models   * + 1. ER- Models     2. Relational Models     3. Hierarchical models     4. Network Models | * Oral questioning * Portfolio of evidence * Interviews * Written tests |
| 3. Create and manipulate database system | 1. Creation of tables 2. Primary and secondary key 3. Linking of tables 4. Data variables 5. Database integration 6. Database Querying - SQL | * Oral questioning * Portfolio of evidence * Interviews * Written tests |
| 4. Perform database testing e.g. using dummy data | 1. Integration testing 2. DB Query testing 3. Database test techniques 4. Schema testing 5. Stored procedure 6. Trigger 7. Stress 8. views 9. Benchmarking    1. Perform database testing    2. Generate test report | * Oral questioning * Portfolio of evidence * Interviews * Written tests |
| 5. Implement designed database (roll out) | 1. Run the designed database 2. Test the design and Database functionality | * Oral questioning * Portfolio of evidence * Interviews * Written tests |
| 6. Establish transaction and concurrency mechanism | 1. Transaction mechanisms 2. Concurrency mechanisms 3. Management of multiple transactions | * Oral questioning * Portfolio of evidence * Interviews * Written tests |
| 7.Manage database security | 1. Restriction of access as per Internal policy 2. Types of restrictions 3. Backup and recovery methods    1. Statement sanitization to remove SQL injections | * Oral questioning * Portfolio of evidence * Interviews * Written tests |

**Suggested Methods of Instructions**

1. Practical
2. Projects
3. Group discussion
4. Direct instruction
5. Demonstration

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | Data presentation charts | Manilla charts | 1 | 1:25 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Lecture/theory room | 72m2 | 1 | 1:25 |
|  | Whiteboard/Plotting grid | 2M by 1M | 1 | 1:25 |
|  | Software | DB Comparer, Ad miner, Firebird, Beaver, phpMyAdmin, Navicat for MySQL, Test Data Generator, Visual Query Designer | 25 | 1:1 |
|  | Projector | LCD High resolution | 1 | 1:25 |
| **C** | **Consumable materials** | | | |
|  | Stationery | Pens, pencils, printing papers etc. | Enough for 25 | 1:1 |
|  | Assorted whiteboard markers | Non-permanent | 3 | 3:25 |
| **D** | **Tools and Equipment** | | | |
|  | Computers | 4GB/8GB RAM/with internet connection | 25 | 1:1 |
|  | Servers | - | 1 | 1:25 |

## **RELIABILITY AND VALIDITY OF DATA**

**UNIT CODE:** 0542 551 17A

**UNIT DURATION:** 180 hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: **Conduct reliability and validity of data**

**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.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Carry out pilot study | **40** |
|  | Conduct reliability test | **50** |
|  | Conduct validity test | **50** |
|  | Compare validity and reliability results with threshold | **40** |
| **Total** | | **180** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| * + 1. Carry out pilot study | 1. Introduction to sample size determination 2. Scholarly evidence 3. Academic justification 4. Scientific proofs 5. Impacts of sample size in reliability of study findings 6. Factors that influence sample size 7. Ethical and practical considerations 8. Purpose of pilot study 9. Designing a pilot study 10. Analyzing and application of pilot study 11. Introduction to Measurement instruments; 12. Literature review 13. Expert advice 14. Statistical application 15. Data entry practices, procedures, common data entry tools and software’s and quality control measures. 16. Data analysis, interpretation, analysis and reporting. | * Oral questioning * Portfolio of evidence * Interviews * Written tests |
| * 1. Conduct reliability test | 1. Reliability Assessments 2. Definitions 3. Types of reliability tests 4. Conduct Reliability Tests; 5. Test-Retest 6. Inter-Rater 7. Internal Consistency 8. Reliability Scales 9. Determination 10. Designing 11. Reliability coefficients Interpretation 12. Variance estimates 13. Alpha values | * Oral questioning * Portfolio of evidence * Interviews   Written tests |
| * 1. Conduct validity test | 1. Validity in research 2. Definitions and Importance 3. Types of validity 4. Uniform validity guidelines; 5. Selection statistical procedures. 6. Content validity 7. Criteria 8. Validation statistical procedures 9. Overview of statistical techniques 10. Importance of following accepted standards in validation process 11. Statistical procedures; 12. Factor Analysis 13. Correlation analysis 14. Regression Analysis     1. Test manuals 15. Overview of purpose and structure 16. Usage of test manuals 17. Interpreting validity Outcomes 18. Comparison with Established benchmarks 19. Components of a validity report 20. Professional Guidelines for reporting | * Practical assessment * Projects * Portfolio of evidence * Oral assessment * Written assessment |
| * 1. Compare validity and reliability results with threshold | 1. Introduction to thresholds for validity and reliability 2. Definitions 3. Importance of identifying appropriate threshold for data quality 4. Threshold values and standards 5. Reliability thresholds (Cronbach alpha, intraclass correlation coefficient (ICC) 6. Validity threshold (correlation coefficients, factor loadings) 7. Reliability and validity test documentation. 8. Reliability outcomes presentation 9. Validity outcomes presentation 10. Interpretation of the impact of results 11. Comparing outcomes against thresholds 12. Decision making based on outcomes 13. Adjusting research plans 14. Evaluating the appropriateness of tests used 15. Assessing quality of testing procedures 16. Standards for reporting and documentation 17. Continuous improvement. | * Practical assessment * Projects * Portfolio of evidence * Oral assessment * Written assessment |

**Suggested Methods of Instruction**

* 1. Projects
  2. Practical
  3. Demonstration
  4. Group discussions
  5. Direct instruction

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | Notes | - | 1 | 1:25 |
|  | Datasets | - | 5 | 1:5 |
|  | Video clips | - | 1 | 1:25 |
|  | Case studies | - | 25 | 1:1 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Lecture/theory room | 72m2 | 1 | 1:25 |
|  | Whiteboard/Plotting grid | 2M by 1M | 1 | 1:25 |
|  | Computers | 4GB/8GB RAM/with internet connection | 25 | 1:1 |
|  | Mobile phones | Android/smart | 25 | 1:1 |
|  | Statistical software | SPSS, STATA, R PROGRAMME,  Advanced Excel, ODK | 25 | 1:1 |
|  | Printers | Ink Jet | 1 | 1:25 |
| **C** | **Consumable materials** | | | |
|  | Stationery | Pens, pencils, printing papers etc. | Enough for 25 | 1:1 |
|  | Assorted whiteboard markers | Non-permanent | 3 | 3:25 |
| **D** | **Tools and Equipment** | | | |
|  | White board protractor, compass, ruler, set squares | Wooden/plastic | 1 per item | 1:25 |
|  | Projector | LCD High resolution | 1 | 1:25 |