

# Government Gazette Staatskoerant

REPUBLIC OF SOUTH AFRICA  
REPUBLIEK VAN SUID-AFRIKA

Vol. 519

Pretoria, 22 September 2008

**No. 31430**

---

**CONTENTS • INHOUD**

*No.* *Page* *Gazette*  
*No.* *No.*

**GOVERNMENT NOTICES****South African Qualifications Authority***Government Notices*

987	National Standards Bodies Regulations: Standards Generating Body (SGB) for Geographical Information Sciences	3	31430
988	do.: Standards Generating Body (SGB) for Electrical Engineering and Construction.....	40	31430
989	do.: Task Team for Computer Sciences and Information Systems.....	87	31430
990	do.: Task Team for Electronics.....	106	31430

---

---

**GOVERNMENT NOTICES**

---

**SOUTH AFRICAN QUALIFICATIONS AUTHORITY****No. 987****22 September 2008****SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)**

In accordance with Regulation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the Standards Generating Body (SGB) for

**Geographical Information Sciences**

registered by Organising Field 12, Physical Planning and Construction, publishes the following Qualification and Unit Standards for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purpose of the Qualification and Unit Standards. The full Qualification and Unit Standards can be accessed via the SAQA web-site at [www.saqqa.org.za](http://www.saqqa.org.za). Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, SAQA House, 1067 Arcadia Street, Hatfield, Pretoria.

Comment on the Qualification and Unit Standards should reach SAQA at the address below and **no later 22 October 2008**. All correspondence should be marked **Standards Setting – Geographical Information Sciences** addressed to

The Director: Standards Setting and Development  
SAQA

*Attention: Mr. D. Mphuthing*

Postnet Suite 248

Private Bag X06

Waterkloof

0145

or faxed to 012 – 431-5144

e-mail: [dmphuthing@saqa.org.za](mailto:dmphuthing@saqa.org.za)

**DR S BHIKHA**

**DIRECTOR: STANDARDS SETTING AND DEVELOPMENT**


**SOUTH AFRICAN QUALIFICATIONS AUTHORITY**
**QUALIFICATION:  
Bachelor of Geographical Information Science (GISc)**

<b>SAQA QUAL ID</b>	<b>QUALIFICATION TITLE</b>		
63711	Bachelor of Geographical Information Science (GISc)		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Geographical Information Sciences			
<b>QUALIFICATION TYPE</b>	<b>FIELD</b>	<b>SUBFIELD</b>	
Professional Qualification	12 - Physical Planning and Construction	Physical Planning, Design and Management	
<b>ABET BAND</b>	<b>MINIMUM CREDITS</b>	<b>NQF LEVEL</b>	<b>QUAL CLASS</b>
Undefined	480	Level 7	Regular-Unit Stds Based

***This qualification does not replace any other qualification and is not replaced by another qualification.***

**PURPOSE AND RATIONALE OF THE QUALIFICATION**

Purpose:

This qualification has been developed for the Geographical Information Science (GISc) occupational area. It aims, through a planned combination of unit standards, to equip learners with skills and knowledge to independently undertake advanced GISc related tasks and duties in an operational and consultation environment, by applying spatial theories and methodologies in different forms to achieve required outcomes.

This qualification has been developed to assist with professional advancement within the GISc industry. This will allow learners to register as a Professional Practitioner in the Geo-information science field and lay a foundation for future career advancement in this learning area.

On achieving this qualification a learner will be able to:

- > Manage the collection and capturing of data from various formats and sources.
- > Manage the analysis and visualisation of data to meet the stated requirement.
- > Manage, design and implement a database to store the required data sets.
- > Operate effectively as a Professional GISc Practitioner in a professional practise.
- > Complete a significant study/research that addresses successfully a particular research problem in any study area of the GISc field.

Rationale:

There is a high demand for learners who are able to apply their competence within the parameters of the legislative framework regulating the GISc profession and formal recognition at this level is beneficial to learners, the industry and society in the order of sustainable employment, increased productivity levels and the health and safety of communities.

This Qualification is based on a combination of unit standards as well as research work will allow learners to enter the occupational area as Geographical Information Systems (GIS) Professionals and to reach full potential of advancement in addition, allow for the recognition of prior learning.

