	Curriculum Document			
Curriculum Code	**Curriculum Title**			
251201002	Occupational Certificate: Artificial Intelligence Software Developer			
	Name	**Email**	**Phone**	**Logo**
Development Quality Partner	MICT SETA	Gugu.Sema@mict.org.za	011-2072600	

Learner QDF Signature **Date**

QDF Signature **Date**

DQP Representative Signature **Date**

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SECTION 1: CURRICULUM SUMMARY

1. Occupational Information

1.1 Associated Occupation

251201: Software Developer

1.2 Occupation or Specialisation Addressed by this Curriculum

251201001: Artificial Intelligence Software Developer

1.3 Alternative Titles used by Industry

- None

2. Curriculum Information

2.1 Curriculum Structure

This qualification is made up of the following compulsory Knowledge and Practical Skills Modules:

Knowledge Modules:

- 251201002-KM-01, Overview of Artificial Intelligence, NQF Level 4, Credits 2
- 251201002-KM-02, Introduction to Mathematics and Statistics, NQF Level 4, Credits 10
- 251201002-KM-03, Analytical Thinking and Problem Solving, NQF Level 4, Credits 3
- 251201002-KM-04, Data, Databases and Data Visualisation, NQF Level 4, Credits 8
- 251201002-KM-05, Computing Theory, NQF Level 4, Credits 8
- 251201002-KM-06, Introduction to Artificial Intelligence, Machine Learning, Deep Learning, NQF Level 4, Credits 5
- 251201002-KM-07, Artificial Intelligence, NQF Level 5, Credits 12
- 251201002-KM-08, Machine Learning, NQF Level 5, Credits 16
- 251201002-KM-09, Deep Learning, NQF Level 5, Credits 16
- 251201002-KM-10, Introduction to Governance, Legislation and Ethics, NQF Level 4, Credits 1
- 251201002-KM-11, Fundamentals of Design Thinking and Innovation, NQF Level 4, Credits 1
- 251201002-KM-12, 4IR and Future Skills, NQF Level 4, Credits 4

Total number of credits for Knowledge Modules: 86

Practical Skills Modules:

- 251201002-PM-01, Mathematics and Statistics for Programming, NQF Level 4, Credits 8
- 251201002-PM-02, Problem Definition, Analytical Thinking and Decision-Making, NQF Level 4, Credits 2

- 251201002-PM-03, Access, Analyse and Visualise Structured Data Using Spreadsheets, NQF Level 4, Credits 4
- 251201002-PM-04, Use SQL to Communicate with a Database, NQF Level 5, Credits 4
- 251201002-PM-05, Build a simple AI solution using Python, NQF Level 5, Credits 8
- 251201002-PM-06, Use Python Data Scraping to Populate Database Table in SQL, NQF Level 5, Credits 4
- 251201002-PM-07, Use Machine Learning to Build an AI solution in Python, NQF Level 5, Credits 6
- 251201002-PM-08, Use Deep Learning to Build an AI Neural Network Architecture in Python, NQF Level 5, Credits 10
- 251201002-PM-09, Use Deep Learning to Build an AI Neural Network Architecture in TensorFlow, NQF Level 5, Credits 10
- 251201002-PM-10, Function Ethically and Effectively as a Member of a Multidisciplinary Team, NQF Level 4, Credits 3
- 251201002-PM-11, Participate in a Design Thinking for Innovation Workshop, NQF Level 4, Credits 4

Total number of credits for Practical Skills Modules: 63

This qualification also requires the following Work Experience Modules:

- 251201001-WM-01, AI Solution Design Interpretation and Development NQF Level 5, Credits 20
- 251201001-WM-02, AI Solution Performance Testing, NQF Level 5, Credits 20
- 251201001-WM-03, AI Solution Deployment, Modification and Improvement, NQF Level 5, Credits 20

Total number of credits for Work Experience Modules: 60

2.2 Entry Requirements

NQF 4

3. Assessment Quality Partner Information

Name of body: MICT Seta

Address of body: 19 Richards Dr, Halfway House, Midrand, 1685

Contact person name: Gugu Sema

Contact person work telephone number: 011-2072600

4. Part Qualification Curriculum Structure

None

SECTION 2: OCCUPATIONAL PROFILE

1. Occupational Purpose

The purpose of this qualification is to prepare a learner to operate as an Artificial Intelligence Software Developer

Artificial Intelligence Developers build AI functionality into software applications through integrating and implementing AI algorithms and logic into the deliverables of an IT project. Developers teach the machine to solve problems the way a human would through the use of programming. They create, test, and deploy code. These developers also assist in converting machine learning APIs so that other applications can use them

2. Occupational Tasks

- Interpret solution design documentation and develop AI solution
- Train the AI model through a machine learning process and test the performance to ensure that model accuracy is strictly maintained within the selection framework
- Deploy the AI solution and maintain the solution to ensure model accuracy is strictly maintained

3. Occupational Task Details

3.1. Interpret solution design documentation and develop AI solution (NQF Level 5)

Unique Product or Service:

- AI solution

Occupational Responsibilities:

- Use machine learning to build an AI solution in Python
- Use deep learning to build an AI neural network architecture in Python
- Use deep learning to build an AI neural network architecture in TensorFlow

Occupational Contexts:

- AI solution design interpretation and development

3.2. Train the AI model through a machine learning process and test the performance to ensure that model accuracy is strictly maintained within the selection framework (NQF Level 5)

Unique Product or Service:

- Trained AI model

Occupational Responsibilities:

- Apply ML process and test the performance of the model

Occupational Contexts:

- AI solution testing

3.3. Deploy the AI solution and maintain the solution to ensure model accuracy is strictly maintained (NQF Level 5)

Unique Product or Service:

- Maintained AI solution

Occupational Responsibilities:

- Deploy and maintain the AI solution

Occupational Contexts:

- AI solution deployment, modification and improvement

SECTION 3: CURRICULUM COMPONENT SPECIFICATIONS

SECTION 3A: KNOWLEDGE MODULE SPECIFICATIONS

List of Knowledge Modules for which Specifications are included

Knowledge	251201-002-00-KM-01	Overview of Artificial Intelligence	4	2
Knowledge	251201-002-00-KM-02	Introduction to Mathematics and Statistics	4	10
Knowledge	251201-002-00-KM-03	Analytical Thinking and Problem Solving	4	3
Knowledge	251201-002-00-KM-04	Data, Databases and Data Visualisation	4	8
Knowledge	251201-002-00-KM-05	Computing Theory	4	8
Knowledge	251201-002-00-KM-06	Introduction to Artificial Intelligence, Machine Learning, Deep Learning	4	5
Knowledge	251201-002-00-KM-07	Artificial Intelligence	5	12
Knowledge	251201-002-00-KM-08	Machine Learning	5	16
Knowledge	251201-002-00-KM-09	Deep Learning	5	16
Knowledge	251201-002-00-KM-10	Introduction to Governance, Legislation and Ethics	4	1
Knowledge	251201-002-00-KM-11	Fundamentals of Design Thinking and Innovation	4	1
Knowledge	251201-002-00-KM-12	4IR and Future Skills	4	4

1. 251201-002-00-KM-01, Overview of Artificial Intelligence, NQF Level 4, Credits 2

1.1 Purpose of the Knowledge Module Intro

The main focus of the learning in this knowledge module is to build an understanding of artificial Intelligence, its definition and future, as well as the purpose and contribution of AI to society and business

The learning will enable learners to demonstrate an understanding of:

- KM-01-KT01 : Introduction to AI **40%**
- KM-01-KT02 : Background to AI **20%**
- KM-01-KT03 : Strategic advantage of AI in business **40%**

1.2 Guidelines for Topics

1.2.1 KM-01-KT01 : Introduction to AI 40%

Topic elements to be covered include:

- KT0101 Evolution of Artificial Intelligence (AI)
- KT0102 Defining AI
- KT0103 Realistic and unrealistic AI
- KT0104 Fields related to AI:
  - Machine learning (ML)
  - Deep learning (DL)
  - Artificial Neural Networks (ANN)
  - Data science
  - Automation
  - Robotics
- KT0105 Taxonomy of AI:
  - Philosophy of AI
  - General vs narrow AI
- KT0106 Strong vs weak AI
- KT0107 Why is AI important
  - Contribution of AI to society
  - Role players and stakeholders
  - The future of AI
- KT0108 Limitation of AI

Internal Assessment Criteria and Weight

- IAC0101 The evolution of AI is discussed and key concepts are understood and defined
- IAC0102 An understanding of the fields related to AI is demonstrated
- IAC0103 AI taxonomy and philosophy are defined using correct terminology
- IAC0104 An understanding of the benefits of AI is demonstrated
- IAC0105 Application opportunities for AI are identified and discussed

(Weight 40%)

1.2.2 KM-01-KT02 : Background to AI 20%

Topic elements to be covered include:

- KT0201 AI applications:
  - Common application types
  - Gaming

- Natural Language Processing
- Expert Systems
- Vision Systems
- Speech Recognition
- Handwriting Recognition
- Intelligent Robots

- KT0202 AI making applications friendlier:
  - Types of AI
    - Reactive Machines
    - Limited Memory
    - Theory of Mind
    - Self-awareness

Internal Assessment Criteria and Weight

- IAC0201 Leading AI applications are defined and discussed

- IAC0202 All AI types are understood and defined using correct terminology

(Weight 20%)

1.2.3 KM-01-KT03 : Strategic advantage of AI in business 40%

Topic elements to be covered include:

- KT0301 Introduction to the 4th Industrial Revolution (4IR)
- KT0302 4IR vs AI
- KT0303 Strategic advantage of AI in Business
- KT0304 AI technology supporting business
- KT0305 AI in production or manufacturing:
  - Automation helping humans work more effectively
  - Levels of automation
  - Robotics
- KT0306 AI in the medical fields:
  - Portable patient monitoring
  - Use of exoskeletons
  - Addressing special needs
  - Surgical techniques
  - Automation possibilities
- KT0307 AI in agriculture
- KT0308 AI in the finance industry
- KT0309 AI in engineering
- KT0310 AI improving human interaction:
  - Language translation
  - Body language
  - Augmenting communication
  - Using multimedia
  - Augmenting human sensory perception

Internal Assessment Criteria and Weight

- IAC0301 The strategic advantage of AI is identified and discussed for various industries

- IAC0302 An understanding of the benefits and application of AI in various industries is demonstrated

(Weight 40%)

1.3 Provider Programme Accreditation Criteria

Physical Requirements:

- The provider must have lesson plans and structured learning material or provide learners with access to structured learning material that addresses all the topics in all the knowledge modules as well as the applied knowledge in the practical skills.
- QCTO/ MICT SETA requirements

Human Resource Requirements:

- Lecturer/learner ratio of 1:20 (Maximum)
- Qualification of lecturer (SME):
    - NQF 6 in industry recognised qualifications with 1 year's experience in the IT industry
    - AI vendor certification (where applicable)
- Assessors and moderators: accredited by the MICT SETA

Legal Requirements:

- Legal (product) licences to use the software for learning and training (where applicable)
- OHS compliance certificate
- Ethical clearance (where necessary)

1.4 Exemptions

- No exemptions, but the module can be achieved in full through a normal RPL process

2. 251201-002-00-KM-02, Introduction to Mathematics and Statistics, NQF Level 4, Credits 10

2.1 Purpose of the Knowledge Module

The main focus of the learning in this knowledge module is to revise and acquire mathematical and statistical theory to successfully understand and interpret actions of Artificial Intelligence, Machine Learning, Deep Learning and Data Analytics

The learning will enable learners to demonstrate an understanding of:

- KM-02-KT01 : Basic Mathematics **20%**
- KM-02-KT02 : Linear Algebra **10%**
- KM-02-KT03 : Conversion between decimal and binary systems **5%**
- KM-02-KT04 : Expressing size and magnitude **5%**
- KM-02-KT05 : Error in calculations **5%**
- KM-02-KT06 : Cartesian coordinate system **5%**
- KM-02-KT07 : Pythagorean theorem **5%**
- KM-02-KT08 : Increments **5%**
- KM-02-KT09 : Calculus **5%**
- KM-02-KT10 : Probabilities **5%**
- KM-02-KT11 : Statistics **20%**
- KM-02-KT12 : Bayes' Theorem **10%**

2.2 Guidelines for Topics

2.2.1 KM-02-KT01 : Basic Mathematics 20%

Topic elements to be covered include:

- KT0101 Operator precedence:
    - Definition and terminology
    - Purpose and use
    - Order of operations (left to right)
    - Apply precedence – PEMDAS (BOMDAS)
        - Parentheses (Brackets)
        - Exponents (Order)
        - Multiply and divide
        - Add and subtract
        - Use of PEMDAS (BOMDAS)
- KT0102 Integer division:
    - Definition and terminology
    - Purpose and use
    - Rules on how to divide integers

- Names and symbols for integer division
- Software for integer division

- KT0103 Modulus:
  - Definition and terminology
  - Purpose and use of modulus
  - Modulus abbreviated as “mod”
  - % application
  - (==) application
  - Modulus in programming
- KT0104 Mixing Types:
  - Definition and terminology
  - Purpose and use of mixing types
  - Apply an operator
  - Combination with the order of operations
  - The order in which an expression is written
  - How a computer would evaluate some expressions that combine types
  - Casting

Internal Assessment Criteria and Weight

- IAC0101 Operator precedence is explained in terms of application and used to solve an expression
- IAC0102 Integer division is explained in terms of application and using correct terminology and symbols
- IAC0103 Modulus is explained in terms of application and using correct terminology and symbols
- IAC0104 Mixing types are explained in terms of application and using correct terminology and symbols

(Weight 20%)

2.2.2 KM-02-KT02 : Linear Algebra 10%

Topic elements to be covered include:

- KT0201 Linear transformation
- KT0202 Vectors:
  - Vectors

- Customary behavioural vectors
- Eigen vectors

- KT0203 Matrices:
  - Matrices
  - Inverse and transports
  - Special matrices
- KT0204 Matrix operations
- KT0205 Special functions in linear algebra:
  - ReLU
  - Sigmoid
  - SoftMax
  - Popular loss functions
  - Cross-entropy
  - Quadratic loss functions

Internal Assessment Criteria and Weight

- IAC0201 The definition of linear transformation, vectors, matrices and matrix operations is understood and the applications thereof described
- IAC0202 The definition of special functions is understood and the applications thereof described

(Weight 10%)

2.2.3 KM-02-KT03 : Conversion between decimal and binary systems 5%

Topic elements to be covered include:

- KT0301 Introduction to binary numbers
- KT0302 Perform addition and subtraction of positive whole numbers in binary
- KT0303 Binary arithmetic

Internal Assessment Criteria and Weight

- IAC0301 Conversions between decimal and binary systems and the application thereof are explained

(Weight 5%)

2.2.4 KM-02-KT04 : Expressing size and magnitude 5%

Topic elements to be covered include:

- KT0401 Use scientific notation for small and large numbers
- KT0402 Prefixes:
  - Giga to Pica (10^{9} to 10^{-12})
  - Conversions

- KT0403 SI to Imperial
- KT0404 Degrees F to degrees C

Internal Assessment Criteria and Weight

- IAC0401 Different ways to express size and magnitude are explained

(Weight 5%)

2.2.5 KM-02-KT05 : Error in calculations 5%

Topic elements to be covered include:

- KT0501 Rational and irrational numbers
- KT0502 Explore repeating decimals and convert them to fraction
- KT0503 Symbols for irrational numbers
- KT0504 Rounding prematurely in calculations
- KT0505 Accuracy in calculations
- KT0506 Final value of a calculation expressed in terms of the required unit
- KT0507 When PEMDAS fail

Internal Assessment Criteria and Weight

- IAC0501 The effect of error in calculations is reasoned

(Weight 5%)

2.2.6 KM-02-KT06 : Cartesian coordinate system 5%

Topic elements to be covered include:

- KT0601 Definition
- KT0602 Terminology
- KT0603 The coordinate plane:
  - Intersecting x- and y-axes
  - Four quadrants
- KT0604 Naming using Roman numerals
- KT0605 Use an application to create graphs and maps

Internal Assessment Criteria and Weight

- IAC0601 The Cartesian coordinate system is explained in terms of application and using correct terminology

(Weight 5%)

2.2.7 KM-02-KT07 : Pythagorean theorem 5%

Topic elements to be covered include:

- KT0701 What is a theorem?
- KT0702 Definition of Pythagorean theorem
- KT0703 Finding the distance between two points

- KT0704 Terminology
- KT0705 Purpose
- KT0706 Determine the distance between two points on the Cartesian grid

Internal Assessment Criteria and Weight

- IAC0701 The definition of theorem is understood and the applications thereof described
- IAC0702 The Pythagorean theorem is explained in terms of application and using correct terminology

(Weight 5%)

2.2.8 KM-02-KT08 : Increments 5%

Topic elements to be covered include:

- KT0801 Definition and terminology
- KT0802 Purpose and use of increments
- KT0803 Increment a variable
- KT0804 Compound assignment operator
- KT0805 Increments in programming

Internal Assessment Criteria and Weight

- KT0901 Increments are explained in terms of application and using correct terminology and symbols

(Weight 5%)

2.2.9 KM-02-KT09 : Calculus 5%

Topic elements to be covered include:

- KT0901 Calculus essentials:
    - Differential calculus
    - Integral calculus
- KT0902 Derivatives:
    - Derivative and partial derivatives
    - Chain rule
    - Derivatives of special functions

Internal Assessment Criteria and Weight

- IAC0901 The definition of calculus is understood and the applications thereof described

(Weight 5%)

2.2.10 KM-02-KT10 : Probabilities 5%

Topic elements to be covered include:

- KT1001 Definition and terminology
- KT1002 Probability essentials
- KT1003 Probability basics and notations
- KT1004 Probabilities and odds
- KT1005 Probability:
    - Why probability matters
    - Odds

  KT1006 The Bayes rule:
    - Essential probability theorem
    - How odds change
    - Bayes rule in practice
    - Naïve Bayes classification
- KT1007 What are parameters
- KT1008 Estimating parameters
- KT1009 Conditional probability
- KT1010 Essential probability theorems for ML

Internal Assessment Criteria and Weight

- IAC1001 The definition of probabilities is understood and the applications thereof described
- IAC1002 The basic Bayes rule is understood and described

(Weight 5%)

2.2.11 KM-02-KT11 : Statistics 20%

Topic elements to be covered include:

- KT1101 Why is statistics important in AI?
- KT1102 Introduction to statistics:
    - Descriptive statistics
    - Inferential statistics
- KT1103 Qualitative and quantitative research:
    - Definitions
    - Application
- KT1104 Statistics and machine learning:
    - Statistics in data preparation
        - Outlier detection
        - Missing value imputation
        - Data sampling
        - Data scaling
        - Variable encoding
    - Statistics in model evaluation
        - Data sampling
        - Data resampling
        - Experimental design