This Qualification represents a planned combination of learning outcomes with a defined purpose in that they consist of the essential theory and applied competence required by the GISc profession and those learners who seek to be recognised by the profession for formal qualifications and registration as a professional GISc practitioner.

This Qualification is aimed at resources in the industry that want to gain progressive accumulation of knowledge, skills and competence exceeding that offered at B Degree, NQF Level 6. These skills can be used in any application or field that requires GIS or spatial solutions. It can be either an entry-level qualification or an academic progression from a lower level qualification. The qualification can also serve as a building block towards the next level or postgraduate qualification at NQF Level 8. The use of GISc leads to improved decision-making, which results in sustainable development and socio economic stability that will benefit all the people in a specific region or country.

This Qualification is accessible to learners' who are employed within the Construction Industry, new entrants into the world of work.

The learning outcomes are relevant to national and industry skills development needs and learners will be able to transfer their credits from one learning institution and/or employer to another. The development and guidance of learners is conducted by persons who have achieved the level of qualification recognised by the industry for certification and registration as a GISc practitioner.

#### **RECOGNIZE PREVIOUS LEARNING?**

Y

#### **LEARNING ASSUMED IN PLACE**

It is assumed that a learner entering a programme leading to this qualification has achieved a FET Certificate at NQF Level 4 or equivalent with mathematics and physics (science), and is proficient in Communication including writing of technical reports.

#### **Recognition of Prior Learning:**

Any learner with appropriate experience and informal or non-formal training who wish to be assessed may arrange to do so without having to attend further education or training (RPL). The assessor will decide on the most appropriate assessment procedures after discussion with the learner.

#### **Access to the Qualification:**

It is open bearing in mind Learning assumed to be in Place.

#### **QUALIFICATION RULES**

To complete this qualification a learner needs to attain at least 480 credits. The credit allocation in this qualification is broken down into three categories.

#### **Credit Allocation:**

- > Fundamentals: 100 credits at NQF Level 7.
- > Core: 297 credits.
- > Electives: 83 credits (minimum).

Total credits at NQF Level 7 = 288 or 60%.

Learners should pick a group of electives, which in total comprise of at least 83 credits. The variety of unit standards provided under electives will cater for areas of specialisation that the learner/employer may wish to incorporate in the qualification.

#### Fundamental Unit Standards:

A number of fundamental unit standards derived from the key working areas in the industry and which serve as building blocks within the qualification, have been identified for inclusion in this qualification. All the following fundamental unit standards totalling 100 credits are compulsory:

#### Mathematics and Statistics:

Unit Standard ID; Title; Level; Credits:

> ID 12892: Demonstrate an understanding of the use of micro and macro-economic indicators as forecasting and planning tools within the financial markets; Level 7; 18 Credits.

#### Spatial Analysis:

Unit Standard ID; Title; Level; Credits:

> ID 258803: Perform 2.5D vector surface; Level 7; 13 Credits.

> ID 258795: Perform spatial and hybrid queries; Level 7; 12 Credits.

#### Research Methodology:

Unit Standard ID; Title; Level; Credits:

> ID 242915: Apply research methodologies in order to compile in a major research report in a public sector context; Level 7; 12 Credits.

> ID 117434: Conduct research; Level 7; 15 Credits.

> ID 115083: Explore research problems; Level 7; 30 Credits.

#### Core Unit Standards:

A research unit standard have been identified for inclusion in this qualification. This unit standard refer to compulsory learning required in situations contextually relevant to this particular occupational environment and is included in the key working area listed below. All the following core unit standards totalling 297 credits are compulsory:

#### Geography Literacy:

Unit Standard ID; Title; Level; Credits:

> ID 258657: Demonstrate an understanding of the context of GI Science; Level 6; 4 Credits.

#### Mathematics and Statistics:

Unit Standard ID; Title; Level; Credits:

> ID 115448: Understand and apply statistical techniques for business and research applications; Level 6; 18 Credits.

#### Data Exchange:

## Unit Standard ID; Title; Level; Credits:

- > ID 258775: Understand spatial data transfer protocols; Level 6; 3 Credits.
- > ID 258758: Collect and capture metadata for spatial data; Level 6; 7 Credits.