        - Statistics in model selection
            - Checking for a significant difference between results
            - Quantifying the size of the difference between results
        - Statistics in model prediction
            - Summarizing the expected skill of the model on average
            - Quantifying the expected variability of the skill of the model in practice
        - Statistics in model presentation
            - Quantifying the expected variability for the prediction
- KT1105 Gaussian distribution and descriptive statistics:
    - Mean
    - Variance
    - Standard deviation
- KT1106 Correlation between variables:
    - Positive correlation
    - Neutral correlation
    - Negative correlation
- KT1107 Statistical Hypothesis Tests:
    - Hypothesis 0 (H0)
    - Hypothesis 1 (H1)
- KT1108 Estimation statistics:
    - Classes of methods
    - Effect size
    - Interval estimation
    - Meta-analysis
- KT1109 Types of intervals:
    - Tolerance interval
    - Confidence interval
    - Prediction interval
- KT1110 Nonparametric statistics

Internal Assessment Criteria and Weight

- IAC1101 The definition and importance of statistics are understood and described
- IAC1102 The definition of qualitative and quantitative research is understood and the applications thereof described
- IAC1103 The application of statistics in machine learning is understood and described
- IAC1104 The application of statistics in preparation is understood and described
- IAC1105 The application of statistics in model evaluation is understood and described
- IAC1106 The application of statistics in model selection is understood and described
- IAC1107 The application of statistics in model preparation is understood and described
- IAC1108 Gaussian distribution and description statistics are understood and described
- IAC1109 The correlation between variables is understood and described
- IAC1110 Statistical hypothesis is understood and successfully used

- IAC1111 Estimation statistics is understood and successfully used
- IAC1112 Types of intervals are understood and described
- IAC1113 Nonparametric statistics is understood and described

(Weight 20%)

2.2.12 KM-02-KT12 : Bayes' Theorem 10%

Topic elements to be covered include:

- KT1201 Bayes' theorem:
  - Bayes' Theorem of conditional probability
  - Naming the terms in the theorem
  - Example for calculating Bayes' Theorem
    - Diagnostic test scenario
    - Manual calculation
    - Python code calculation
    - Binary classifier terminology
  - Bayes' Theorem for modelling Hypotheses
  - Bayes' Theorem for classification
    - Bayes' Classifier
    - Bayes' Optimal Classifier
  - More uses of Bayes' Theorem in Machine Learning
    - Bayesian optimisation
    - Bayesian belief networks

Internal Assessment Criteria and Weight

- IAC1201 The Bayes Theorem of Conditional probability is understood and described
- IAC1202 The Bayes Theorem calculation is understood and described
- IAC1203 The Bayes Theorem is used for modelling a hypothesis and for classification
- IAC1204 The Bayes Theorem is used for Machine learning

(Weight 10%)

2.3 Provider Programme Accreditation Criteria

Physical Requirements:

- The provider must have lesson plans and structured learning material or provide learners with access to structured learning material that addresses all the topics in all the knowledge modules as well as the applied knowledge in the practical skills.
- QCTO/ MICT SETA requirements

Human Resource Requirements:

- Lecturer/learner ratio of 1:20 (Maximum)

- Qualification of lecturer (SME):
    - NQF 6 in industry recognised qualifications with 1 year’s experience in the IT industry
    - AI vendor certification (where applicable)
- Assessors and moderators: accredited by the MICT SETA

Legal Requirements:

- Legal (product) licences to use the software for learning and training (where applicable)
- OHS compliance certificate
- Ethical clearance (where necessary)

2.4 Exemptions

- No exemptions, but the module can be achieved in full through a normal RPL process

3. 251201-002-00-KM-03, Analytical Thinking and Problem Solving, NQF Level 4, Credits 3

3.1 Purpose of the Knowledge Module

The main focus of the learning in this knowledge module is to provide the learner with an opportunity to acquire theory for formulating a problem and applying knowledge to design and create a solution for such a problem

The learning will enable learners to demonstrate an understanding of:

- KM-03-KT01 : Introduction to analytical thinking **40%**
- KM-03-KT02 : Problem solving and critical thinking **40%**
- KM-03-KT03 : AI problem solving **20%**

3.2 Guidelines for Topics

3.2.1 KM-03-KT01 : Introduction to analytical thinking 40%

Topic elements to be covered include:

- KT0101 Analytical thinking
- KT0102 Types of thinking
- KT0103 Define analytical thinking
- KT0104 Analytical thinking skills:
    - Research
    - Forecasting
    - Problem solving
    - Data mining
    - Data and metrics interpreting
    - Reporting
    - Organisation
    - Communication

Internal Assessment Criteria and Weight

- IAC0101 Analytical thinking is understood and described
- IAC0102 Analytical thinking steps and the application thereof are explained and used

(Weight 40%)

3.2.2 KM-03-KT02 : Problem solving and critical thinking 40%

Topic elements to be covered include:

- KT0201 Root cause analysis (RCA):
    - What is RCA?
    - RCA Steps
    - Define the event
    - Identify the problem – 5 Why's
    - Establish a probable cause/s
    - Find the root cause
    - Test to determine the cause
    - Establish a plan to resolve the problem
    - Implement a solution

- Verify the functionality
- Implement preventative measures
- Document results
- Advantages and disadvantages

- KT0202 Decision tree analysis
  - What are decision trees?
  - Terminology used
  - Steps
  - Advantages and disadvantages

Internal Assessment Criteria and Weight

- IAC0201 Problem-solving is understood and explained
- IAC0202 Root cause analysis is understood and explained
- IAC0203 Root cause analysis steps and the application thereof are explained and used
- IAC0204 Decision tree analysis is understood and explained
- IAC0205 Decision tree analysis steps and the application thereof are explained and used

(Weight 40%)

3.2.3 KM-03-KT03 : AI problem solving 20%

Topic elements to be covered include:

- KT0301 Formulate a real-world problem
- KT0302 Search data
- KT0303 Solve problems with AI
- KT0304 Formulate a simple game tree:
  - What is a game tree
  - Minimize and maximize
  - Strategy
  - The value of the root node
  - Minimax principle

Internal Assessment Criteria and Weight

- IAC0301 A real-world problem is understood and defined
- IAC0302 Search data are understood and explained and used in problem-solving using a problem-solving process
- IAC0303 Simple game tree is understood, designed and used to solve a problem

(Weight 20%)

3.3 Provider Programme Accreditation Criteria

Physical Requirements:

- The provider must have lesson plans and structured learning material or provide learners with access to structured learning material that addresses all the topics in all the knowledge modules as well as the applied knowledge in the practical skills.
- QCTO/ MICT SETA requirements

Human Resource Requirements:

- Lecturer/learner ratio of 1:20 (Maximum)
- Qualification of lecturer (SME):
    - NQF 6 in industry recognised qualifications with 1 year's experience in the IT industry
    - AI vendor certification (where applicable)
- Assessors and moderators: accredited by the MICT SETA

Legal Requirements:

- Legal (product) licences to use the software for learning and training (where applicable)
- OHS compliance certificate
- Ethical clearance (where necessary)

3.4 Exemptions

- No exemptions, but the module can be achieved in full through a normal RPL process

4. 251201-002-00-KM-04, Data, Databases and Data Visualisation, NQF Level 4, Credits 8

4.1 Purpose of the Knowledge Module

The main focus of the learning in this knowledge module is to build an understanding of data and databases and giving meaning to data through data processing, analysis and visualisation

The learning will enable learners to demonstrate an understanding of:

- KM-04-KT01 : Introduction to data **20%**
- KM-04-KT02 : Data in spreadsheets **20%**
- KM-04-KT03 : Data analytics **10%**
- KM-04-KT04 : Introduction to databases **15%**
- KM-04-KT05 : Data mining **15%**
- KM-04-KT06 : Structured query language (SQL) **5%**
- KM-04-KT07 : Visualising data with AI tools **5%**
- KM-04-KT08 : Data security **10%**

4.2 Guidelines for Topics

4.2.1 KM-04-KT01 : Introduction to data 20%

Topic elements to be covered include:

- KT0101 Value of data
- KT0102 Data analysis for AI: Importance of analysis
- KT0103 Data sourcing:
    - Data sources
    - Reliable data
    - Automated data collection
- KT0104 Refining data:
    - Missing data
    - Data misalignments
    - Separating useful data from the rest
- KT0105 Flaws in data:
    - Commission
    - Omission
    - Perspective
    - Bias
    - Frame of reference
- KT0106 Limits of data acquisition

- KT0107 Data:
    - Setting up data
    - Data interactions
    - Data assigned to different fields
- KT0108 Wrangling
    - Importing data from different file formats
    - Web scraping
    - How to tidy data using suitable software packages to better facilitate analysis
    - String processing with regular expressions (regex)
    - HTML parsing
    - Wrangling data using suitable software package
    - How to work with dates and times as file format
    - Text mining
- KT0109 Approaches in data analysis:
    - Descriptive Analysis
    - Diagnostic Analysis
    - Predictive Analysis
    - Prescriptive Analysis

Internal Assessment Criteria and Weight

- IAC0101 Data and data processing principles are understood and explained
- IAC0102 Four approaches used in understanding and applying data analysis, i.e., Descriptive, Diagnostic, Predictive and Prescriptive, are described and understood
- IAC0103 Factors that are used as measures of data quality, such as accuracy, consistency and relevancy, etc., are recognised and interpreted
- IAC0104 Data capturing systems and processes as sources of data are explained, taking their parameters and maintenance into account

(Weight 20%)

4.2.2 KM-04-KT02 : Data and spreadsheets 20%

Topic elements to be covered include:

- KT0201 Use spreadsheets to analyse and visualise data:

- Reporting using spreadsheets
  - Create a spreadsheet report
  - Filter and format data
  - Create charts
- Spreadsheets tables
- Create a spreadsheet table
- Summarize data
- Sort, filter, and validate data
- Format summarized data
- Pivot tables and pivot charts
  - Use pivot tables and pivot charts
  - Import data from a csv file
  - Create a pivot table
  - Edit pivot tables and pivot charts
  - How to set up pivot tables
  - How to interpret data obtained from a pivot table and communicate it
- Dashboards
  - Create spreadsheet dashboards
  - Conduct data analysis in spreadsheet pivot tables
  - Arrange tables and charts
  - Slice data
  - Filter data using a slicer
  - Add calculated columns to a dashboard
  - Find anomalies
- Hierarchies and time data
  - Create a hierarchy
  - Configure time data
  - Create an animated time chart
- The spreadsheets data model
  - Explore an spreadsheet data model
  - Add multiple tables
  - Create relationships
  - Add external data
  - Import external data and use it
  - Link out to external data
  - DAX
  - View data within an spreadsheet table
- Importing data from files
  - Pre-formatting and importing csv files
  - Import data into spreadsheet
  - Shape and transform data
  - Load data
- Importing data from databases
  - Import data into spreadsheets from a SQL server database
  - Identify available data sources
  - Preview, shape, and transform data
  - Table relationships and hierarchies
  - Loading data
- Importing Data from Spreadsheet Reports

    - Import data from Spreadsheet reports
    - Transform Spreadsheet report data
- Creating and Formatting Measures
    - Create and format measures
    - DAX
    - Measures
    - Advanced DAX Functions
    - Use some of the advanced functions within DAX
- Visualizing Data in Spreadsheets
    - Pivot charts
    - Cube functions
    - Charts for cube functions
    - Create and refine a pivot chart
    - Describe cube functions and when to use them
    - Describe a number of charts for use with cube functions.

Internal Assessment Criteria and Weight

- IAC0201 Data and data processing principles used to manage data in Spreadsheets are understood and explained

(Weight 20%)

4.2.3 KM-04-KT03 : Data analytics 10%

Topic elements to be covered include:

- KT0301 Types of data:
    - Relational databases
    - Data warehouses
    - Advanced DB and information repositories
    - Object-oriented and object-relational databases
    - Transactional and Spatial databases
    - Heterogeneous and legacy databases
    - Multimedia and streaming databases
    - Text databases
    - Text mining and Web mining
- KT0302 Operators
- KT0303 Conditional statements:
    - Loops
    - Script
    - Functions
    - Probability
- KT0304 Inference and modelling

Internal Assessment Criteria and Weight

- IAC0301 The functions and applications of data types and variables are understood and their importance in programming recognised

- IAC0302 The various elements of data analytics are understood and described

(Weight 10%)

4.2.4 KM-04-KT04 : Introduction to databases 15%

Topic elements to be covered include:

- KT0401 What is a Database:
    - Definition of a database
    - Components of a database
    - Function of a database
    - Types of databases
    - Characteristics of a good database
    - Structure and challenges
    - Database design tools
- KT0402 Data Storage:
    - Characteristics of quality data
    - Quality traits of data
    - Data reliability
    - Best practices
    - Data collection and warehousing
    - Sources and collection systems
    - Data capturing systems and processes
    - Parameters for data capturing systems and processes
    - Maintenance of data capturing systems and processes
    - Automated data collection
    - Limits of data acquisition
- KT0403 Relational database design:
    - Design a rational database
    - Create a rational database
    - Modify a relational database
- KT0404 Import and export data
- KT0405 Design and create queries
- KT0406 Data driven solutions

Internal Assessment Criteria and Weight

- IAC0401 Database concepts, principles and characteristics are described
- IAC0402 Data concepts, principles and characteristics are described
- IAC0403 Database design concepts, principles and tools are described
- IAC0404 Access to data is described
- IAC0405 The process of data wrangling and the various methods, processes and suitable software packages used in order to fulfil its purpose to transform and map data from one data form to another that is more appropriate, are understood and described

(Weight 15%)

4.2.5 KM-04-KT05 : Data mining 15%

Topic elements to be covered include:

- KT0501 What is data mining?
- KT0502 Data mining implementation process:
  - Understanding business
  - Understanding data
  - Data preparation
  - Data transformation
  - Modelling
- KT0503 Data mining techniques:
  - Classification
  - Clustering
  - Regression
  - Association rule
  - Outer detection
  - Sequential pattern
  - Prediction
- KT0504 Challenges of data mine implementations
- KT0505 Data mining tools:
  - R language
  - Oracle data mining
- KT0505 Advantages and disadvantages of data mining
- KT0506 Application of data mining

Internal Assessment Criteria and Weight

- IAC0501 The process of data mining and the various methods, processes and suitable software packages used in order to fulfil its purpose to transform and map data from one data form to another that is more appropriate, are understood and described

(Weight 15%)

4.2.6 KM-04-KT06 : Structured query language (SQL) 5%

Topic elements to be covered include:

- KT0601 SQL programming language
- KT0602 SQL code constructs to perform database transactions
- KT0603 Storing, retrieving, managing or manipulating the data inside a relational database management system (RDBMS)

Internal Assessment Criteria and Weight

- KT0604 The application of SQL is explained

(Weight 5%)

4.2.7 KM-04-KT07 : Visualising data with AI tools 5%

Topic elements to be covered include:

- KT0701 Introduction to data visualization:
    - Data visualization using graphics
    - ggplot2 in R language
    - Data visualization using AI tools
    - TensorFlow Graph Visualiser
    - MS Azure ML Studio

Internal Assessment Criteria and Weight

- IAC0701 Data visualization is understood
- IAC0702 The various actions and tools needed to create interactive data visualizations are descried and applied

(Weight 5%)

4.2.8 KM-04-KT08 : Data security 10%

Topic elements to be covered include:

- KT0801 Definition
- KT0802 Purpose of protecting data
- KT0803 Process for protecting data
- KT0804 Unauthorised access
- KT0805 Data corruption
- KT0806 Data security solutions

Internal Assessment Criteria and Weight

- IAC0801 The importance of data security is reasoned

(Weight 10%)

4.3 Provider Programme Accreditation Criteria

Physical Requirements:

- The provider must have lesson plans and structured learning material or provide learners with access to structured learning material that addresses all the topics in all the knowledge modules as well as the applied knowledge in the practical skills.
- QCTO/ MICT SETA requirements

Human Resource Requirements:

- Lecturer/learner ratio of 1:20 (Maximum)
- Qualification of lecturer (SME):
    - NQF 6 in industry recognised qualifications with 1 year's experience in the IT industry
    - AI vendor certification (where applicable)
- Assessors and moderators: accredited by the MICT SETA

Legal Requirements:

- Legal (product) licences to use the software for learning and training (where applicable)
- OHS compliance certificate
- Ethical clearance (where necessary)

4.4 Exemptions

- No exemptions, but the module can be achieved in full through a normal RPL process

5. 251201-002-00-KM-05, Computing Theory, NQF Level 4, Credits 8

5.1 Purpose of the Knowledge Module

The main focus of the learning in this knowledge module is to build an understanding of programming as creating a set of instructions for a computer on how to perform a task, using coding and programming languages

The learning will enable learners to demonstrate an understanding of:

- KM-05-KT01 : Introduction to programming languages **25%**
- KM-05-KT02 : Introduction to algorithms **25%**
- KM-05-KT03 : Programming basics **20%**
- KM-05-KT04 : Solution development **15%**
- KM-05-KT05 : Introduction to Python **15%**

5.2 Guidelines for Topics

5.2.1 KM-05-KT01 : Introduction to programming languages 25%

Topic elements to be covered include:

- KT0101 Concepts, principles and terminology
- KT0102 Developing structured and creative thinking skills through programming
- KT0103 The logic of programming
- KT0104 Types of programming languages:
    - Procedural Programming
    - Functional Programming
    - Object-oriented Programming
    - Scripting Programming
    - Logic Programming
- KT0105 Choosing a programming language
- KT0106 Top 5 AI programming languages:
    - Python
    - C++
    - Java
    - LISP
    - Prolog

Internal Assessment Criteria and Weight

- IAC0101 The benefits of a programming ability are reasoned
- IAC0102 An understanding of the basics of programming language and code is demonstrated

(Weight 10%)

5.2.2 KM-05-KT02 : Introduction to algorithms 25%

Topic elements to be covered include:

KT0201 Advantages and disadvantages of AI programming languages:

- Definition and concept

- The role and function of algorithms
- Different types of algorithms (theories)
    - Algorithms and Data Structures
    - Algorithms and Problem Solving
- Algorithm development
    - Planning and branching
    - Adversarial games
    - Mathematical formulas in texts
    - Tools for representing algorithms
- Tracing and interpreting algorithms
- Problem solving steps
- Use of local search and heuristics
- Machine learning
- Deep learning
- Neural Process Learning

Internal Assessment Criteria and Weight

- IAC0201 The definition of algorithms is understood and the applications thereof described

(Weight 15%)

5.2.3 KM-05-KT03 : Programming basics 20%

Topic elements to be covered include:

- KT0301 Programming environment
- KT0302 Algorithms
- KT0303 Data types
- KT0304 Variables
- KT0305 Keywords
- KT0306 Logical and arithmetical operators
- KT0307 Logical operations: if-statements, where-statements, If-else conditions
- KT0308 Loops

- KT0309 Numbers, characters and arrays
- KT0310 Functions
- KT0311 Input and output operations

Internal Assessment Criteria and Weight

- IAC0301 An understanding of the basics of a programming environment and language is demonstrated

(Weight 40%)

5.2.4 KM-05-KT04 : Solution development 15%

Topic elements to be covered include:

- KT0401 Software development principles:
  - Solution development
  - Design tools and techniques
  - Process flow and cycle
  - Extracting information
  - User interface concepts and design (usability, functionality)
- KT0402 Computational thinking:
  - Sequencing
  - Selection
  - Looping
  - Simple data structures
  - Objects

Internal Assessment Criteria and Weight

- IAC0401 An understanding of software development principles is demonstrated
- IAC0402 An understanding of computational thinking is demonstrated

(Weight 35%)

5.2.5 KM-05-KT05 : Introduction to Python 15%

Topic elements to be covered include:

- KT0501 Python programming
- KT0502 Installing Python:
  - Programming basics
  - Native data types
  - Python classes
  - Inheritance concepts

- Magic functions
- Special functions in Python

- KT0503 Python Programming:
  - Array and array manipulation
  - Selecting data
  - Slicing
  - Stacking
  - Splitting arrays
  - Key Functions

Internal Assessment Criteria and Weight

- IAC0501 Python as a programming language is understood and described
- IAC0502 Python installation is understood and demonstrated
- IAC0503 Python programming is understood and demonstrated

(Weight 35%)

5.3 Provider Programme Accreditation Criteria

Physical Requirements:

- The provider must have lesson plans and structured learning material or provide learners with access to structured learning material that addresses all the topics in all the knowledge modules as well as the applied knowledge in the practical skills.
- QCTO/ MICT SETA requirements

Human Resource Requirements:

- Lecturer/learner ratio of 1:20 (Maximum)
- Qualification of lecturer (SME):
  - NQF 6 in industry recognised qualifications with 1 year's experience in the IT industry
  - AI vendor certification (where applicable)
- Assessors and moderators: accredited by the MICT SETA

Legal Requirements:

- Legal (product) licences to use the software for learning and training (where applicable)
- OHS compliance certificate

- Ethical clearance (where necessary)

5.4 Exemptions

- No exemptions, but the module can be achieved in full through a normal RPL process

6. 251201-002-00-KM-06, Introduction to Artificial Intelligence, Machine Learning, Deep Learning, NQF Level 4, Credits 5

6.1 Purpose of the Knowledge Module

The main focus of the learning in this knowledge module is to build an understanding of the relationship between Artificial Intelligence, Machine Learning and Deep Learning, as well as the application of such systems to create a set of instructions to perform a programming task

The learning will enable learners to demonstrate an understanding of:

- KM-06-KT01 : Artificial Intelligence (AI) vs Machine Learning (ML) vs Deep Learning (DL) **100%**

6.2 Guidelines for Topics

6.2.1 KM-06-KT01 : Artificial Intelligence (AI) vs Machine Learning (ML) vs Deep Learning (DL) 100%

Topic elements to be covered include:

- KT0101 Artificial Intelligence Systems:
  - What are AI systems
  - Types of AI systems
    - Artificial narrow intelligence
    - Artificial general intelligence
    - Artificial super intelligence
- KT0102 Introduction to Machine Learning (ML):
  - What is ML?
  - How does ML work?
- KT0103 Introduction to Deep Learning (DL):
  - What is DL?
  - How does DL work?

Internal Assessment Criteria and Weight

- IAC0101 Concepts and terminology related to AI, ML and DL are understood and described
- IAC0102 Link between AI, ML and DL is understood and described

(Weight 100%)

6.3 Provider Programme Accreditation Criteria

Physical Requirements:

- The provider must have lesson plans and structured learning material or provide learners with access to structured learning material that addresses all the topics in all the knowledge modules as well as the applied knowledge in the practical skills.
- QCTO/ MICT SETA requirements

Human Resource Requirements:

- Lecturer/learner ratio of 1:20 (Maximum)
- Qualification of lecturer (SME):

    - NQF 6 in industry recognised qualifications with 1 year’s experience in the IT industry
    - AI vendor certification (where applicable)
- Assessors and moderators: accredited by the MICT SETA

Legal Requirements:

- Legal (product) licences to use the software for learning and training (where applicable)
- OHS compliance certificate
- Ethical clearance (where necessary)

6.4 Exemptions

- No exemptions, but the module can be achieved in full through a normal RPL process

7. 251201-002-00-KM-07, Artificial Intelligence, NQF Level 5, Credits 12

7.1 Purpose of the Knowledge Module

The main focus of the learning in this knowledge module is to build an understanding of the relationship between Artificial Intelligence, Machine Learning and Deep Learning, as well as the application of AI to create a set of instructions to perform a programming task

The learning will enable learners to demonstrate an understanding of:

- KM-07-KT01 : AI frameworks **50%**
- KM-07-KT02 : Using AI for data scraping **50%**

7.2 Guidelines for Topics

7.2.1 KM-07-KT01 : AI frameworks 50%

Topic elements to be covered include:

- KT0101 Introduction to AI frameworks
- KT0102 Advantages and disadvantages of frameworks:
  - TensorFlow -- TensorFlow Lite
  - Theano -- Lasagne
  - Keras
  - Torch -- PyTorch
  - IBM Watson -- Watson IoT
  - Amazon Web Services (AWS) -- Amazon Lex, Amazon Translate & Amazon Polly
- KT0103 Fundamentals of each framework
  - What application is best suitable for a specific context
  - Applied knowledge of frameworks
- KT0104 Demonstration of each framework

Internal Assessment Criteria and Weight

- IAC0101 Artificial Intelligence frameworks are understood and described
- IAC0102 Advantages and disadvantages of AI frameworks are understood and described
- IAC0103 Fundamentals of AI frameworks are understood, described and demonstrated

(Weight 50%)

7.2.2 KM-07-KT02 : Using AI for data scraping 50%

Topic elements to be covered include:

- KT0201 Concept and definition
- KT0202 Purpose of data scraping
- KT0203 Data scraping tools
- KT0204 Legal issues
- KT0205 Web scraping procedure:
  - Find the URL to scrape
  - Inspect the page
  - Find the data you want to extract
  - Write the code
  - Run the code and extract the data

- Store the data in the required format
- KT0206 Libraries used for web scraping

Internal Assessment Criteria and Weight

- IAC0201 The principles and purpose of data scraping are explained
- IAC0202 Web scraping applications are created in languages such as Python or Java to help bring data into a variety of AI applications

(Weight 50%)

7.3 Provider Programme Accreditation Criteria

Physical Requirements:

- The provider must have lesson plans and structured learning material or provide learners with access to structured learning material that addresses all the topics in all the knowledge modules as well as the applied knowledge in the practical skills.
- QCTO/ MICT SETA requirements

Human Resource Requirements:

- Lecturer/learner ratio of 1:20 (Maximum)
- Qualification of lecturer (SME):
    - NQF 6 in industry recognised qualifications with 1 year's experience in the IT industry
    - AI vendor certification (where applicable)
- Assessors and moderators: accredited by the MICT SETA

Legal Requirements:

- Legal (product) licences to use the software for learning and training (where applicable)
- OHS compliance certificate
- Ethical clearance (where necessary)

7.4 Exemptions

- No exemptions, but the module can be achieved in full through a normal RPL process

8. 251201-002-00-KM-08, Machine Learning, NQF Level 5, Credits 16

8.1 Purpose of the Knowledge Module

The main focus of the learning in this knowledge module is to build an understanding of the relationship between Artificial Intelligence, Machine Learning and Deep Learning, as well as the application of ML to create a set of instructions to perform a programming task

The learning will enable learners to demonstrate an understanding of:

- KM-08-KT01 : Types of ML models **20%**
- KM-08-KT02 : ML algorithm classification **20%**
- KM-08-KT03 : Common ML algorithms **30%**
- KM-08-KT04 : ML Workflow Process (Framework) **10%**
- KM-08-KT05 : Business benefits of ML **20%**

8.2 Guidelines for Topics

8.2.1 KM-08-KT01 : Types of ML models 20%

Topic elements to be covered include:

- KT0101 Binary classification model
- KT0102 Multiclass classification model
- KT0103 Regression classification model
- KT0104 ML features and labels
- KT0105 ML Advantages and disadvantages

Internal Assessment Criteria and Weight

- IAC0101 Types of ML are understood and described
- IAC0102 ML features and labels are understood and described

(Weight 20%)

8.2.2 KM-08-KT02 : ML algorithm classification 20%

Topic elements to be covered include:

- KT0201 Supervised Learning
- KT0202 Unsupervised Learning
- KT0203 Reinforcement Learning

Internal Assessment Criteria and Weight

- IAC0201 ML algorithm classifications are understood and described

(Weight 20%)

8.2.3 KM-08-KT03 : Common ML algorithms 30%

Topic elements to be covered include:

- KT0301 Supervised Learning:
  - Linear Regression

- Naive Bayes
- Decision Trees
- Nearest neighbour
- Super Vector Machines SVM)
- Neural Networks

- KT0302 Unsupervised Learning:
  - K-means clustering
  - Association rule
- KT0303 Reinforcement Learning:
  - Labels
  - No labels
- KT0304 Reinforcement Learning
  - Q-learning
  - Temporal difference (TD)
  - Deep adversarial networks

Internal Assessment Criteria and Weight

- IAC0301 Common ML algorithms are understood and described

(Weight 30%)

8.2.4 KM-08-KT04 : ML Workflow Process (Framework) 10%

Topic elements to be covered include:

- KT0401 Data Collection
- KT0402 Data Preparation
- KT0403 Choose a Model
- KT0404 Train the Model
- KT0405 Evaluate the Model
- KT0406 Parameter Tuning
- KT0407 Make Predictions

Internal Assessment Criteria and Weight

- IAC0401 ML workflow process is understood and applied

(Weight 10%)

8.2.5 KM-08-KT05 : Business benefits of ML 20%

Topic elements to be covered include:

- KT0501 Real-time business decision making
- KT0502 Eliminating manual tasks

- KT0503 Enhancing security and network performance
- KT0504 Improved business models and services
- KT0505 Reducing operating expense
- KT0506 Other

Internal Assessment Criteria and Weight

- IAC0501 Benefits of ML to business are understood

(Weight 20%)

8.3 Provider Programme Accreditation Criteria

Physical Requirements:

- The provider must have lesson plans and structured learning material or provide learners with access to structured learning material that addresses all the topics in all the knowledge modules as well as the applied knowledge in the practical skills.
- QCTO/ MICT SETA requirements

Human Resource Requirements:

- Lecturer/learner ratio of 1:20 (Maximum)
- Qualification of lecturer (SME):
    - NQF 6 in industry recognised qualifications with 1 year's experience in the IT industry
    - AI vendor certification (where applicable)
- Assessors and moderators: accredited by the MICT SETA

Legal Requirements:

- Legal (product) licences to use the software for learning and training (where applicable)
- OHS compliance certificate
- Ethical clearance (where necessary)

8.4 Exemptions

- No exemptions, but the module can be achieved in full through a normal RPL process

9. 251201-002-00-KM-09, Deep Learning, NQF Level 5, Credits 16

9.1 Purpose of the Knowledge Module

The main focus of the learning in this knowledge module is to build an understanding of the relationship between Artificial Intelligence, Machine Learning and Deep Learning, as well as the application of Deep Learning to create a set of instructions to perform a programming task using a Deep Learning tool

The learning will enable learners to demonstrate an understanding of:

- KM-09-KT01 : Deep Learning (DL) **40%**
- KM-09-KT02 : Advance Python for Deep Learning **25%**
- KM-09-KT03 : TensorFlow and Keras for Deep Learning **35%**

9.2 Guidelines for Topics

9.2.1 KM-09-KT01 : Deep Learning (DL) 40%

Topic elements to be covered include:

- KT0101 DL neural network architecture:
    - What are neural networks and layers?
    - Neural network types
- KT0102 DL fundamental network architectures:
    - Convolution neural networks
    - Recurrent neural networks
    - Recursive neural networks
- KT0103 Input and output nodes
- KT0104 Activation functions in DL:
    - Types of activation functions
    - Sigmoid function
    - Hyperbolic Tangent function (Tanh)
    - Softmax function
    - Softsign function
    - Rectified Linear Unit (ReLU) function
    - Exponential Linear Units (ELUs) function
- KT0105 Activation function in TensorFlow
- KT0106 Building a simple DL Network
- KT0107 Tuning a DL Network

Internal Assessment Criteria and Weight

- IAC0101 DL neural network architecture is understood and described
- IAC0102 Fundamental DL network architectures are defined and described
- IAC0103 Input and output nodes are understood and described
- IAC0104 Activation functions in DL are understood and described
- IAC0105 Activation functions in TensorFlow are understood and demonstrated
- IAC0106 A simple DL network is demonstrated by building the network in TensorFlow
- IAC0107 Tuning a DL network is understood, described and demonstrated

(Weight 40%)

9.2.2 KM-09-KT02 : Advance Python for Deep Learning 25%

Topic elements to be covered include:

- KT0201 Python programming primer:
  - Decorators and special functions
  - Decorators' implementation with class
  - Context manager 'with' in Python
  - Context manager application
  - Exception Handling
  - Try and Catch block
  - Python package management
  - Bundling and export python packages

Internal Assessment Criteria and Weight

- IAC0201 DL network is understood and demonstrated by building a simple network in Python Primer

(Weight 25%)

9.2.3 KM-09-KT03 : TensorFlow and Keras for Deep Learning 35%

Topic elements to be covered include:

- KT0301 TensorFlow 2.0 Basics:
  - TensorFlow core concepts, Tensors, core APIs
  - Concrete Functions, Data Types, Control Statements
  - Polymorphic Functions, Concrete Functions, Datatypes, Control Statements, NumPy, Pandas
  - Autograph eager execution
  - tf.function autograph implementation
- KT0302 Keras (TensorFlow 2.0 Built-in API) Overview:
  - Sequential models
    - Configuring layers
    - Loading data
    - Train and test
  - Complex models

- Callbacks
- Save and restore
- Neural network weights
- Building neural networks in Keras
- Building neural networks from scratch in Keras

Internal Assessment Criteria and Weight

- IAC0301 DL network is understood and demonstrated by building a network in TensorFlow and Keras

(Weight 35%)

9.3 Provider Programme Accreditation Criteria

Physical Requirements:

- The provider must have lesson plans and structured learning material or provide learners with access to structured learning material that addresses all the topics in all the knowledge modules as well as the applied knowledge in the practical skills.
- QCTO/ MICT SETA requirements

Human Resource Requirements:

- Lecturer/learner ratio of 1:20 (Maximum)
- Qualification of lecturer (SME):
    - NQF 6 in industry recognised qualifications with 1 year's experience in the IT industry
    - AI vendor certification (where applicable)
- Assessors and moderators: accredited by the MICT SETA

Legal Requirements:

- Legal (product) licences to use the software for learning and training (where applicable)
- OHS compliance certificate
- Ethical clearance (where necessary)

9.4 Exemptions

- No exemptions, but the module can be achieved in full through a normal RPL process

10. 251201-002-00-KM-10, Introduction to Governance, Legislation and Ethics, NQF Level 4, Credits 1

10.1 Purpose of the Knowledge Module

The main focus of the learning in this knowledge module is to build an understanding of the various legislations governing the workplace and their implication for the employer and employees. The learning of this module will also enable the learner to acquire an understanding of the principles of areas of performance management, business planning concepts, costing of products and concepts of general ethical behaviour and its impact in the workplace

The learning will enable learners to demonstrate an understanding of:

- KM-10-KT01 : Governance **20%**
- KM-10-KT02 : Legislation governing workplaces **15%**
- KM-10-KT03 : Introduction to ethics and security **5%**
- KM-10-KT04 : Ethics at work **14%**
- KM-10-KT05 : Security **15%**
- KM-10-KT06 : Performance management **10%**
- KM-10-KT07 : Business planning **7%**
- KM-10-KT08 : Costing of products **7%**
- KM-10-KT09 : Resources **7%**

10.2 Guidelines for Topics

10.2.1 KM-10-KT01 : Governance 20%

Topic elements to be covered include:

- KT0101 Definitions and the role of governance
- KT0102 Rules, norms and actions that are structured, sustained, regulated and held accountable
- KT0103 Structures and processes and industry codes of practice
- KT0104 Transparent, participatory, inclusive and responsive
- KT0105 Domains of IT governance
- KT0106 Compliance vs non-compliance

Internal Assessment Criteria and Weight

- IAC0101 Governance as the way in which rules, norms and actions are structured, sustained, regulated and held accountable, is justified

(Weight 20%)

10.2.2 KM-10-KT02 : Legislation governing workplaces 15%

Topic elements to be covered include:

- KT0201 LRA
- KT0202 POPI
- KT0203 B-BBEE
- KT0204 BCEA

- KT0205 SDA
- KT0206 Current trends

Internal Assessment Criteria and Weight

- IAC0201 Legislation governing workplaces is identified and the implications for the workplace are reasoned

(Weight 15%)

10.2.3 KM-10-KT03 : Introduction to ethics and security 5%

Topic elements to be covered include:

- KT0301 Principles and practices
- KT0302 Concepts, definitions and terminology

Internal Assessment Criteria and Weight

- IAC0301 Definition, principles and practices of ethics and its influence on security within a business ecosystem, are understood

(Weight 5%)

10.2.4 KM-10-KT04 : Ethics at work 14%

Topic elements to be covered include:

- KT0401 Code of conduct and moral compass
- KT0402 Components of ethical behaviour, including integrity, honesty, fair dealing and respecting diversity
- KT0403 Unwritten but expected behaviours, including reliability, accountability, time keeping and respect for others
- KT0404 Lapses in ethical behaviour, including sexual harassment, racism, bullying, theft, abuse of company property, rules, time and sick leave
- KT0405 Conflicts of interest, including primary and secondary interests, the impact on individuals and organisations and the link to corruption
- KT0406 The need for ethical behaviour and the impact or consequences of lapses in ethical behaviour
- KT0407 Copyright and plagiarism
- KT0408 Intellectual property
- KT0409 Spamming
- KT0410 Contract management
- KT0411 Software licensing
- KT0412 Pricing

Internal Assessment Criteria and Weight

- IAC0401 Concepts, issues and examples of ethical and unethical conduct are defined and described
- IAC0402 The impact of these factors on an employer and an employee is discussed

- IAC0403 The impact of lapses in ethical behaviour on the organisation and individuals in the organisation is described
- IAC0404 Processes which employer organisations use to support ethical conduct in the workplace are evaluated
- IAC0405 The importance of the responsibility to consistently comply to the industry ethics and codes of conduct within the business ecosystem, is understood and described
- IAC0406 Own moral compass is developed and applied to ensure privacy, accountability and confidentiality within the industry

(Weight 14%)

10.2.5 KM-10-KT05 : Security 15%

Topic elements to be covered include:

- KT0501 Risks, threats and vulnerabilities
- KT0502 Mitigation tools and strategies
- KT0503 Digital forensics
- KT0504 Cloud
- KT0505 Commercial law
- KT0506 Cyber security
- KT0507 New trends

Internal Assessment Criteria and Weight

- IAC0501 A sound knowledge of the various threats and vulnerabilities within the business ecosystem and the ways to mitigate these, is demonstrated
- IAC0502 The importance of cyber forensics and cybersecurity and their application within the boundaries of the law, is understood

(Weight 15%)

10.2.6 KM-10-KT06 : Performance management 10%

Topic elements to be covered include:

- KT0601 Planning, organising and control
- KT0602 Work flow
- KT0603 Cost, waste
- KT0604 Productivity, efficiency
- KT0605 Housekeeping
- KT0606 Risk, health, safety, environment and related systems
- KT0607 Quality and quality systems

- KT0608 Continual improvement

Internal Assessment Criteria and Weight

- IAC0601 Performance management as a process of ensuring that sets of activities and outputs meet an organization's goals in an effective and efficient manner, is reasoned
- IAC0602 The various focus areas of performance management (e.g., the performance of an organization, a department, an employee or the processes) which should be in place to manage particular tasks, are identified and justified

(Weight 10%)

10.2.7 KM-10-KT07 : Business planning 7%

Topic elements to be covered include:

- KT0701 Business sustainability
- KT0702 Concept of supply and demand
- KT0703 Concept of profit, loss and breakeven
- KT0704 Accountability and responsibility
- KT0705 Competition
- KT0706 Customers
- KT0707 Contracts
- KT0708 Budgets

Internal Assessment Criteria and Weight

- IAC0701 The various concepts of business planning, including competition and budgets, are described

(Weight 7%)

10.2.8 KM-10-KT08 : Costing of products 7%

Topic elements to be covered include:

- KT0801 Input cost
- KT0802 Overhead costs
- KT0803 Direct labour cost
- KT0804 Pricing a product (Under- or over-pricing)

Internal Assessment Criteria and Weight

- IAC0801 Costs related to the production of a product are identified and the effect thereof on the price of the product is analysed

(Weight 7%)

10.2.9 KM-10-KT09 : Resources 7%

Topic elements to be covered include:

- KT0901 Human resources
- KT0902 Financial resources
- KT0903 Physical resources (infrastructure, machinery, equipment)
- KT0904 Communication and information technology

Internal Assessment Criteria and Weight

- IAC0901 Various resources needed in a workplace are identified and the effect thereof on the output is analysed

(Weight 7%)

10.3 Provider Programme Accreditation Criteria

Physical Requirements:

- The provider must have lesson plans and structured learning material or provide learners with access to structured learning material that addresses all the topics in all the knowledge modules as well as the applied knowledge in the practical skills.
- QCTO/ MICT SETA requirements

Human Resource Requirements:

- Lecturer/learner ratio of 1:20 (Maximum)
- Qualification of lecturer (SME):
    - NQF 5 in industry recognised qualifications with 1 year's relevant experience
- Assessors and moderators: accredited by the MICT SETA

Legal Requirements:

- Legal (product) licences to use the software for learning and training (where applicable)
- OHS compliance certificate
- Ethical clearance (where necessary)

10.4 Exemptions

- No exemptions, but the module can be achieved in full through a normal RPL process

11. 251201-002-00-KM-11, Fundamentals of Design Thinking and Innovation, NQF Level 4, Credits 1

11.1 Purpose of the Knowledge Module

The main focus of the learning in this knowledge module is to build an understanding of the design thinking principles and applications in the workplace

The learning will enable learners to demonstrate an understanding of:

- KM-11-KT01 : Introduction to design thinking **15%**
- KM-11-KT02 : The human element **10%**
- KM-11-KT03 : Creativity **20%**
- KM-11-KT04 : Innovation **20%**
- KM-11-KT05 : Design **10%**
- KM-11-KT06 : Design thinking methodology **10%**
- KM-11-KT07 : Application of design thinking **15%**

11.2 Guidelines for Topics

11.2.1 KM-11-KT01 : Introduction to design thinking 15%

Topic elements to be covered include:

- KT0101 Philosophy
- KT0102 Approach and concepts
- KT0103 Definitions and terminology
- KT0104 History

Internal Assessment Criteria and Weight

- IAC0101 Design thinking methodology is understood

(Weight 15%)

11.2.2 KM-11-KT02 : The human element 10%

Topic elements to be covered include:

- KT0201 Human centeredness
- KT0202 Human participation

Internal Assessment Criteria and Weight

- IAC0201 The principles of design thinking are understood

(Weight 10%)

11.2.3 KM-11-KT03 : Creativity 20%

Topic elements to be covered include:

- KT0301 Creativity: is unleashing the potential of the mind to conceive new ideas
- KT0302 Perceiving the world in new ways
- KT0303 Find hidden patterns
- KT0304 Make connections between seemingly unrelated phenomena
- KT0305 Generate solutions
- KT0306 Application in the workplace

Internal Assessment Criteria and Weight

- IAC0301 Creativity is analysed and possible applications are identified

(Weight 20%)

11.2.4 KM-11-KT04 : Innovation 20%

Topic elements to be covered include:

- KT0401 Innovation: is the action of putting things into practical reality, despite challenges and resistance
- KT0402 Different innovations:
  - Incremental
  - Disruptive
  - Architectural and
  - Radical
- KT0403 Main types of innovation:
  - Process innovation
  - Product innovation
  - Organisational innovation
  - Market innovation
- KT0404 What innovation means to business

Internal Assessment Criteria and Weight

- IAC0401 Innovation is analysed and possible applications are identified

(Weight 20%)

11.2.5 KM-11-KT05 : Design 10%

Topic elements to be covered include:

- KT0501 Think outside the box
- KT0502 Push beyond the obvious solutions

- KT0503 Communication through shape and form

Internal Assessment Criteria and Weight

- IAC0501 Design is analysed and possible applications are identified

(Weight 10%)

11.2.6 KM-11-KT06 : Design thinking methodology 10%

Topic elements to be covered include:

- KT0601 Design thinking phases
- KT0602 Design thinking tools and techniques

Internal Assessment Criteria and Weight

- IAC0601 Design thinking phases, tools and techniques are understood

(Weight 10%)

11.2.7 KM-11-KT07 : Application of design thinking 15%

Topic elements to be covered include:

- KT0701 Application in software development
- KT0702 Application in cyber security
- KT0703 Business innovation
- KT0704 Innovative problem solving

Internal Assessment Criteria and Weight

- IAC0701 Possible design thinking applications are explored and discussed

(Weight 15%)

11.3 Provider Programme Accreditation Criteria

Physical Requirements:

- The provider must have lesson plans and structured learning material or provide learners with access to structured learning material that addresses all the topics in all the knowledge modules as well as the applied knowledge in the practical skills.
- QCTO/ MICT SETA requirements

Human Resource Requirements:

- Lecturer/learner ratio of 1:20 (Maximum)

- Qualification of lecturer (SME):
    - NQF 5 in industry recognised qualifications with 1 year’s relevant experience
- Assessors and moderators: accredited by the MICT SETA

Legal Requirements:

- Legal (product) licences to use the software for learning and training (where applicable)
- OHS compliance certificate
- Ethical clearance (where necessary)

11.4 Exemptions

- No exemptions, but the module can be achieved in full through a normal RPL process

12. 251201-002-00-KM-12, 4IR and Future Skills, NQF Level 4, Credits 4

12.1 Purpose of the Knowledge Module

The main focus of the learning in this knowledge module is to build an understanding of the impact of 4IR on communities, individuals and businesses as well as important skills for future needs

The learning will enable learners to demonstrate an understanding of:

- KM-12-KT01 : 4 IR emerging trends **10%**
- KM-12-KT02 : Computing Knowledge **7%**
- KM-12-KT03 : Future skills and competencies (4IR) **10%**
- KM-12-KT04 : 4 IR trends affecting businesses **10%**
- KM-12-KT05 : Interpersonal skills **5%**
- KM-12-KT06 : Intrapersonal skills **5%**
- KM-12-KT07 : Communication principles and methods **5%**
- KM-12-KT08 : Written business communication **7%**
- KM-12-KT09 : Presentation skills **7%**
- KM-12-KT10 : Teamwork in the workplace **10%**
- KM-12-KT11 : Committees and meetings **5%**
- KM-12-KT12 : Job descriptions and profiles **5%**
- KM-12-KT13 : Customers and stakeholders **7%**
- KM-12-KT14 : Customer service **7%**

12.2 Guidelines for Topics

12.2.1 KM-12-KT01 : 4 IR emerging trends 10%

Topic elements to be covered include:

- KT0101 Artificial intelligence
- KT0102 Cloud computing
- KT0103 Cyber security
- KT0104 Data science
- KT0105 Internet of things
- KT0106 Quality engineering automation
- KT0107 Robotic processing automation
- KT0108 Software programming
- KT0109 Design thinking and innovation
- KT0110 e-Waste

Internal Assessment Criteria and Weight

- IAC0101 The transformational effect that 4IR is having or may have on business ecosystems is understood through a comprehensive knowledge of the emerging trends within 4IR

(Weight 10%)

12.2.2 KM-12-KT02 : Computing Knowledge 7%

Topic elements to be covered include:

- KT0201 Introduction to programming language
- KT0202 Programming basics
- KT0203 Basic programming knowledge on HTML, JavaScript (or any scripting language)

- KT0204 Software development, e.g., C#, C++, Java, .NET
- KT0205 Databases (SQL or NoSQL)
- KT0206 Web development technologies

Internal Assessment Criteria and Weight

- IAC0201 A sound knowledge of the basics of programming and software development, including various development languages, databases and web development, is demonstrated

(Weight 7%)

12.2.3 KM-12-KT03 : Future skills and competencies (4IR) 10%

Topic elements to be covered include:

- KT0301 Disruptive thinking (encourage this) (application to their own environment)
- KT0302 Continuously searching for ideas
- KT0303 Thinking innovatively (analyse the current market and come up with solutions to the current problems)
- KT0304 Soft skills
- KT0305 Programming languages
- KT0306 Operating systems
- KT0307 Open source
- KT0308 Tools for a cloud environment (for configuration and management), tools for debugging, login and monitoring and tools for image
- KT0309 Familiarity with Office tools
- KT0310 Leadership and people management skills

Internal Assessment Criteria and Weight

- IAC0301 A sound knowledge of programming languages, operating systems, the cloud environment, Office tools, etc. is demonstrated
- IAC0302 The importance of analytical and innovative thinking within a business ecosystem that encompasses 4IR, is understood
- IAC0303 Soft skills as well as leadership and people management skills are understood and applied

(Weight 10%)

12.2.4 KM-12-KT04 : 4 IR trends affecting businesses 10%

Topic elements to be covered include:

- KT0401 Afro-centric approach to African problems – taking the best from the existing products and coming up with own solutions - Continental challenges and opportunities
- KT0402 Using Google, Amazon and MS forms and tools to reduce development time (e.g., embed AI APIs)
- KT0403 Business intelligence applications and availability of Big Data (collecting data, converting data into information and turning information into knowledge, knowledge into intelligence and intelligence into wisdom)
- KT0404 Collecting data on clients
- KT0405 Insight into different markets
- KT0406 Automated factories

- KT0407 Exposure to the global world

Internal Assessment Criteria and Weight

- IAC0401 The various IR trends affecting businesses are described and understood within an Afro-centric context, taking into account the existing continental challenges and opportunities for development
- IAC0402 Business Intelligence and Big Data are applied and utilized as marketing tool
- IAC0403 Knowledge of automated factories and insight into the different global markets are displayed

(Weight 10%)

12.2.5 KM-12-KT05 : Interpersonal skills 5%

Topic elements to be covered include:

- KT0501 Concept, definition and terminology
- KT0502 Principles
- KT0503 Attributes:
  - Social intelligence
  - Confidentiality
  - Conflict handling and resolution
  - Decision making
  - Defending vs attacking
  - Problem solving, Troubleshooting
  - Respect
  - Roles, responsibilities
  - Thinking about the end-user

Internal Assessment Criteria and Weight

- IAC0501 The following universal soft skills are applied in an IR report: flexibility, communication skills, teamwork, literacy, emotional maturity, decision making and adaptability

(Weight 5%)

12.2.6 KM-12-KT06 : Intrapersonal skills 5%

Topic elements to be covered include:

- KT0601 Concept, definition and terminology
- KT0602 Principles
- KT0603 Attributes:
  - Adaptability
  - Agility
  - Analytical thinking
  - Cognitive thinking skills
  - Emotional maturity
  - Flexibility
  - Planning
  - Problem solving

- Reflection
- Research and investigate
- Self-management
- Strong attention to detail
- Time-management
- Resilience

Internal Assessment Criteria and Weight

- IAC0601 The concept and principles of the intrapersonal skills needed to function effectively within a business ecosystem and with the demands of 4IR in mind, are understood
- IAC0602 The importance of an ability to solve problems through planning, research, investigation, analytical thinking and strong attention to detail, is described
- IAC0603 Effective self-management and time-management are applied

(Weight 5%)

12.2.7 KM-12-KT07 : Communication principles and methods 5%

Topic elements to be covered include:

- KT0701 Concept, definition and terminology
- KT0702 The different types and forms of communication and communication processes
- KT0703 Communication methods
- KT0704 Barriers to communication
- KT0705 Communication network: Interdepartmental, Supply chain network, etc.
- KT0706 Advantages of good communication
- KT0707 Consequences of poor/no communication

Internal Assessment Criteria and Weight

- IAC0701 The basic principles of communication within a business ecosystem are explained
- IAC0702 Types of communication are defined and compared
- IAC0703 Various communication methods and techniques are compared for effectiveness in the workplace
- IAC0704 Communication flow in the workplace is evaluated
- IAC0705 Reporting structures in the workplace are evaluated
- IAC0706 The importance and the role of recording and reporting of data and information are explained

(Weight 5%)

12.2.8 KM-12-KT08 : Written business communication 7%

Topic elements to be covered include:

- KT0801 Business requirement specifications
- KT0802 Types

- KT0803 Conventions
- KT0804 Schedules
- KT0805 Reports, reporting protocols and methods
- KT0806 Manuals and guidelines
- KT0807 Work instructions/briefs
- KT0808 Technical report writing
- KT0809 Extracting information from written texts
- KT0810 Policies aligned to standard (IEEE 829-2008 standards)

Internal Assessment Criteria and Weight

- IAC0801 The purpose of written communication within a business ecosystem is stated
- IAC0802 Effective written communication is evaluated
- IAC0803 Work instructions are interpreted and applied
- IAC0804 The purpose and advantages of communication are described
- IAC0805 Definition and purpose of work instructions are described

(Weight 7%)

12.2.9 KM-12-KT09 : Presentation skills 7%

Topic elements to be covered include:

- KT0901 Concept, definition and terminology
- KT0902 Types: visual, verbal, written
- KT0903 Conventions
- KT0904 Presenting options and solutions
- KT0905 Presenting technical details
- KT0906 Visualisation of business intelligence
- KT0907 Suitable APIs and storytelling using the right tools to:
    - present
    - frame the story
    - focus on certain aspects
    - pitch
    - clear terms
    - pictorial

Internal Assessment Criteria and Weight

- IAC0901 The definition and importance of effective presentation skills are understood
- IAC0902 Effective presentation, either visually, verbally or in written form, is applied
- IAC0903 The technical aspects of and solutions for effective presenting, are described
- IAC0904 Suitable APIs are selected and applied in the form of stories in order to visually present business intelligence within the business

(Weight 7%)

12.2.10 KM-12-KT10 : Teamwork in the workplace 10%

Topic elements to be covered include:

- KT1001 Concept, definition and terminology
- KT1002 Principles of teamwork
- KT1003 Advantages of teamwork
- KT1004 Team composition and members
- KT1005 Roles, responsibilities and functions
- KT1006 Team dynamics
- KT1007 Common goals and collaboration
- KT1008 Nature of multidisciplinary teams and teamwork
- KT1009 Setting and achieving targets
- KT1010 Collaboration tools (electronic)

Internal Assessment Criteria and Weight

- IAC1001 The composition of a team within a business ecosystem is described
- IAC1002 The role of a team and its various members is described
- IAC1003 The contribution of a team to an organisation is evaluated
- IAC1004 The dynamics of a well-functioning team are described
- IAC1005 The influence of different team members on team performance is analysed
- IAC1006 External factors which will impact on teamwork are defined
- IAC1007 Internal factors which will impact on teamwork are defined

(Weight 10%)

12.2.11 KM-12-KT11 : Committees and meetings 5%

Topic elements to be covered include:

- KT1101 Procedures
- KT1102 Agendas and minutes
- KT1103 Roles and responsibilities
- KT1104 WSP committees
- KT1105 EE committees
- KT1106 Safety and health committees
- KT1107 Wellness committees

Internal Assessment Criteria and Weight

- IAC1101 The roles and functions of the various committees are defined
- IAC1102 The purpose and objectives of meetings are defined
- IAC1103 Input on correctness of minutes is constructed

(Weight 5%)

12.2.12 KM-12-KT12 : Job descriptions and profiles 5%

Topic elements to be covered include:

- KT1201 Purpose
- KT1202 Job and person specification
- KT1203 Content
- KT1204 Alignment to performance standards

Internal Assessment Criteria and Weight

- IAC1201 Definition and purpose of a job description are described
- IAC1202 A job description is compiled
- IAC1203 A job profile is compiled

(Weight 5%)

12.2.13 KM-12-KT13 : Customers and stakeholders 7%

Topic elements to be covered include:

- KT1301 Concept, definition and terminology
- KT1302 Types of customers
- KT1303 Customer profile
- KT1304 Typical customer behaviour: including habits and mannerisms
- KT1305 Difficult customers
- KT1306 Customer care
- KT1307 Stakeholder management and participation

Internal Assessment Criteria and Weight

- IAC1301 The importance of knowledge about the various types of customers and stakeholders operating within a business ecosystem, is understood
- IAC1302 Culture, habits and nature of customers and stakeholders are taken into account when interaction with these parties is necessitated

(Weight 7%)

12.2.14 KM-12-KT14 : Customer service 7%

Topic elements to be covered include:

- KT1401 Concept, definition and terminology
- KT1402 Customer service principles
- KT1403 Customer centeredness
- KT1404 Handover and sign-off procedures and techniques

- KT1405 Technical documentation
- KT1406 Training in the use of the system

Internal Assessment Criteria and Weight

- IAC1401 The definition, principles and importance of customer service are understood and described
- IAC1402 Technical aspects of customer service, including sign-off procedures and techniques and knowledge of the system used, are described and applied

(Weight 7%)

12.3 Provider Programme Accreditation Criteria

Physical Requirements:

- The provider must have lesson plans and structured learning material or provide learners with access to structured learning material that addresses all the topics in all the knowledge modules as well as the applied knowledge in the practical skills.
- QCTO/ MICT SETA requirements

Human Resource Requirements:

- Lecturer/learner ratio of 1:20 (Maximum)
- Qualification of lecturer (SME):
    - NQF 5 in industry recognised qualifications with 1 year's relevant experience y
- Assessors and moderators: accredited by the MICT SETA

Legal Requirements:

- Legal (product) licences to use the software for learning and training (where applicable)
- OHS compliance certificate
- Ethical clearance (where necessary)

12.4 Exemptions

- No exemptions, but the module can be achieved in full through a normal RPL process