## Data Capture:

## Unit Standard ID; Title; Level; Credits:

- > ID 258804: Understand issues that influence the quality of data; Level 7; 6 Credits.
- > ID 258800: Demonstrate a thorough knowledge of GPS technology; Level 7; 15 Credits.
- > ID 258778: Understand and manage data errors in relation to spatial data; Level 6; 4 Credits.
- > ID 258802: Create a standard operating procedure for geo-information data capture; Level 7; 15 Credits.

## Data Manipulation:

## Unit Standard ID; Title; Level; Credits:

- > ID 258761: Perform data generalisation and aggregation; Level 7; 5 Credits.
- > ID 258762: Understand concepts and processes of data conversion; Level 6; 8 Credits.
- > ID 258801: Perform life-cycle management of spatio-temporal data; Level 7; 8 Credits.
- > ID 11820: Select a map projection and transform data between projections or ellipsoids; Level 6; 3 Credits.

## Map Production:

## Unit Standard ID; Title; Level; Credits:

- > ID 258797: Develop web sites with advanced mapping functionality; Level 7; 16 Credits.

## Photogrammetry for orthophoto and map production:

## Unit Standard ID; Title; Level; Credits:

- > ID 258661: Demonstrate a basic knowledge and understanding of photogrammetry; Level 6; 8 Credits.
- > ID 258799: Demonstrate an in-depth knowledge and understanding of photogrammetry; Level 7; 12 Credits.

## Databases:

## Unit Standard ID; Title; Level; Credits:

- > ID 258736: Demonstrate an understanding of general database theory; Level 6; 3 Credits.
- > ID 258737: Design and develop a simple database; Level 6; 7 Credits.
- > ID 258777: Use the SQL language to create, modify, query and manage a database application; Level 7; 8 Credits.

## Professional Practice:

## Unit Standard ID; Title; Level; Credits:

- > ID 115348: Oversee the professional execution of daily functions; Level 6; 5 Credits.

- > ID 13070: Evaluate and apply the processes of planning and control as it relates to corporate strategy, budgeting, pricing decision, standard costing and decentralised control; Level 7; 14 Credits.
- > ID 11830: Interpret the Professional and Technical Surveyors` Act, no. 40 of 1984 and the rules framed thereunder; Level 6; 3 Credits.
- > ID 258815: Interpret and apply legislation applicable to GISc practices; Level 7; 15 Credits.
- > ID 258798: Investigate and interpret the Spatial Data Infrastructure Act, no. 54 of 2003 and the regulations framed thereunder; Level 7; 10 Credits.

#### Geographical Information Systems/Software:

Unit Standard ID; Title; Level; Credits:

- > ID 258756: Demonstrate GIS Software skills with an additional package; Level 6; 2 Credits.
- > ID 11825: Customise a generic GIS to an individual specification; Level 6; 10 Credits.

#### Remote Sensing: Concepts and Foundation:

Unit Standard ID; Title; Level; Credits:

- > ID 258653: Understand the basic principles of Remote Sensing Imagery; Level 6; 4 Credits.
- > ID 258796: Acquire Remote Sensing Imagery; Level 6; 5 Credits.
- > ID 11842: Design Geographical Positioning Systems/Geographical Navigation Satellite Systems assisted photography; Level 7; 6 Credits.

#### Spatial Awareness:

Unit Standard ID; Title; Level; Credits:

- > ID 258658: Work with map projections; Level 6; 8 Credits.

#### Spatial Analysis:

Unit Standard ID; Title; Level; Credits:

- ID 258738: Understand concepts and theory of cartographic modelling; Level 6; 12 Credits.
- ID 258757: Perform spatial error analysis; Level 6; 2 Credits.
- ID 258764: Demonstrate a basic understanding of spatial modelling in GISc; Level 6; 10 Credits.

#### Work Ethics:

Unit Standard ID; Title; Level; Credits:

- > ID 242916: Strengthen and implement sustainable public (Geomatics/GISc) sector ethical practices; Level 7; 8 Credits.
- > ID 14505: Apply the principles of ethics and professionalism to a business environment; Level 6; 6 Credits.