SECTION 3B: PRACTICAL SKILLS MODULE SPECIFICATIONS

List of Practical Skills Module Specifications

Practical Skills	251201-002-00-PM-01	Mathematics and Statistics for Programming	4	8
Practical Skills	251201-002-00-PM-02	Problem Definition, Analytical Thinking and Decision-Making	4	2
Practical Skills	251201-002-00-PM-03	Access, Analyse and Visualise Structured Data Using Spreadsheets	4	4
Practical Skills	251201-002-00-PM-04	Use SQL to Communicate with a Database	5	4
Practical Skills	251201-002-00-PM-05	Build a simple AI solution using Python	5	8
Practical Skills	251201-002-00-PM-06	Use Python Data Scraping to Populate Database Table in SQL	5	4
Practical Skills	251201-002-00-PM-07	Use Machine Learning to Build an AI solution in Python	5	6
Practical Skills	251201-002-00-PM-08	Use Deep Learning to Build an AI Neural Network Architecture in Python	5	10
Practical Skills	251201-002-00-PM-09	Use Deep Learning to Build an AI Neural Network Architecture in TensorFlow	5	10
Practical Skills	251201-002-00-PM-10	Function Ethically and Effectively as a Member of a Multidisciplinary Team	4	3
Practical Skills	251201-002-00-PM-11	Participate in a Design Thinking for Innovation Workshop	4	4

1. 251201-002-00-PM-01, Mathematics and Statistics for Programming, NQF Level 4, Credits 8

1.1 Purpose of the Practical Skills Module

The focus of the learning in this module is on applying the mathematical and statistical theory learned successfully and to interpret such skills in terms of action for Artificial Intelligence, Machine Learning, Deep Learning and Data Analytics

The learner will be required to:

- PM-01-PS01 : Apply basic mathematics
- PM-01-PS02 : Apply linear algebra
- PM-01-PS03 : Convert decimal into binary systems
- PM-01-PS04 : Express size and magnitude
- PM-01-PS05 : Fix errors in calculations
- PM-01-PS06 : Apply Cartesian coordinate system
- PM-01-PS07 : Apply Pythagorean theorem
- PM-01-PS08 : Use increments
- PM-01-PS09 : Use calculus
- PM-01-PS10 : Use probabilities
- PM-01-PS11 : Apply statistical calculations
- PM-01-PS12 : Apply Bayes' Theorem

1.2 Guidelines for Practical Skills

1.2.1 PM-01-PS01 : Apply basic mathematics

Scope of Practical Skill

Given a demonstration, thereafter suitable problem statements and tasks, the learner must be able to:

- PA0101 Use operator precedence;
  - Order of operations (left to right)
  - Apply PEMDAS (BOMDAS)
- PA0102 Use software for integer division
- PA0103 Use modulus:
  - % application
  - (==) application
  - Use modulus in programming
- PA0104 Mixing Types:
  - Apply an operator
  - Combine with the order of operations
  - Apply the order in which an expression is written
  - Evaluate some expressions that combine types
  - Use casting

Applied Knowledge

- AK0101 The effect of error in calculations

Internal Assessment Criteria

- IAC0101 An ability to apply mathematical thinking to solve a mathematical problem is demonstrated

1.2.2 PM-01-PS02 : Apply linear algebra

Scope of Practical Skill

Given a demonstration, thereafter suitable problem statements and tasks, the learner must be able to:

- PA0201 Apply linear transformation
- PA0202 Apply vectors
    - Vectors
    - Customary behavioural vectors
    - Eigen Vectors
- PA0203 Apply matrices:
    - Use inverse and transports
    - Use special Matrices
- PA0204 Apply matrix operations
- PA0205 Perform special functions using:
    - ReLU
    - Sigmoid
    - SoftMax
    - Popular Loss Functions
    - Cross-entropy
    - Quadratic Loss Functions

Applied Knowledge

- AK0201 The effect of error in calculations

Internal Assessment Criteria

- IAC0201 An ability to apply mathematical thinking to solve a mathematical problem is demonstrated

1.2.3 PM-01-PS03 : Convert decimal into binary systems

Scope of Practical Skill

Given a demonstration, thereafter suitable problem statements and tasks, the learner must be able to:

- PA0301 Perform addition and subtraction of positive whole numbers in binary
- PA0302 Apply binary arithmetic

Applied Knowledge

- AK0301 The effect of error in calculations

Internal Assessment Criteria

- IAC0301 An ability to apply mathematical thinking to solve a mathematical problem is demonstrated

1.2.4 PM-01-PS04 : Express size and magnitude

Scope of Practical Skill

Given a demonstration, thereafter suitable problem statements and tasks, the learner must be able to:

- PA0401 Use scientific notation for small and large numbers

- PA0402 Use prefixes
    - Giga to Pica (10^{9} to 10^{-12})
- PA0403 Use conversions
    - Apply SI to Imperial
    - Apply degrees F to degrees C

Applied Knowledge

- AK0401 The effect of error in calculations

Internal Assessment Criteria

- IAC0401 An ability to apply mathematical thinking to solve a mathematical problem is demonstrated

1.2.5 PM-01-PS05 : Fix errors in calculations

Scope of Practical Skill

Given a demonstration, thereafter suitable problem statements and tasks, the learner must be able to:

- PA0501 Explore repeating decimals and convert them to fraction
- PA0502 Fix prematurely rounding in calculations
- PA0503 Express final value of a calculation in terms of the required unit

Applied Knowledge

- AK0501 The effect of error in calculations

Internal Assessment Criteria

- IAC0501 An ability to apply mathematical thinking to solve a mathematical problem is demonstrated

1.2.6 PM-01-PS06 : Apply Cartesian coordinate system

Scope of Practical Skill

Given a demonstration, thereafter suitable problem statements and tasks, the learner must be able to:

- PA0601 Use the coordinate plane
    - Apply intersecting x- and y-axes
- PA0602 Name using Roman numerals
- PA0603 Use and application to creating graphs and maps

Applied Knowledge

- AK0601 The effect of error in calculations

Internal Assessment Criteria

IAC0601 An ability to apply mathematical thinking to solve a mathematical problem is demonstrated

1.2.7 PM-01-PS07 : Apply Pythagorean theorem

Scope of Practical Skill

Given a demonstration, thereafter suitable problem statements and tasks, the learner must be able to:

- PA0701 Determine the distance between two points on the Cartesian grid

Applied Knowledge

- AK0701 The effect of error in calculations

Internal Assessment Criteria

- IAC0701 An ability to apply mathematical thinking to solve a mathematical problem is demonstrated

1.2.8 PM-01-PS08 : Use increments

Scope of Practical Skill

Given a demonstration, thereafter suitable problem statements and tasks, the learner must be able to:

- PA0801 Use increment variable
- PA0802 Use compound assignment operator
- PA0803 Programme using increments

Applied Knowledge

- AK0801 The effect of error in calculations

Internal Assessment Criteria

- IAC0801 An ability to apply mathematical thinking to solve a mathematical problem is demonstrated

1.2.9 PM-01-PS09 : Use calculus

Scope of Practical Skill

Given a demonstration, thereafter suitable problem statements and tasks, the learner must be able to:

- PA0901 Apply calculus essentials:
    - Use differential calculus
    - Use integral calculus
- PA0902 Apply derivatives:
    - Use derivative and partial derivatives
    - Use chain rule
    - Use derivatives of special functions

Applied Knowledge

- AK0901 The effect of error in calculations

Internal Assessment Criteria

- IAC0901 An ability to apply mathematical thinking to solve a mathematical problem is demonstrated

1.2.10 PM-01-PS10 : Use probabilities

Scope of Practical Skill

Given a demonstration, thereafter suitable problem statements and tasks, the learner must be able to:

- PA1001 Apply probability essentials
- PA1002 Use probability basics and notations
- PA1003 Use probabilities and odds
- PA1004 Apply the Bayes rule
- PA1005 Use naïve Bayes' classification
- PA1006 Estimate parameters
- PA1007 Apply conditional probability

Applied Knowledge

- AK1001 The effect of error in calculations

Internal Assessment Criteria

- IAC1001 An ability to apply mathematical thinking to solve a mathematical problem is demonstrated

1.2.11 PM-01-PS11 : Apply statistical calculations

Scope of Practical Skill

Given a demonstration, thereafter suitable problem statements and tasks, the learner must be able to:

- PA1101 Apply statistics to data
    - Use descriptive statistics
    - Use inferential statistics
- PA1102 Apply qualitative and quantitative research
- PA1103 Apply statistics and Machine Learning:
    - Use statistics in data preparation
    - Outlier detection
    - Missing value imputation
    - Data sampling
    - Data scaling
    - Variable encoding
    - Use statistics in model evaluation
    - Data sampling
    - Data resampling
    - Experimental design
    - Use statistics in model selection
    - Check for a significant difference between results
    - Quantify the size of the difference between results
    - Use statistics in model prediction
    - Summarize the expected skill of the model on average
    - Quantify the expected variability of the skill of the model in practice
    - Use statistics in model presentation
    - Quantify the expected variability for the prediction
- PA1104 Apply Gaussian distribution and descriptive statistics

    - Mean
    - Variance
    - Standard deviation
- PA1105 Apply correlation between variables:
    - Positive Correlation
    - Neutral Correlation
    - Negative Correlation
- PA1106 Use statistical hypothesis tests:
    - Hypothesis 0 (H0)
    - Hypothesis 1 (H1)
- PA1107 Use estimation statistics:
    - Classes of methods
    - Effect size
    - Interval Estimation
    - Meta-Analysis
- PA1108 Use types of intervals:
    - Tolerance Interval
    - Confidence Interval
    - Prediction Interval
- PA1109 Use nonparametric statistics

Applied Knowledge

- AK1101 The effect of error in statistical calculations

Internal Assessment Criteria

- IAC1101 An ability to apply mathematical thinking to solve a statistical problem is demonstrated

1.2.12 PM-01-PS12 : Apply Bayes' Theorem

Scope of Practical Skill

Given a demonstration, thereafter suitable problem statements and tasks, the learner must be able to:

- PA1201 Apply Bayes' theorem
    - Bayes' Theorem of Conditional Probability
    - Calculating Bayes' Theorem
        - Diagnostic test scenario
        - Manual calculation
        - Python code calculation
        - Binary classifier terminology
    - Use Bayes' Theorem for Modelling Hypotheses
    - Use Bayes' Theorem for Classification
        - Bayes'' Classifier
        - Bayes' Optimal Classifier
    - Use Bayes' Theorem in Machine Learning
    - Bayesian optimisation
    - Bayesian belief networks

Applied Knowledge

- AK1201 The effect of error in statistical calculations

Internal Assessment Criteria

- IAC1201 An ability to apply Bayes' Theorem thinking to solve a statistical problem is demonstrated

1.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Valid licenses software and application, including OS.
- Internet connection and hardware availability
- Examples and information specified in the scope statement and all the case studies, scenarios and access to hardware and software implied in the scope statements of the modules.
- Remote learners: Provider must provide business IT simulation system (e.g., invoice processing).

Human Resource Requirements:

- Lecturer/learner ratio of 1:10 (Maximum)
- Qualification of lecturer (SME):
    - NQF 6 industry recognised qualification with 1 year's experience in the IT industry
    - AI vendor certification
- Assessors and moderators: accredited by the MICT SETA

Legal Requirements:

- Legal (product) licences to use the software for learning and training
- OHS compliance certificate
- Ethical clearance (where necessary)

1.4 Exemptions

- No exemptions, but the module can be achieved in full through a normal RPL process

2. 251201-002-00-PM-02, Problem Definition, Analytical Thinking and Decision Making, NQF Level 4, Credits 2

2.1 Purpose of the Practical Skills Module

The focus of the learning in this module is on using the opportunity to apply analytical thinking skills to formulating a problem and use knowledge to design and create a solution for such a problem

The learner will be required to:

- PM-02-PS01 : Apply analytical thinking skills
- PM-02-PS02 : Apply problem solving and critical thinking skills
- PM-02-PS03 : AI Problem Solving

2.2 Guidelines for Practical Skills

2.2.1 PM-02-PS01 : Apply analytical thinking skills

Scope of Practical Skill

Given a demonstration, thereafter suitable problem statements and tasks, the learner must be able to:

- PA0101 Apply analytical thinking skills:
    - Research
    - Forecasting
    - Problem solving
    - Data mining
    - Data and metrics interpreting
    - Reporting
    - Organisation
    - Communication

Applied Knowledge

- AK0101 Analytical thinking

Internal Assessment Criteria

- IAC0101 Required problem is identified and analysed

2.2.2 PM-02-PS02 : Apply problem solving and critical thinking skills

Scope of Practical Skill

Given a demonstration, thereafter suitable problem statements and tasks, the learner must be able to:

- PA0201 Apply Root Cause Analysis (RCA) to a problem statement using appropriate steps:
    - Define the event
    - Identify the problem – 5 Why's
    - Establish a probable cause/s

- Find the root cause
- Test to determine the cause
- Establish a plan to resolve the problem
- Implement a solution
- Verify the functionality
- Implement preventative measures
- Document results

- PA0202 Apply a decision tree analysis to a problem statement using appropriate step

Applied Knowledge

- AK0201 Critical thinking skills

Internal Assessment Criteria

- IAC0201 Required problem is analysed and a plausible solution is found and tested

2.2.3 PM-02-PS03 : AI Problem Solving

Scope of Practical Skill

Given a demonstration, thereafter suitable problem statements and tasks, the learner must be able to:

PA0301 Formulate a real-world problem
PA0302 Search data
PA0303 Solve problems with AI
PA0304 Formulate a simple game tree:

- What is a game tree
- Minimize and maximize
- Strategy
- The value of the root node
- Minimax principle

Applied Knowledge

- AK0301 Problem solving skills

Internal Assessment Criteria

- IAC0301 Required solution to a problem is identified and postulated in hypothesis testing scenarios

2.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Valid licenses for software and applications, including OS.
- Internet connection and hardware availability
- Examples and information specified in the scope statement and all the case studies, scenarios and access to hardware and software implied in the scope statements of the modules.
- Remote learners: Provider must provide business IT simulation system (e.g., invoice processing).

Human Resource Requirements:

- Lecturer/learner ratio of 1:10 (Maximum)

- Qualification of lecturer (SME):
    - NQF 6 industry recognised qualification with 1 year’s experience in the IT industry
    - AI vendor certification
- Assessors and moderators: accredited by the MICT SETA

Legal Requirements:

- Legal (product) licences to use the software for learning and training
- OHS compliance certificate
- Ethical clearance (where necessary)

2.4 Exemptions

- No exemptions, but the module can be achieved in full through a normal RPL process

3. 251201-002-00-PM-03, Access, Analyse and Visualise Structured Data Using Spreadsheets, NQF Level 4, Credits 4

3.1 Purpose of the Practical Skills Module

The focus of the learning in this module is on providing the learner with an opportunity to acquire the skills to use spreadsheets to analyse and visualise data and databases through data processing, analysis and visualisation

The learner will be required to:

- PM-03-PS01 : Source, refine, clean and analyse data
- PM-03-PS02 : Analyse and visualise data using Spreadsheets
- PM-03-PS03 : Analyse and report data presented in a database
- PM-03-PS04 : Use data mining to source and present data
- PM-03-PS05 : Visualising data with AI tools

3.2 Guidelines for Practical Skills

3.2.1 PM-03-PS01 : Source, refine, clean and analyse data

Scope of Practical Skill

Given a suitable set of data and a problem to solve, the learner must be able to:

- PA0101 Source data
- PA0102 Refine data
- PA0103 Identify flaws in data
- PA0104 Apply data wrangling:
    - Import data from different file formats
    - Scrape web
    - Tidy data us using a suitable software
    - Process string (regex)
    - Parse HTML
    - Wrangle data using software
    - Work with dates and times as file format
    - Mine text
- PA0105 Apply data analysis approaches:
    - Descriptive analysis
    - Diagnostic analysis
    - Predictive analysis

Applied Knowledge

- AK0101 Data analysis
- AK0102 Spreadsheet functions and capabilities

Internal Assessment Criteria

IAC0101 Required data is sourced, imported, refined, cleaned and analysed

3.2.2 PM-03-PS02 : Analyse and visualise data using Spreadsheets

Scope of Practical Skill

Given a set of data in Spreadsheets and a problem to solve, the learner must be able to:

- PA0201 Use Spreadsheets to analyse and visualise data:
    - Report using Spreadsheets
        - Create a Spreadsheet report
        - Filter and format data.
        - Create charts
    - Create a Spreadsheet Table
        - Summarize Spreadsheet Data
        - Sort, filter, and validate data.
        - Format summarized data
    - Create Pivot Tables and Pivot Charts
        - Use pivot tables and pivot charts
        - Import data from a CSV file
        - Create a pivot table
        - Edit pivot tables and pivot charts
        - Set up pivot tables
        - Interpret data obtained from a pivot table and communicate it
    - Create a Spreadsheet dashboard
        - Conduct data analysis in spreadsheets pivot tables
        - Arrange tables and charts
        - Slice data
        - Filter data using a slicer.
        - Add calculated columns to a dashboard
        - Find anomalies
    - Create hierarchies and time data
        - Configure time data
        - Create an animated time chart
    - Explore an Spreadsheets data model
        - Add multiple tables
        - Create relationships

        - Add external data
        - Import external data and use it
        - Link out to external data
        - View data within a Spreadsheet table
    - Import data from files
        - Pre-format and import CSV files
        - Import data into spreadsheets
        - Shape and transform data
        - Load data
    - Import data from a database
        - Import data into Spreadsheets from a SQL Server database
        - Identify available data sources
        - Preview, shape, and transform data
        - Table relationships and hierarchies
        - Load data
    - Import data from Spreadsheets reports
        - Import data from Spreadsheet reports
        - Transform Spreadsheet report data
    - Create and Format measures
        - Use advanced functions within DAX
    - Visualize data in Spreadsheets
        - Use pivot charts
        - Use cube functions
        - Use charts for cube functions
        - Create and refine a pivot chart

Applied Knowledge

- AK0201 Data analysis
- AK0202 Spreadsheet functions and capabilities

Internal Assessment Criteria

- IAC0201 Spreadsheets are used containing data backed tables and charts, data are sliced, filtered and calculated and anomalies found

3.2.3 PM-03-PS03 : Analyse and report data presented in a database

Scope of Practical Skill

Given a suitable problem to solve, the learner must be able to:

- PA0301 Apply structure to a database using a database design tool
- PA0302 Use a system to source and collect:
    - Set parameters for data capturing systems and processes
    - Maintain data capturing systems and processes
    - Automate a data collection process
- PA0303 Import and export data
- PA0304 Design and create queries
- PA0305 Analyse data using conditional statements
- PA0306 Report on findings of data

Applied Knowledge

- AK0301 Use a system to source, collect and automate data collection from a database
- AK0302 Report on data findings

Internal Assessment Criteria

- IAC0301 Required database transaction is applied using an appropriate tool

3.2.4 PM-03-PS04 : Use data mining to source and present data

Scope of Practical Skill

Given a suitable problem to solve, a PC or laptop and spreadsheet software, the learner must be able to:

- PA0401 Apply a data mining process using a data mining tool

Applied Knowledge

- AK0401 Purpose and procedure of data mining using a tool

Internal Assessment Criteria

- IAC0401 Required data are mined from the web using appropriate procedure

3.2.5 PM-03-PS05 : Visualising data with AI tools

Scope of Practical Skill

Given a suitable problem to solve, a PC or laptop and spreadsheet software, the learner must be able to:

- PA0501 Display data using AI graphic design

Applied Knowledge

- AK0501 Use AI software to design and display data visually

Internal Assessment Criteria

- IAC0501 Data are visualized using AI design tools

3.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Valid licenses software and application, including OS.
- Internet connection and hardware availability
- Examples and information specified in the scope statement and all the case studies, scenarios and access to hardware and software implied in the scope statements of the modules.
- Remote learners: Provider must provide business IT simulation system (e.g., invoice processing).

Human Resource Requirements:

- Lecturer/learner ratio of 1:10 (Maximum)
- Qualification of lecturer (SME):
    - NQF 6 industry recognised qualification with 1 year's experience in the IT industry
    - AI vendor certification
- Assessors and moderators: accredited by the MICT SETA

Legal Requirements:

- Legal (product) licences to use the software for learning and training
- OHS compliance certificate
- Ethical clearance (where necessary)

3.4 Exemptions

- No exemptions, but the module can be achieved in full through a normal RPL process

4. 251201-002-00-PM-04, Use SQL to Communicate with a Database, NQF Level 5, Credits 4

4.1 Purpose of the Practical Skills Module

The focus of the learning in this module is on providing the learner with an opportunity to display the skills required to use SQL to communicate with a database and to perform a database transaction

The learner will be required to:

- PM-04-PS01 : Apply Structured Query Language (SQL) to perform a database transaction

4.2 Guidelines for Practical Skills

4.2.1 PM-04-PS01 : Apply Structured Query Language (SQL) to perform a database transaction

Scope of Practical Skill

Given a suitable problem to solve, a PC or laptop and spreadsheet software, the learner must be able to:

- PA0101 Apply a SQL code construct to perform database transactions
- PA0102 Store, retrieve, manage or manipulate data inside a relational database management system (RDBMS)

Applied Knowledge

- AK0101 Purpose and procedure of SQL

Internal Assessment Criteria

- IAC0101 Required database transaction is applied using an appropriate tool

4.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Valid licenses software and application, including OS.
- Internet connection and hardware availability
- Examples and information specified in the scope statement and all the case studies, scenarios and access to hardware and software implied in the scope statements of the modules.
- Remote learners: Provider must provide business IT simulation system (e.g., invoice processing).

Human Resource Requirements:

- Lecturer/learner ratio of 1:10 (Maximum)
- Qualification of lecturer (SME):
    - NQF 6 industry recognised qualification with 1 year’s experience in the IT industry
    - AI vendor certification
- Assessors and moderators: accredited by the MICT SETA

Legal Requirements:

- Legal (product) licences to use the software for learning and training

- OHS compliance certificate
- Ethical clearance (where necessary)

4.4 Exemptions

- No exemptions, but the module can be achieved in full through a normal RPL process

5. 251201-002-00-PM-05, Build a simple AI solution using Python, NQF Level 5, Credits 8

5.1 Purpose of the Practical Skills Module

The focus of the learning in this module is on providing the learner with an opportunity to acquire the skills to apply basic programming skills and code to use a software toolkit/platform in the field of study or employment

The learner will be required to:

- PM-05-PS01 : Install Python on a PC
- PM-05-PS02 : Identify a problem
- PM-05-PS03 : Prepare data
- PM-05-PS04 : Choose AI Learning category
- PM-05-PS05 : Train model
- PM-05-PS06 : Select an ML system
- PM-05-PS07 : Run AI implementation

5.2 Guidelines for Practical Skills

5.2.1 PM-05-PS01 : Install Python on a PC

Scope of Practical Skill

Given access to the internet, the learner must be able to:

- PA0101 Install Python on a PC
- PA0102 Learn to navigate on the system

Applied Knowledge

- AK0101 Ability to use Python for AI programming purposes

Internal Assessment Criteria

- IAC0101 A suitable software toolkit/platform/language is installed on a PC

5.2.2 PM-05-PS02 : Identify a problem

Scope of Practical Skill

Given access to a suitable PC or device with software toolkit/platform, the learner must be able to:

- PA0201 Identify a problem to solve through an AI solution
- PA0202 Use a suitable tool to analyse the cause of the problem

Applied Knowledge

- AK0201 Analytical and critical thinking
- AK0202 Problem solving tools

Internal Assessment Criteria

- IAC0201 Required solution to a problem is identified and postulated in hypothesis testing scenarios

5.2.3 PM-05-PS03 : Prepare data

Scope of Practical Skill

Given a suitable problem to solve, the learner must be able to:

- PA0301 Use a system to source data
- PA0302 Analyse data and gain insights using the appropriate algorithms

Applied Knowledge

- AK0301 Use a system to source, collect and automate data collection from a database
- AK0302 Apply algorithms to data

Internal Assessment Criteria

- IAC0301 Required database transaction is applied using an appropriate tool and data are analysed using algorithms

5.2.4 PM-05-PS04 : Choose AI Learning category

Scope of Practical Skill

Given data on a suitable problem to solve, the learner must be able to:

- PA0401 Investigate different type of learning tools
    - Apply supervised learning
    - Apply unsupervised learning
    - Apply reinforcement learning

Applied Knowledge

- AK0401 Use a learning category to apply to AI model

Internal Assessment Criteria

- IAC0401 Required data are analysed and an appropriate learning category is identified

5.2.5 PM-05-PS05 : Train model

Scope of Practical Skill

Given data on a suitable problem to solve and having identified and AI category, the learner must be able to:

- PA0501 Identify a suitable AI model
- PA0502 Train the AI model through mathematical algorithms to solve a problem

Applied Knowledge

- AK0501 Train an AI model to find a solution to a problem using mathematical algorithms

Internal Assessment Criteria

- IAC0501 Required AI model is identified and trained to use mathematical algorithms to solve a problem

5.2.6 PM-05-PS06 : Select an ML system

Scope of Practical Skill

Given access to a suitable PC or device with software toolkit/platform, the learner must be able to:

- PA0601 Identify a suitable ML system
- PA0602 Select a ML system
- PA0603 Use AI to predict an outcome without being programmed to do so

Applied Knowledge

- AK0601 Use an ML system to predict an outcome to a problem without being programmed

Internal Assessment Criteria

- IAC0601 Required ML system is identified and trained to predict an outcome without being programmed to do so

5.2.7 PM-05-PS07 : Run AI implementation

Scope of Practical Skill

Given access to a suitable PC or device with software toolkit/platform, the learner must be able to:

- PA0701 Run an AI solution that solve a problem without being programmed

Applied Knowledge

- AK0701 Successful application of AI solution

Internal Assessment Criteria

IAC0701 AI program is run and is able to provide an outcome without being programmed to do so

5.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Valid licenses software and application, including OS.
- Internet connection and hardware availability
- Examples and information specified in the scope statement and all the case studies, scenarios and access to hardware and software implied in the scope statements of the modules.
- Remote learners: Provider must provide business IT simulation system (e.g., invoice processing).

Human Resource Requirements:

- Lecturer/learner ratio of 1:10 (Maximum)
- Qualification of lecturer (SME):
    - NQF 6 industry recognised qualification with 1 year’s experience in the IT industry
    - AI vendor certification
- Assessors and moderators: accredited by the MICT SETA

Legal Requirements:

- Legal (product) licences to use the software for learning and training
- OHS compliance certificate
- Ethical clearance (where necessary)

5.4 Exemptions

No exemptions, but the module can be achieved in full through a normal RPL process

6. 251201-002-00-PM-06, Use Python Data Scraping to Populate Database Table in SQL, NQF Level 5, Credits 4

6.1 Purpose of the Practical Skills Module

The focus of the learning in this module is on providing the learner with an opportunity to display the skills required to use data scraping to populate a database table in SQL

The learner will be required to:

- PM-06-PS01 : Apply Python to scrape data in a database using Structured Query Language (SQL)

6.2 Guidelines for Practical Skills

6.2.1 PM-06-PS01 : Apply Python to scrape data in a database using Structured Query Language (SQL)

Scope of Practical Skill

Given a suitable problem to solve, a PC or laptop and spreadsheet software, the learner must be able to:

- PA0101 Apply data scraping on a database table in SQL using Python
- PA0102 Store, retrieve, manage or manipulate data inside a SQL database table

Applied Knowledge

- AK0101 Purpose and procedure of SQL

Internal Assessment Criteria

- IAC0101 Required database transaction is applied using an appropriate tool

6.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Valid licenses software and application, including OS.
- Internet connection and hardware availability
- Examples and information specified in the scope statement and all the case studies, scenarios and access to hardware and software implied in the scope statements of the modules.
- Remote learners: Provider must provide business IT simulation system (e.g., invoice processing).

Human Resource Requirements:

- Lecturer/learner ratio of 1:10 (Maximum)
- Qualification of lecturer (SME):
    - NQF 6 industry recognised qualification with 1 year’s experience in the IT industry
    - AI vendor certification
- Assessors and moderators: accredited by the MICT SETA

Legal Requirements:

- Legal (product) licences to use the software for learning and training
- OHS compliance certificate
- Ethical clearance (where necessary)

6.4 Exemptions

No exemptions, but the module can be achieved in full through a normal RPL process

7. 251201-002-00-PM-07, Use Machine Learning to Build an AI solution in Python, NQF Level 5, Credits 6

7.1 Purpose of the Practical Skills Module

The focus of the learning in this module is on providing the learner with an opportunity to acquire the skills to build an AI solution in Python that can solve a real-life problem

The learner will be required to:

- PM-07-PS01 : Identify a problem
- PM-07-PS02 : Prepare data
- PM-07-PS03 : Choose AI Learning category
- PM-07-PS04 : Train model
- PM-07-PS05 : Select an ML system
- PM-07-PS06 : Run AI implementation
- PM-07-PS07 : Turn prototype solution into an economically viable product

7.2 Guidelines for Practical Skills

7.2.1 PM-07-PS01 : Identify a problem

Scope of Practical Skill

Given a typical AI use case and set up environment, the learner must be able to:

- PA0101 Identify a complex problem to solve through an AI solution using a machine learning platform
- PA0102 Use a suitable tool to analyse the cause of the problem
- PA0103 Ask the right questions
- PA0104 Define the objectives
- PA0105 Design a solution
- PA0106 Draw a flow chart

Applied Knowledge

- AK0101 Analytical and critical thinking
- AK0102 Problem solving tools
- AK0103 Clearly define the problem
- AK0104 Clearly express what success means for the AI solution
- AK0105 Clearly express performance standard

Internal Assessment Criteria

- IAC0101 Required solution to a problem is identified and postulated in hypothesis testing scenarios

7.2.2 PM-07-PS02 : Prepare data

Scope of Practical Skill

Given a suitable problem to solve, the learner must be able to:

- PA0201 Use a system to source data
- PA0202 Analyse data and gain insights using the appropriate algorithms
- PA0203 Find patterns in the data
- PA0204 Prepare the data by checking consistency, defining a chronological order, adding labels where necessary
- PA0205 Massage and manipulate data

- PA0206 Split the data into 3 datasets: training, validation and test
- PA0207 Explore the data through analysis techniques

Applied Knowledge

- AK0201 Use a system to source collect and automate data collection from a database
- AK0202 Apply algorithms to data

Internal Assessment Criteria

- IAC0201 Required database transaction is applied using an appropriate tool and data are analysed using algorithms

7.2.3 PM-07-PS03 : Choose AI Learning category

Scope of Practical Skill

Given data on a suitable problem to solve, the learner must be able to:

- PA0301 Investigate different type of learning tools:
  - Apply supervised learning
  - Apply unsupervised learning
  - Apply reinforcement learning
- PA0302 Use Python to create a programme

Applied Knowledge

- AK0301 Use a learning category to apply to AI model

Internal Assessment Criteria

- IAC0301 Required data are analysed and an appropriate learning category is identified

7.2.4 PM-07-PS04 : Train model

Scope of Practical Skill

Given data on a suitable problem to solve and having identified and AI category, the learner must be able to:

- PA0401 Identify a suitable AI model
- PA0402 Choose the algorithm according to supervised, unsupervised and reinforced learning
- PA0403 Train the algorithms
  - Prepare tools
  - Use tools to train and test models for model accuracy according to accepted thresholds
  - Retrain the model and check all steps to ensure model predictability

Applied Knowledge

- AK0401 Different common types of algorithms dependent on the type of learning
- AK0402 Supervised, unsupervised learning and reinforced learning
- AK0403 Train an AI model to find a solution to a problem using mathematical algorithms
- AK0404 Combine large amounts of data with fast, iterative processing and intelligent algorithms to allow the software to learn automatically from patterns or features in the data

Internal Assessment Criteria

- IAC0401 Required AI model is identified and trained to use mathematical algorithms to solve a problem

7.2.5 PM-07-PS05 : Select an ML system

Scope of Practical Skill

Given access to a suitable PC or device with software toolkit/platform/, the learner must be able to:

- PA0501 Identify a suitable ML system
- PA0502 Select a ML system
- PA0503 Use AI to predict an outcome without being programmed to do so
- PA0504 Test and debug the system
- PA0505 Validate the model in comparison with the performance metric

Applied Knowledge

- AK0501 Use an ML system to predict an outcome to a problem without being programmed

Internal Assessment Criteria

- IAC0501 Required ML system is identified and trained to predict an outcome without being programmed to do so

7.2.6 PM-07-PS06 : Run AI implementation

Scope of Practical Skill

Given access to a suitable PC or device with software toolkit/platform, the learner must be able to:

- PA0601 Run an AI solution that solve a problem without being programmed.
- PA0602 Monitor and maintain

Applied Knowledge

- AK0601 Successful application of AI solution

Internal Assessment Criteria

- IAC0601 AI program is run and is able to provide an outcome without being programmed to do so

7.2.7 PM-07-PS07 : Turn prototype solution into an economically viable product

Scope of Practical Skill

Given access to a suitable PC or device with software toolkit/platform, the learner must be able to:

- PA0701 Run an AI solution that solve a problem without being programmed
- PA0702 Monitor and maintain the system
- PA0703 Iterate the steps for the next version
- PA0704 Test with real-world users
- PA0705 Build a production-ready system to productionise the system
- PA0706 Build infrastructure that allows the solution to run live statistical experiments
- PA0707 Run live experiments to launch safely
- PA0708 Identify systems and processes with the potential to be affected by the solution

Applied Knowledge

- AK0701 Importance of validation

Internal Assessment Criteria

- IAC0701 AI program is run and is able to provide viable business solutions to a specific industry or

field

7.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Valid licenses software and application, including OS.
- Internet connection and hardware availability
- Examples and information specified in the scope statement and all the case studies, scenarios and access to hardware and software implied in the scope statements of the modules.
- Remote learners: Provider must provide business IT simulation system (e.g., invoice processing).

Human Resource Requirements:

- Lecturer/learner ratio of 1:10 (Maximum)
- Qualification of lecturer (SME):
    - NQF 6 industry recognised qualification with 1 year's experience in the IT industry
    - AI vendor certification
- Assessors and moderators: accredited by the MICT SETA

Legal Requirements:

- Legal (product) licences to use the software for learning and training
- OHS compliance certificate
- Ethical clearance (where necessary)

7.4 Exemptions

No exemptions, but the module can be achieved in full through a normal RPL process

8. 251201-002-00-PM-08, Use Deep Learning to Build an AI Neural Network Architecture in Python, NQF Level 5, Credits 10

8.1 Purpose of the Practical Skills Module

The focus of the learning in this module is on providing the learner with an opportunity to acquire the skills to build an AI neural network architecture in Python that will solve a real-life problem

The learner will be required to:

- PM-08-PS01 : Identify a problem
- PM-08-PS02 : Prepare data
- PM-08-PS03 : Choose AI Learning category
- PM-08-PS04 : Train model
- PM-08-PS05 : Select an ML system
- PM-08-PS06 : Run AI implementation
- PM-08-PS07 : Turn prototype solution into an economically viable product

8.2 Guidelines for Practical Skills

8.2.1 PM-08-PS01 : Identify a problem

Scope of Practical Skill

Given a typical AI use case and set up environment, the learner must be able to:

- PA0101 Identify a complex problem to solve through an AI solution using a machine learning platform
- PA0102 Use a suitable tool to analyse the cause of the problem
- PA0103 Ask the right questions
- PA0104 Define the objectives
- PA0105 Design a solution
- PA0106 Draw a flow chart

Applied Knowledge

- AK0101 Analytical and critical thinking
- AK0102 Problem solving tools
- AK0103 Clearly define the problem
- AK0104 Clearly express what success means for the AI solution
- AK0105 Clearly express performance standard

Internal Assessment Criteria

- IAC0101 Required solution to a problem is identified and postulated in hypothesis testing scenarios

8.2.2 PM-08-PS02 : Prepare data

Scope of Practical Skill

Given a suitable problem to solve, the learner must be able to:

- PA0201 Use a system to source data
- PA0202 Analyse data and gain insights using the appropriate algorithms
- PA0203 Find patterns in the data
- PA0204 Prepare the data by checking consistency, defining a chronological order, adding labels

where necessary

- PA0205 Massage and manipulate data
- PA0206 Split the data into 3 datasets: training, validation and test
- PA0207 Explore the data through analysis techniques

Applied Knowledge

- AK0201 Use a system to source, collect and automate data from a database
- AK0202 Apply algorithms to data

Internal Assessment Criteria

- IAC0201 Required database transaction is applied using an appropriate tool and data are analysed using algorithms

8.2.3 PM-08-PS03 : Choose AI Learning category

Scope of Practical Skill

Given data on a suitable problem to solve, the learner must be able to:

- PA0301 Investigate different type of learning tools
  - Apply supervised learning
  - Apply unsupervised learning
  - Apply reinforcement learning
- PA0302 Use Python to create a programme

Applied Knowledge

- AK0301 Use a learning category to apply to AI model

Internal Assessment Criteria

- IAC0301 Required data are analysed and an appropriate learning category is identified

8.2.4 PM-08-PS04 : Train model

Scope of Practical Skill

Given data on a suitable problem to solve and having identified and AI category, the learner must be able to:

- PA0401 Identify a suitable AI model
- PA0402 Choose the algorithm according to supervised, unsupervised and reinforced learning
- PA0403 Train the algorithms
  - Prepare tools
  - Use tools to train and test models for model accuracy according to accepted thresholds
  - Retrain the model and check all steps to ensure model predictability

Applied Knowledge

- AK0401 Different common types of algorithms dependent on the type of learning
- AK0402 Supervised, unsupervised and reinforced learning
- AK0403 Train an AI model to find a solution to a problem using mathematical algorithms
- AK0404 Combine large amounts of data with fast, iterative processing and intelligent algorithms to allow the software to learn automatically from patterns or features in the data

Internal Assessment Criteria

IAC0401 Required AI model is identified and trained to use mathematical algorithms to solve a problem

8.2.5 PM-08-PS05 : Select an ML system

Scope of Practical Skill

Given access to a suitable PC or device with software toolkit/platform, the learner must be able to:

- PA0501 Identify a suitable ML system
- PA0502 Select a ML system
- PA0503 Use AI to predict an outcome without being programmed to do so
- PA0504 Test and debug the system
- PA0505 Validate the model in comparison with the performance metric

Applied Knowledge

- AK0501 Use an ML system to predict an outcome to a problem without being programmed

Internal Assessment Criteria

- IAC0501 Required ML system is identified and trained to predict and outcome without being programmed to do so

8.2.6 PM-08-PS06 : Run AI implementation

Scope of Practical Skill

Given access to a suitable PC or device with software toolkit/platform, the learner must be able to:

- PA0601 Run an AI solution that solve a problem without being programmed.
- PA0602 Monitor and maintain

Applied Knowledge

- AK0601 Successful application of AI solution

Internal Assessment Criteria

- IAC0601 AI program run and is able to provide an outcome without being programmed to do so

8.2.7 PM-08-PS07 : Turn prototype solution into an economically viable product

Scope of Practical Skill

Given access to a suitable PC or device with software toolkit/platform/, the learner must be able to:

- PA0701 Run an AI solution that solve a problem without being programmed
- PA0702 Monitor and maintain the system
- PA0703 Iterate the steps for the next version
- PA0704 Test with real-world users
- PA0705 Build a production-ready system to productionise the system
- PA0706 Build infrastructure that allows the solution to run live statistical experiments
- PA0707 Run live experiments to launch safely
- PA0708 Identify systems and processes with the potential to be affected by the solution

Applied Knowledge

- AK0701 Importance of validation

Internal Assessment Criteria

- IAC0701 AI program is run and is able to provide viable business solutions to a specific industry or field

8.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Valid licenses software and application, including OS.
- Internet connection and hardware availability.
- Examples and information specified in the scope statement and all the case studies, scenarios and access to hardware and software implied in the scope statements of the modules.
- Remote learners: Provider must provide business IT simulation system (e.g., invoice processing).