#### Research Methodology:

Unit Standard ID; Title; Level; Credits:

- > ID 258816: Select and undertake an approved research project in GISc; Level 7; 30 Credits.

#### Training:



Unit Standard ID; Title; Level; Credits:

- > ID 14299: Mentor and advise learners in Higher Education and Training; Level 7; 10 Level.
- > ID 116587: Develop, support and promote RPL practices; Level 7; 10 Credits.

Elective Unit Standards:

Learners should pick a group of electives, which in total comprise of at least a minimum of 83 credits. The key working areas and the total number of credits for each working area are the following:

Geographical Information Systems/Software:

Unit Standard ID; Title; Level; Credits:

- > ID 115165: Operate multiple computer software packages exceeding the fundamental ones and practice varying production techniques; Level 6; 20 Credits.

Data Capture:

Unit Standard ID; Title; Level; Credits:

- > ID 258766: Plan and check the capture of geo-information from secondary data sources; Level 6; 6 Credits.
- > ID 11823: Capture spatial data for Geographical Information System (GIS) using a single-phase Global Navigation Satellite System (GNSS); Level 6; 6 Credits.
- > ID 258740: Capture geo-information from secondary data sources; Level 6; 5 Credits.

Data Manipulation:

Unit Standard ID; Title; Level; Credits:

- > ID 258638: Assess fitness for use of spatial data; Level 6; 13 Credits.

Map Production:

Unit Standard ID; Title; Level; Credits:

- > ID 258656: Demonstrate an understanding of map composition elements in map production; Level 6; 4 Credits.
- > ID 258654: Demonstrate an understanding of different visual variables used on maps; Level 6; 4 Credits.
- > ID 258652: Demonstrate an understanding of map design and layout; Level 6; 3 Credits.
- > ID 11821: Design a geo-information product according to cartographical specifications and design standards; Level 6; 8 Credits.
- > ID 258739: Understand the conceptual context of spatial visualisations and presentation; Level 6; 10 Credits.

Spatial Analysis:

Unit Standard ID; Title; Level; Credits:

- > ID 258742: Perform basic queries of existing networks under supervision; Level 6; 10 Credits.
- > ID 258645: Understand concepts and theory of networks; Level 6; 10 Credits.

**Mathematics and Statistics:**

Unit Standard ID; Title; Level; Credits:

- > ID 258741: Understand the theory and practice of exploratory data analysis; Level 6; 4 Credits.
- > ID 12882: Perform mathematical and statistical calculations relevant to the financial markets; Level 6; 15 Credits.
- > ID 244247: Apply elementary modelling techniques; Level 6; 15 Credits.

**Financial Administration:**

Unit Standard ID; Title; Level; Credits:

- > ID 13102: Apply the processes of planning and control as it relates to budgeting, standard costing and decentralised control; Level 6; 15 Credits.

**Physics:**

Unit Standard ID; Title; Level; Credits:

- > ID 11778: Investigate and interpret the theory relating to remote sensing including aerial cameras; Level 6; 7 Credits.

**IT:**

Unit Standard ID; Title; Level; Credits:

- > ID 115387: Apply the principles of creating a computer program using a procedural programming language in a GUI environment; Level 6; 14 Credits.
- > ID 115381: Apply the principles of creating a computer program using an OOP language in a GUI environment; Level 6; 12 Credits.
- > ID 115382: Apply the principles of creating a computer programs containing advanced algorithms using a procedural programming language; Level 6; 12 Credits.

**Remote Sensing: Concepts and foundation:**

Unit Standard ID; Title; Level; Credits:

- > ID 258650: Demonstrate a capability to perform visual image interpretation of prescribed aspects of the real world; Level 6; 4 Credits.
- > ID 258760: Understand and apply the process of image mosaicing; Level 6; 5 Credits.

**Spatial Awareness:**

Unit Standard ID; Title; Level; Credits:

- > ID 258659: Demonstrate an understanding of the basic principles of spatial data; Level 6; 6 Credits.
- > ID 258649: Demonstrate an understanding of topology for storing spatial data; Level 6; 4 Credits.