Human Resource Requirements:

- Lecturer/learner ratio of 1:10 (Maximum)
- Qualification of lecturer (SME):
    - NQF 6 industry recognised qualification with 1 year’s experience in the IT industry
    - AI vendor certification
- Assessors and moderators: accredited by the MICT SETA

Legal Requirements:

- Legal (product) licences to use the software for learning and training
- OHS compliance certificate
- Ethical clearance (where necessary)

8.4 Exemptions

No exemptions, but the module can be achieved in full through a normal RPL process

9. 251201-002-00-PM-09, Use Deep Learning to Build an AI Neural Network Architecture in TensorFlow, NQF Level 5, Credits 10

9.1 Purpose of the Practical Skills Module

The focus of the learning in this module is on providing the learner with an opportunity to acquire the skills to build an AI neural network architecture in TensorFlow that will solve a real-life problem

The learner will be required to:

- PM-09-PS01 : Identify a problem
- PM-09-PS02 : Prepare data
- PM-09-PS03 : Choose AI Learning category
- PM-09-PS04 : Train model
- PM-09-PS05 : Select an ML system
- PM-09-PS06 : Run AI implementation
- PM-09-PS07 : Turn prototype solution into an economically viable product

9.2 Guidelines for Practical Skills

9.2.1 PM-09-PS01 : Identify a problem

Scope of Practical Skill

Given a typical AI use case and set up environment, the learner must be able to:

- PA0101 Identify a complex problem to solve through an AI solution using a machine learning platform
- PA0102 Use a suitable tool to analyse the cause of the problem
- PA0103 Ask the right questions
- PA0104 Define the objectives
- PA0105 Design a solution
- PA0106 Draw a flow chart

Applied Knowledge

- AK0101 Analytical and critical thinking
- AK0102 Problem solving tools
- AK0103 Clearly define the problem
- AK0104 Clearly express what success means for the AI solution
- AK0105 Clearly express performance standard

Internal Assessment Criteria

- IAC0101 Required solution to a problem is identified and postulated in hypothesis testing scenarios

9.2.2 PM-09-PS02 : Prepare data

Scope of Practical Skill

Given a suitable problem to solve, the learner must be able to:

- PA0201 Use a system to source data
- PA0202 Analyse data and gain insights using the appropriate algorithms
- PA0203 Find patterns in the data
- PA0204 Prepare the data by checking consistency, defining a chronological order, adding labels where necessary

- PA0205 Massage and manipulate data.
- PA0206 Split the data into 3 datasets: training, validation and test
- PA0207 Explore the data through analysis techniques

Applied Knowledge

- AK0201 Use a system to source, collect and automate data collection from a database
- AK0202 Apply algorithms to data

Internal Assessment Criteria

- IAC0201 Required database transaction is applied using an appropriate tool and data is analysed using algorithms

9.2.3 PM-09-PS03 : Choose AI Learning category

Scope of Practical Skill

Given data on a suitable problem to solve, the learner must be able to:

- PA0301 Investigate different type of learning tools:
  - Apply supervised learning
  - Apply unsupervised learning
  - Apply reinforcement learning
- PA0302 Use TensorFlow to create a programme

Applied Knowledge

- AK0301 Use a learning category to apply to AI model

Internal Assessment Criteria

- IAC0301 Required data are analysed and an appropriate learning category is identified

9.2.4 PM-09-PS04 : Train model

Scope of Practical Skill

Given data on a suitable problem to solve and having identified and AI category, the learner must be able to:

- PA0401 Identify a suitable AI model
- PA0402 Choose the algorithm according to supervised, unsupervised and reinforced learning
- PA0403 Train the algorithms
  - Prepare tools
  - Use tools to train and test models for model accuracy according to accepted thresholds
  - Retrain the model and check all steps to ensure model predictability

Applied Knowledge

- AK0401 Different common types of algorithms dependent on the type of learning
- AK0402 Supervised, unsupervised and reinforced learning
- AK0403 Train an AI model to find a solution to a problem using mathematical algorithms
- AK0404 Combine large amounts of data with fast, iterative processing and intelligent algorithms to allow the software to learn automatically from patterns or features in the data

Internal Assessment Criteria

- IAC0401 Required AI model is identified and trained to use mathematical algorithms to solve a problem

9.2.5 PM-09-PS05 : Select an ML system

Scope of Practical Skill

Given access to a suitable PC or device with software toolkit/platform, the learner must be able to:

- PA0501 Identify a suitable ML system
- PA0502 Select a ML system
- PA0503 Use AI to predict an outcome without being programmed to do so
- PA0504 Test and debug the system
- PA0505 Validate the model in comparison with the performance metric

Applied Knowledge

- AK0501 Use an ML system to predict an outcome to a problem without being programmed

Internal Assessment Criteria

- IAC0501 Required ML system is identified and trained to predict an outcome without being programmed to do so

9.2.6 PM-09-PS06 : Run AI implementation

Scope of Practical Skill

Given access to a suitable PC or device with software toolkit/platform, the learner must be able to:

- PA0601 Run an AI solution that solve a problem without being programmed
- PA0602 Monitor and maintain

Applied Knowledge

- AK0601 Successful application of AI solution

Internal Assessment Criteria

- IAC0601 AI program is run and is able to provide and outcome without being programmed to do so

9.2.7 PM-09-PS07 : Turn prototype solution into an economically viable product

Scope of Practical Skill

Given access to a suitable PC or device with software toolkit/platform, the learner must be able to:

- PA0701 Run an AI solution that solve a problem without being programmed
- PA0702 Monitor and maintain the system
- PA0703 Iterate the steps for the next version
- PA0704 Test with real-world users
- PA0705 Build a production-ready system to productionise the system
- PA0706 Build infrastructure that allows the solution to run live statistical experiments
- PA0707 Run live experiments to launch safely
- PA0708 Identify systems and processes with the potential to be affected by the solution

Applied Knowledge

- AK0701 Importance of validation

Internal Assessment Criteria

- IAC0701 AI program is run and is able to provide viable business solutions to a specific industry or

field

9.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Valid licenses software and application, including OS.
- Internet connection and hardware availability
- Examples and information specified in the scope statement and all the case studies, scenarios and access to hardware and software implied in the scope statements of the modules.
- Remote learners: Provider must provide business IT simulation system (e.g., invoice processing).

Human Resource Requirements:

- Lecturer/learner ratio of 1:10 (Maximum)
- Qualification of lecturer (SME):
    - NQF 6 industry recognised qualification with 1 year's experience in the IT industry
    - AI vendor certification
- Assessors and moderators: accredited by the MICT SETA

Legal Requirements:

- Legal (product) licences to use the software for learning and training
- OHS compliance certificate
- Ethical clearance (where necessary)

9.4 Exemptions

No exemptions, but the module can be achieved in full through a normal RPL process

10. 251201-002-00-PM-10, Function Ethically and Effectively as a Member of a Multidisciplinary Team, NQF Level 4, Credits 3

10.1 Purpose of the Practical Skills Module

The focus of the learning in this module is on providing the learner with an opportunity to acquire the skills to function ethically and effectively in the workplace

The learner will be required to:

- PM-10-PS01 : Present information to an audience
- PM-10-PS02 : Conduct basic research (gather and explore data and information) on 4IR skills and application opportunities in the workplace
- PM-10-PS03 : Ensure compliance with the code of conduct and governance in the workplace
- PM-10-PS04 : Collaborate with team members in the workplace
- PM-10-PS05 : Attend and participate in meetings

10.2 Guidelines for Practical Skills

10.2.1 PM-10-PS01 : Present information to an audience

Scope of Practical Skill

Given information on an audience and presentation tools, the learner must be able to:

- PA0101 Analyse the audience and research if needed
- PA0102 Select a topic
- PA0103 Define the objective and conduct research on the topic or gather information from an available source
- PA0104 Prepare the content and body of the presentation
- PA0105 Visualise the content using suitable technology
- PA0106 Decide on the method of presentation e.g., storytelling
- PA0107 Prepare the introduction and conclusion
- PA0108 Prepare for the presentation
- PA0109 Adapt presentation style to the audience and reaction of the audience
- PA0110 Speak from memory, from notes and from text

Applied Knowledge

- AK0101 Presentation principles
- AK0102 Presentation methods and techniques
- AK0103 Presentation technologies appropriate to the information

Internal Assessment Criteria

- IAC0101 Information is presented using tools, techniques and presentation methods appropriate to the audience

10.2.2 PM-10-PS02 : Conduct basic research (gather and explore data and information) on 4IR skills and application opportunities in the workplace

Scope of Practical Skill

Given access to the internet, the learner must be able to:

- PA0201 Gather and explore information on technologies such as Google, Amazon and MS and identify opportunities to use these tools to improve or reduce development time (e.g., embed AI APIs)
- PA0202 Gather and explore information on business intelligence (BI) applications and availability of Big Data (collecting data, converting data into information and turning information into knowledge, knowledge into intelligence and intelligence into wisdom)

Applied Knowledge

- AK0201 4IR technologies
- AK0202 Impact of 4IR on businesses and individuals

Internal Assessment Criteria

- IAC0201 The application of future skills and competencies in the workplace is researched and opportunities to adapt to the requirements of 4IR are identified

10.2.3 PM-10-PS03 : Ensure compliance with the code of conduct and governance in the workplace

Scope of Practical Skill

Given legislation, industry norms and standards and company policy on governance and code of conduct, the learner must be able to:

- PA0301 Compare company policy with legislation, industry norms and standards to identify any shortfalls or opportunities for improvement
- PA0302 Compare code of conduct with the policy and identify any shortfalls or opportunities for improvement
- PA0303 Compare IT procedures with policy and code of conduct and identify any shortfalls or opportunities for improvement

Applied Knowledge

- AK0301 Ethics: concept and principles
- AK0302 Function of governance
- AK0303 Compliance vs non-compliance

Internal Assessment Criteria

- IAC0301 Company governance policy and procedures are assessed for compliance with legislation and industry norms and standard.

10.2.4 PM-10-PS04 : Collaborate with team members in the workplace

Scope of Practical Skill

Given access to a communication tool (e.g., Agile) and team members, the learner must be able to:

- PA0401 Use technology to communicate and report on progress
- PA0402 Actively collaborate with team members to achieve shared goals
- PA0403 Resolve conflict (if it occurs) using conflict resolutions and other interpersonal skills
- PA0404 Apply time management skills and problem-solving skills
- PA0405 Achieve goals timeously in support of team goals

Applied Knowledge

- AK0401 Reporting and communication technology

Internal Assessment Criteria

- IAC0401 Management and team members are informed about progress through communication and reporting
- IAC0402 Interpersonal and intrapersonal skills are applied to achieve own and team goals

10.2.5 PM-10-PS05 : Attend and participate in meetings

Scope of Practical Skill

Given role-play on meetings, the learner must be able to:

- PA0501 Apply meeting procedures
- PA0502 Prepare the agenda for the meeting
- PA0503 Take notes during the meeting and produce minutes of the meeting
- PA0504 Participate and contribute to the discussions in the meeting

Applied Knowledge

- AK0501 Meeting procedures

Internal Assessment Criteria

- IAC0501 Meeting procedures are observed
- IAC0502 Documentation (agenda and minutes) is produced which gives an accurate representation of the agreements

10.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Valid licenses software and application, including OS.
- Internet connection and hardware availability.
- Examples and information specified in the scope statement and all the case studies, scenarios and access to hardware and software implied in the scope statements of the modules.
- Remote learners: Provider must provide business IT simulation system (e.g., invoice processing).

Human Resource Requirements:

- Lecturer/learner ratio of 1:10 (Maximum)
- Qualification of lecturer (SME):
    - NQF 5 industry recognised qualification with 1 year’s relevant experience
- Assessors and moderators: accredited by the MICT SETA

Legal Requirements:

- Legal (product) licences to use the software for learning and training
- OHS compliance certificate
- Ethical clearance (where necessary)

10.4 Exemptions

No exemptions, but the module can be achieved in full through a normal RPL process

11. 251201-002-00-PM-11, Participate in a Design Thinking for Innovation Workshop, NQF Level 4, Credits 4

11.1 Purpose of the Practical Skills Module

The focus of the learning in this module is on providing the learner with an opportunity to acquire the skills to participate in a design thinking intervention, apply design thinking methodologies and look for opportunities to apply the same methodology in world-of-work and personal life

The learner will be required to:

- PM-11-PS01 : Collaborate with team members to apply innovative and problem-solving strategies
- PM-11-PS02 : Apply design thinking process to solve a problem creatively and innovatively

11.2 Guidelines for Practical Skills

11.2.1 PM-11-PS01 : Collaborate with team members to apply innovative and problem-solving strategies

Scope of Practical Skill

Given access to a Design Thinking workshop with multidisciplinary team members, the learner must be able to:

- PA0101 Interact and collaborate with team members
- PA0102 Engage in dialogues as required by the process
- PA0103 Participate in the activities as presented by the facilitator
- PA0104 Actively contribute to the discussions and activities.

Applied Knowledge

- AK0101 Design Thinking as a solution-based approach to solving problems

Internal Assessment Criteria

- IAC0101 The ability to collaborate with team members towards a joint goal is demonstrated

11.2.2 PM-11-PS02 : Apply design thinking process to solve a problem creatively and innovatively

Scope of Practical Skill

Given access to a Design Thinking workshop with multidisciplinary team members and techniques and equipment, the learner must be able to:

- PA0201 Empathise with users/customers by setting aside own assumptions and formulate real insights about the user
- PA0202 Define the problem statement and create a point-of-view statement, indicating a specific user, a need and an insight
- PA0203 Ideate by challenging assumptions and creating ideas for innovative solutions to help resolve the challenges and needs
- PA0204 Prototype workable ideas
- PA0205 Test the solution applying a reiterative process and using various techniques

Applied Knowledge

- AK0201 Involving five phases: Empathize, Define, Ideate, Prototype and Test

Internal Assessment Criteria

- IAC0201 The ability to participate in the design thinking phases is demonstrated
- IAC0202 Skills are used to understand users, challenge assumptions, redefine problems and create innovative solutions to prototype and test an innovative and creative solution

11.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Valid licenses software and application, including OS.
- Internet connection and hardware availability.
- Examples and information specified in the scope statement and all the case studies, scenarios and access to hardware and software implied in the scope statements of the modules.
- Remote learners: Provider must provide business IT simulation system (e.g., invoice processing).

Human Resource Requirements:

- Lecturer/learner ratio of 1:10 (Maximum)
- Qualification of lecturer (SME):
    - NQF 5 industry recognised qualification with 1 year's relevant experience
- Assessors and moderators: accredited by the MICT SETA

Legal Requirements:

- Legal (product) licences to use the software for learning and training
- OHS compliance certificate
- Ethical clearance (where necessary)

11.4 Exemptions

- No exemptions, but the module can be achieved in full through a normal RPL process

SECTION 3C: WORK EXPERIENCE MODULE SPECIFICATIONS

List of Work Experience Module Specifications

Work Experience	251201-002-00-WM-01	AI Solution Design Interpretation and Development	5	20
Work Experience	251201-002-00-WM-02	AI Solution Performance Testing	5	20
Work Experience	251201-002-00-WM-03	AI Solution Deployment, Modification and Improvement	5	20

1. 251201-002-00-WM-01, AI Solution Design Interpretation and Development, NQF Level 5, Credits 20

1.1 Purpose of the Work Experience Module

The focus of the work experience is on providing the learner with an opportunity to interpret a real-life world problem and build AI solutions which are more sensitive to user behaviour and changes in their environments

The learner will be required to:

- WM-01-WE01 : Attend induction program and familiarise self with company processes, procedures, tools and culture
- WM-01-WE02 : Scrape data using a suitable tool e.g., SQL
- WM-01-WE03 : Review existing AI solutions
- WM-01-WE04 : Analyse the SDD for the AI solution and prepare the technical design documentation
- WM-01-WE05 : Scrape and analyse data for application
- WM-01-WE06 : Develop smarter, friendlier and more sensitive AI solutions in accordance with the design documents and company quality standards, applying best practices

1.2 Guidelines for Work Experience

1.2.1. WM-01-WE01: Attend induction program and familiarise self with company processes, procedures, tools and culture

Scope of Work Experience

The person will be expected to engage in the following work activities:

- Attend induction program and familiarise self with the culture of the company
- Apply protocols and work etiquette
- Attend company specific information sharing sessions (e.g., standing meetings, toolbox talks, power hours, etc.)
- Familiarise self with and apply “working from anywhere” protocols
- Comply with governance protocols and code of ethics of the company and ensure legal compliance by adhering to legal requirements (incl. but not limited to privacy, confidentiality, security of data, etc.)
- Spend time in the various departments of the company, observe process flows and compile wire diagrams or workflow of the processes observed using suitable tools
- Understand the change management process when taking the change into the production system
- Manage timesheets and apply self-management skills
- Analyse workflow diagram which describes the business process and validate whether the thinking was correct

- Collaborate with team members to achieve common and individual goals

Supporting Evidence

- Attendance register
- Wire diagrams or workflows

1.2.2. WM-01-WE02: Scrape data using a suitable tool e.g., SQL

Scope of Work Experience

The person will be expected to engage in the following work activities:

- Identify source and destination data
- Find the URL to scrape
- Inspect the page
- Find the data to extract
- Write the code
- Run the code and extract the data
- Store the data in the required format and specified libraries

Supporting Evidence

- Libraries
- Stored data

1.2.3. WM-01-WE03: Review existing AI solutions

Scope of Work Experience

The person will be expected to engage in the following work activities:

- Review AI solutions employed by the organisation
- Analyse and interpret industry specific AI solutions
- Compare solutions and determine gaps, problems and possible solutions
- Investigate programming tools and platforms used by the organisation for AI

Supporting Evidence

- Comments on AI applications, gaps, problems and possible solutions

1.2.4. WM-01-WE04: Analyse the SDD for the AI solution and prepare the technical design documentation

Scope of Work Experience

The person will be expected to engage in the following work activities:

- Analyse the solution design document (SDD) for identification of the process and objects
- Analyse the workflow of the business process and identify the interaction between different components of the AI solution
- Analyse deployment related specifications
- Analyse the impact of AI solution related decisions on business and organization
- Compile the technical design document according to company specifications and update where necessary to incorporate changes according to continuous improvement protocols

Supporting Evidence

- Technical design document for the AI solution design(s)

1.2.5. WM-01-WE05: Scrape and analyse data for application

Scope of Work Experience

The person will be expected to engage in the following work activities:

- Conduct data scraping
- Perform data analysis to understand and identify the types of variables, arrays and dictionaries (since AI bots transform complex, unstructured data sets into organized, automated tasks)

Supporting Evidence

- Data tables

1.2.6. WM-01-WE06: Develop smarter, friendlier and more sensitive AI solutions in accordance with the design documents and company quality standards, applying best practices

Scope of Work Experience

The person will be expected to engage in the following work activities:

- Select suitable tools for the AI solution in accordance with the design documents
- Apply the most suitable algorithms for a machine learning application
- Generate the software code for each component of AI solution using a modular approach so that codes can be reused
- Integrate various modules of the AI solution
- Apply best practices and quality standards during coding to ensure compliance with internal control or audit requirements
- Plan and organise the work to achieve targets and deadlines using Agile or similar methodologies
- Coordinate with cross-functional teams using Agile or similar methodologies

- Document the code and include applicable information
- Apply error handling techniques to achieve accuracy standards of the company. Check the work is complete and free of errors
- Strictly adhere to version control procedures

Supporting Evidence

- AI solution
- Documented code

1.3 Contextualised Workplace Knowledge

1. Organisational policies, procedures and guidelines which relate to building and maintaining AI solutions, communicating data and security configurations.
2. Standard templates, documentation and tools.
3. Business processes and workflows pertaining to the AI solution.
4. Company specific operating systems and AI development tools and platforms.
5. Company specific best practices, quality standards and security protocols.
6. Version control system.