**Spatial Databases:**

Unit Standard ID; Title; Level; Credits:

- > ID 11824: Selecting a data structure for Geographical Information Systems (GIS); Level 6; 8 Credits.
- > ID 258647: Be aware of the principles of spatial data in database; Level 6; 8 Credits.

Work Ethics:

Unit Standard ID; Title; Level; Credits:

- > ID 12891: Apply concepts and principles of business ethics in the professional environment; Level 6; 5 Credits.

Research Methodology:

Unit Standard ID; Title; Level; Credits:

- > ID 115022: Describe research problems; Level 6; 20 Credits.
- > ID 115590: Design public participation processes; Level 6; 10 Credits.

### **EXIT LEVEL OUTCOMES**

On achieving this qualification a learner will be able to undertake work in the field of Geoinformatics or Geographical Information Science, in any working environment by:

1. Manage the collection and capturing of data from various formats and sources.
2. Manage the analysis and visualisation of data to meet the stated requirement.
3. Manage, design and implement a database to store the required data sets.
4. Operate effectively as a Professional GISc Practitioner in a professional practise.
5. Conduct a significant study/research that addresses successfully a particular research problem in any study area of the GISc field.

Critical Cross-Field Outcomes:

This qualification promotes, in particular, the following cross-field outcomes:

Ability to solve problems:

- > When analysing data in order to make informed decisions.
- > When managing projects according to specifications, while meeting dead lines and budget constraints.

Work effectively with others as a member of a team/group/organisation or community:

- > When sourcing data from different custodians.
- > When analysing data and assist users to make informed decisions.
- > When managing team members to achieve optimal performance.

Organise and manage oneself and one's activities responsibly and effectively:

- > When performing the work in accordance with industry standards.

- > When managing projects according to specifications, while meeting dead lines and budget constraints.
- > When sourcing and managing data from different custodians.

Collect, organise and critically evaluate information:

- > When complying with user need requirements.
- > When analysing data and assist users to make informed decisions.
- > When managing projects according to specifications, while meeting dead lines and budget constraints.

Communicate effectively using visual, Mathematics and language skills in the modes of oral and written presentations:

- > When analysing data and assist users to make informed decisions.
- > When managing projects according to specifications, while meeting dead lines and budget constraints.
- > When providing metadata for data sets.

Use science and technology effectively and critically (showing responsibility towards the environment and health of others):

- > When analysing data and assist users to make informed decisions.
- > When managing projects according to specifications, while meeting dead lines and budget constraints.
- > When using the appropriate technology and tools in consideration of environmental constraints.

Demonstrate an understanding of the world as a set of related systems:

- > The inter-relatedness when applying knowledge and technology regarding spatially related entities in problem solving.

### **ASSOCIATED ASSESSMENT CRITERIA**

Associated Assessment Criteria for Exit-Level-Outcome 1:

- > Digital data files in different physical formats are imported into the dataset.
- > Data sets in different co-ordinate systems are transformed into an appropriate target co ordinate system.
- > Source data at different levels of accuracy, currency and scale are manipulated for the target data set.
- > Data are collected from various data sources.
- > Meta data should be included in all data sets.
- > Range: Sources: Including but not limited to Government and private data providers, internet, other systems (e.g. financial data), paper maps, multi spectral satellite imagery and aerial photography, alphanumeric data, digitizing.

Associated Assessment Criteria for Exit-Level-Outcome 2:

- > A given dataset is effectively analysed to assist the end user in making an informed decision.
- > The data is symbolised in a way, which will allow for visual interpretation and decision making.

Associated Assessment Criteria for Exit-Level-Outcome 3:

- > A data base to facilitate efficient and correct results are designed.

- > The data base are populated with batch importing and single record capturing.
- > Data are captured in an accurate and consistent manner.
- > The data is analysed and queried in an effective way to assist in decision making.
- > The relevant data are backed up to enable restoring of all the data in the case of any data loss.

Associated Assessment Criteria for Exit-Level-Outcome 4:

- > Projects are managed according to specification, on time and within budget.
- > Ethical principles are applied in all decisions.
- > Team members are managed in such a way that optimal performance is achieved.