1.4 Criteria for Workplace Approval

Physical Requirements:

- Tools, equipment, systems, e.g.: AI Solution Development, etc.
- Key processes, e.g.: AI design, testing and deployment processes project on the go or completed.

Human Resource Requirements:

- Maximum mentor/learner ratio of 1:3 in the ideal situation
- Supervisor/mentor: 2 years' software development experience

Legal Requirements:

- Legal (product) licences to use software
- OHS compliance certificate
- Ethical clearance (where necessary)

1.5 Additional Assignments to be Assessed Externally

None

2. 251201-002-00-WM-02, AI Solution Performance Testing, NQF Level 5, Credits 20

2.1 Purpose of the Work Experience Module

The focus of the work experience is on providing the learner with an opportunity to problem-solve issues (post-production) that arise in day to day running of AI processes and to provide timely responses and solutions as required.

The learner will be required to:

- WM-02-WE01: Assist with the preparation of test cases for the AI solution
- WM-02-WE02: Take remedial action to address any exception from the desired outcomes
- WM-02-WE03: Resolve workflow incidents related to the AI solution through troubleshooting and fixing bugs

2.2 Guidelines for Work Experience

2.2.1. WM-02-WE01: Assist with the preparation of test cases for the AI solution

Scope of Work Experience

The person will be expected to engage in the following work activities:

- Define the type of testing and testing requirements for the AI solution applying various criteria
- Evaluate and select the best testing tool for a specific purpose
- Search the organization's knowledge base for reusable scenarios, test cases, scripts and tools
- Access, create and modify different types of:
    - test cases
    - automated scripts
    - test data
    - test plans
- Create or modify suitable test cases according to requirements and suitable to specific applications
- Check whether test cases are suitable to be automated and create or modify scripts
- Identify issues that may occur with the testing requirements and address
- Access or create test data according to the requirements
- Apply procedures to check that the tests are working according to requirements
- Run the simulated test cases

Supporting Evidence

- Test cases

2.2.2. WM-02-WE02: Take remedial action to address any exception from the desired outcomes

Scope of Work Experience

The person will be expected to engage in the following work activities:

- Identify inconsistencies with desired output
- Analyse outcomes and apply findings to improve test cases
- Continue the debugging and logging processes until the AI solution runs without errors
- Compile documentation on the tests or simulations

Supporting Evidence

- Reports on error handling activities (debugging and logging)
- Documentation on tests or simulations

2.2.3. WM-02-WE03: Resolve workflow incidents related to the AI solution through troubleshooting and fixing bugs

Scope of Work Experience

The person will be expected to engage in the following work activities:

- Log the incident using the company system
- Analyse the error and determine the cause, e.g., the tool, the AI solution or application
- Debug the code using suitable methods
- Identify the line of code where the bug occurred
- Identify the bug type and fix the error in the code
- Analyse logged activities
- Apply problem-solving approaches in different situations
- Continue the debugging and logging processes until the AI solution runs without errors
- Report unresolved issues to AI vendor or other relevant team members

Supporting Evidence

- Reports on error handling activities (debugging and logging)
- Documentation on tests or simulations

2.3 Contextualised Workplace Knowledge

1. Organisational policies, procedures and guidelines which relate to building and maintaining AI solutions, communicating data and security configurations.
2. Standard templates, documentation and tools.
3. Business processes and workflows pertaining to the AI solution.
4. Team members.
5. Company specific operating systems and AI development tools and platforms.
6. Company specific best practices, quality standards and security protocols.
7. Version control system.
8. Test or simulation tools.
9. Sources of information available for designing tests.
10. Approval process for testing.

2.4 Criteria for Workplace Approval

Physical Requirements:

- Tools, equipment, systems, e.g.: company systems, documents, data, relevant meetings, teams and supervisors, etc.
- Key processes, e.g.: AI design, testing and deployment processes project on the go or completed.

Human Resource Requirements:

- Maximum mentor/learner ratio of 1:3 in the ideal situation
- Supervisor/mentor: 2 years' software development experience

Legal Requirements:

- Legal (product) licences to use software
- OHS compliance certificate
- Ethical clearance (where necessary)

2.5 Additional Assignments to be Assessed Externally

None

3. 251201-002-00-WM-03, AI Solution Deployment, Modification and Improvement, NQF Level 5, Credits 20

3.1 Purpose of the Work Experience Module

The focus of the work experience is on providing the learner with an opportunity to assist with the deployment of AI solutions for business process automation and maintain, modify and improve such solutions.

The learner will be required to:

- WM-03-WE01: Assist the team to deploy the AI solution
- WM-03-WE02: Investigate opportunities for the modification and improvement of the AI solution
- WM-03-WE03: Maintain and update the AI solution to incorporate improvements and changes

3.2 Guidelines for Work Experience

3.2.1. WM-03-WE01: Assist the team to deploy the AI solution

Scope of Work Experience

The person will be expected to engage in the following work activities:

- Schedule times that the bots must run as per design specifications (coding) for unattended robots
- Deploy the solution into the production environment (Go live)
- Update process documentation
- Enable AI users (if necessary), to understand how the automation works and how they should interact with the AI solution (attended robots – human triggers) on business need basis
- Monitor the bot status through auditing logs and dashboards
- Import and export AI solutions

Supporting Evidence

- Reports

3.2.2. WM-03-WE02: Investigate opportunities for the modification and improvement of the AI solution

Scope of Work Experience

The person will be expected to engage in the following work activities:

- Troubleshoot problems and performance of the AI solution
- Investigating and documenting better practices and alternative solutions that could be used in future development (new requirements)
- Update and maintain developer standards (best practice) around AI best practices to adapt due to regulatory and market pressures

- Explore and identify process improvements that can simplify the process and make it more understandable, therefore reducing the necessary programming and auditing effort and improving customer experience

Supporting Evidence

- Reports

3.2.3. WM-03-WE03: Maintain and update the AI solution to incorporate improvements and changes

Scope of Work Experience

The person will be expected to engage in the following work activities:

- Update robotic workflows should the company (client) update its AI software version
- Implement enhancements and introduce updates to already automated processes
- Implement change requests to already automated processes

Supporting Evidence

- Reports

3.3 Contextualised Workplace Knowledge

1. Organisational policies, procedures and guidelines which relate to building and maintaining AI solutions, communicating data and security configurations.
2. Standard templates, documentation and tools.
3. Business processes and workflows pertaining to the AI solution.
4. Team members.
5. Company specific operating systems and AI development tools and platforms.
6. Company specific best practices, quality standards and security protocols.
7. Version control system.
8. Test or simulation tools.
9. Sources of information available for designing tests.
10. Approval process for testing.

3.4 Criteria for Workplace Approval

Physical Requirements:

- Tools, equipment, systems, e.g.: AI Solution Deployment, Modification and Improvement, etc.
- Key processes, e.g.: AI design, testing and deployment processes project on the go or completed.

Human Resource Requirements:

- Maximum mentor/learner ratio of 1:3 in the ideal situation

- Supervisor/mentor: 2 years' software development experience

Legal Requirements:

- Legal (product) licences to use software
- OHS compliance certificate
- Ethical clearance (where necessary)

3.5 Additional Assignments to be Assessed Externally

None

SOURCES CONSULTED:

https://blog.global.fujitsu.com/fgb/2020-05-14/how-to-build-the-right-data-architecture-for-a-data-driven-transformation/

https://executive-education-online.mit.edu/presentations/info/mit-artificial-intelligence-online-short-course

https://mitwpu.edu.in/pg-diploma-artificial-intelligence-and-machine-learning/

https://study.com/articles/artificial_intelligence_programmer_job_description_salary.html

https://towardsdatascience.com/machine-learning-basics-part-1-a36d38c7916

https://www.cimtcollege.com/cimt/programs/pg-diploma-in-artificial-intelligence-and-machine-learning.aspx

https://www.cloudcredential.org/product/artificial-intelligence-ai-foundation/

https://www.computersciencedegreehub.com/faq/skills-job-artificial-intelligence/

https://www.lambtoncollege.ca/custom/LambtonApps/Programs/International.aspx?id=2147524849&type=PI&location=Toronto

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https://www.lewagon.com/tech-jobs/data-science/ai-developer

https://www.toolbox.com/tech/artificial-intelligence/tech-101/ai-job-roles-how-to-become-a-data-scientist-ai-developer-or-machine-learning-engineer/

STATEMENT OF WORK EXPERIENCE:

251201001-WM-01, AI Solution Design Interpretation and Development, NQF Level 5, Credits 20

WM-01-WE01	Attend induction program and familiarise self with company processes, procedures, tools and culture		
	Scope of Work Experience	Date	Signature
WA0101	Attend induction program and familiarise self with the culture of the company.		
WA0102	Apply protocols and work etiquette.		
WA0103	Attend company specific information sharing sessions (e.g. standing meetings, toolbox talks, power hours, etc.)		
WA0104	Familiarise self with and apply “working from anywhere” protocols.		
WA0105	Comply with governance protocols and code of ethics of the company and ensure legal compliance by adhering to legal requirements (incl. but not limited to privacy, confidentiality, security of data, etc.).		
WA0106	Spend time in the various departments of the company, observe process flows and compile wire diagrams or workflow of the processes observed using suitable tools.		
WA0107	Understand the change management process when taking the change into the production system.		
WA0108	Manage timesheets and apply self-management skills.		
WA0109	Analyse workflow diagram which describes the business process and validate whether the thinking was correct.		
WA0110	Collaborate with team members to achieve common and individual goals		

	Supporting Evidence	Date	Signature
SE0101	Attendance register		
SE0102	Wire diagrams or workflows		
WM-01-WE02	Scrape data using a suitable tool e.g. SQL		
	Scope of Work Experience	Date	Signature
WA0201	Identify source and destination data.		
WA0202	Find the URL to scrape		
WA0203	Inspect the page		
WA0204	Find the data to extract		
WA0205	Write the code		
WA0206	Run the code and extract the data		
WA0207	Store the data in the required format and specified libraries		
	Supporting Evidence	Date	Signature
SE0201	Libraries		
SE0202	Stored data		
WM-01-WE03	Review existing AI solutions		
	Scope of Work Experience	Date	Signature
WA0301	Review AI solutions employed by the organisation		
WA0302	Analyse and interpret industry specific AI solutions.		
WA0303	Compare solutions and determine gaps, problems and possible solutions.		
WA0304	Investigate programming tools and platforms used		

	by the organisation for AI.		
	Supporting Evidence	Date	Signature
SE0301	Comments on AI applications, gaps, problems and possible solutions		
WM-01-WE04	Analyse the SDD for the AI solution and prepare the technical design documentation		
	Scope of Work Experience	Date	Signature
WA0401	Analyse the solution design document (SDD) for identification of the process and objects.		
WA0402	Analyse the workflow of the business process and identify the interaction between different components of the AI solution.		
WA0403	Analyse deployment related specifications.		
WA0404	Analyse the impact of AI solution related decisions on business and organization.		
WA0405	Compile the technical design document according to company specifications and update where necessary to incorporate changes according to continuous improvement protocols.		
	Supporting Evidence	Date	Signature
SE0401	Technical design document for the AI solution design(s)		
WM-01-WE05	Scrape and analyse data for application		
	Scope of Work Experience	Date	Signature
WA0501	Conduct data scraping		
WA0502	Perform data analysis to understand and identify the types of variables, arrays and dictionaries (since AI bots transform complex, unstructured data sets into organized, automated tasks)		

	Supporting Evidence	Date	Signature
SE0501	Data tables		
WM-01-WE06	Develop smarter, friendlier and more sensitive AI solutions in accordance with the design documents and company quality standards applying best practices		
	Scope of Work Experience	Date	Signature
WA0601	Select suitable tools for the AI solution in accordance with the design documents.		
WA0602	Apply the most suitable algorithms for a machine learning application.		
WA0603	Generate the software code for each component of AI solution using a modular approach so that codes can be reused.		
WA0604	Integrate various modules of the AI solution.		
WA0605	Apply best practices and quality standards during coding to ensure compliance with internal control or audit requirements.		
WA0606	Plan and organise the work to achieve targets and deadlines using Agile or similar methodologies.		
WA0607	Coordinate with cross-functional teams using Agile or similar methodologies.		
WA0608	Document the code and include applicable information.		
WA0609	Apply error handling techniques to achieve accuracy standards of the company. Check the work is complete and free from errors.		
WA0610	Strictly adhere to version control procedures.		
	Supporting Evidence	Date	Signature
SE0601	AI solution		
SE0602	Documented code		

	Contextualised Workplace Knowledge	Date	Signature

	Additional Assignments to be Assessed Externally	Date	Signature

251201001-WM-02, AI Solution Performance Testing, NQF Level 5, Credits 20

WM-02-WE01	Assist with the preparation of test cases for the AI solution		
	Scope of Work Experience	Date	Signature
WA0101	Define the type of testing and testing requirements for the AI solution applying various criteria.		
WA0102	Evaluate and select the best testing tool for a specific purpose.		
WA0103	Search the organization’s knowledge base for reusable scenarios, test cases, scripts and tools.		
WA0104	Access, create and modify different types of:		
	test cases		
	automated scripts		
	test data		
	test plans		
WA0105	Create or modify suitable test cases according to requirements and suitable to specific applications.		
WA0106	Check whether test cases are suitable to be automated and create or modify scripts.		
WA0107	Identify issues that may occur with the testing		

	requirements and address.		
WA0108	Access or create test data according to the requirements.		
WA0109	Apply procedures to check the tests are working according to requirements.		
WA0110	Run the simulated test cases.		
	Supporting Evidence	Date	Signature
SE0101	Test cases		
WM-02-WE02	Take remedial action to address any exception from the desired outcomes		
	Scope of Work Experience	Date	Signature
WA0201	Identify inconsistencies with desired output.		
WA0202	Analyse outcomes and apply findings to improve test cases.		
WA0203	Continue the debugging and logging processes until the AI solution runs without errors.		
WA0204	Compile documentation on the tests or simulations.		
	Supporting Evidence	Date	Signature
SE0201	Reports on error handling activities (debugging and logging)		
SE0202	Documentation on tests or simulations		
WM-02-WE03	Resolve workflow incidents related to the AI solution through troubleshooting and fixing bugs		
	Scope of Work Experience	Date	Signature
WA0301	Log the incident using the company system.		
WA0302	Analyse the error and determine the cause, e.g. the tool, the AI solution or application.		

WA0303	Debug the code using suitable methods.		
WA0304	Identify the line of code where the bug occurred.		
WA0305	Identify the bug type and fix the error in the code.		
WA0306	Analyse logged activities.		
WA0307	Apply problem-solving approaches in different situations.		
WA0308	Continue the debugging and logging processes until the AI solution runs without errors.		
WA0309	Report unresolved issues to AI vendor or other relevant team members		
	Supporting Evidence	Date	Signature
SE0301	Reports on error handling activities (debugging and logging)		
SE0302	Documentation on tests or simulations		

	Contextualised Workplace Knowledge	Date	Signature

	Additional Assignments to be Assessed Externally	Date	Signature

251201001-WM-03, AI Solution Deployment, Modification and Improvement, NQF Level 5, Credits 20

WM-03-WE01	Assist the team to deploy the AI solution		
	Scope of Work Experience	Date	Signature

WA0101	Schedule times that the bots must run as per design specifications (coding) for unattended robots		
WA0102	Deploy the solution into the production environment (Go live)		
WA0103	Update process documentation		
WA0104	Enable AI users (if necessary), to understand how the automation works and how they should interact with the AI solution (attended robots – human triggers) on business need basis		
WA0105	Monitor the bot status through auditing logs and dashboards		
WA0106	Import and export AI solutions		
	Supporting Evidence	Date	Signature
SE0101	Reports		
WM-03-WE02	Investigate opportunities for the modification and improvement of the AI solution		
	Scope of Work Experience	Date	Signature
WA0201	Troubleshoot problems and performance of the AI solution		
	Investigating and documenting better practices and alternative solutions that could be used in future development (new requirements)		
	Update and maintain developer standards (best practice) around AI best practices to adapt due to regulatory and market pressures		
	Explore and identify process improvements that can simplify the process, make it more understandable, therefore reducing the necessary programming and auditing effort and improving customer experience		
	Supporting Evidence	Date	Signature

SE0201	Reports		
WM-03-WE03	Maintain and update the AI solution to incorporate improvements and changes		
	Scope of Work Experience	Date	Signature
WA0301	Update robotic workflows should the company (client) update its AI software version		
WA0302	Implement enhancements and introduce updates to already automated processes		
WA0303	Implement change requests to already automated processes		
	Supporting Evidence	Date	Signature
SE0301	Reports		

	Contextualised Workplace Knowledge	Date	Signature

	Additional Assignments to be Assessed Externally	Date	Signature