Associated Assessment Criteria for Exit-Level-Outcome 5:

The problem is viable and researchable:

- > The learner provided prove that he/she understands the problem in the GISc industry in which he/she has done their research.
- > The learner is able to analyse and set it out logically, is able to arrive at logical conclusions or a diagnosis.
- > The learner is able to make proposals for the improvement/elimination of the problem.

Integrated Assessment:

Integrated assessment provides learners with an opportunity to display an ability to integrate practical performance, actions, concepts and theory across unit standards to achieve competence in relation to the purpose of this qualification.

Assessment shall:

- > Measure the quality of the observed practical performance as well as the theory and underpinning knowledge behind it.
- > Use methods that are varied to allow the learner to display thinking and decision making in the demonstration of practical performance.
- > Maintain a balance between practical performance and theoretical assessment methods to ensure each is measured in accordance with the level of the qualification.
- > The relationship between practical and theoretical is not fixed but varies according to the type and level of qualification.
- > It is advisable that each learner's assessment must include an oral interview.

### **INTERNATIONAL COMPARABILITY**

Extensive International comparability was conducted with various countries and the following countries were chosen because of their best practise.

Australia:

Queensland University of Technology.

Graduate Diploma in Geographic Information Systems:

- > Remote Sensing.
- > Geographic Information Systems.
- > Topics in Spatial Information Science.
- > Specialisation.

**Potential Careers:**

> Geologist, Mapping Scientist/Photogrammetrist, Surveyor.

**Topics in Spatial Information Science:****Remote Sensing:**

This unit includes the following:

- > History and principals of remote sensing.
- > Types of imagery.
- > Image interpretation.
- > Satellite systems.
- > Supervised and unsupervised image.
- > Classification.
- > Interpretation.
- > Analysis and presentation of data.
- > Applications in the earth sciences.

**Specialization:**

This unit ensures personalised study that supports the student's elected specialisation and contributes directly to the better understanding of the research project topic. Students undertake study to develop specialised knowledge and skills related to the specific specialisation and to support the direction of the proposed research project topic. Study is taken from specific programs offered by the School, or from advanced units within the University or, where appropriate, through another university or through specialist studies offered by staff in their areas of expertise and approved by the Head of School on the recommendation of the student's supervisor.

**Geographic Information Systems:**

This unit investigates the basic concepts of geographic information systems. Topics to be covered include components of GIS, spatial databases, data acquisition, reference frameworks, use of photographs and images, spatial analysis and graphic output design issues. The unit will highlight the importance of geographic information systems the unit will highlight the importance of geospatial positioning applications in society.

**USA:**

Northwest Missouri State University offers a Master of Science degree in Geographic Information Science. The program includes courses on modelling with GIS, Geostatics, Cartographic design, GIS database design and project management.

**University at Buffalo:**

The University at Buffalo offers a doctoral degree concentration in Geographic Information Science: An emerging interdisciplinary field that incorporates innovative research in environmental science, social science, information science, and engineering. The goal of the program is to prepare Ph.D. students with the interdisciplinary background and the technical, professional and personal skills needed for careers in Geographic Information Science. Students in the GI Science concentration at the University at Buffalo take a core of courses in GI Science, while also completing requirements for doctorates in any of the seven discipline-based departments:

GI Science students obtain research training through individualized faculty mentoring, and participate in active research programs under three broad themes: Geographic Information Science, Geographic Environmental Science, and Geographic Social Science. Students also gain a wealth of practical experience through internships, international opportunities, and participation in workshops, conferences, and fieldwork. By awarding degrees in traditional disciplines, while having an inherently interdisciplinary curriculum, the GI Science Concentration allows students to combine an innovative program of study suited to our rapidly changing world with the solid credentials of an established doctoral degree.

Curtin University of Technology:

Curtin offers a wide range of master and doctoral degrees by research. To qualify as a research degree, at least two-thirds of the required work for the award must be research. The award of a Master's (by Research) or a PhD indicates that a student has contributed substantially to the knowledge or understanding in a field, and is capable of carrying out independent research.

University of Dallas:

To receive the PhD in Geospatial Information Sciences, students must complete the Geospatial Science Core (15 SCH) to achieve a mastery of GI Science technologies and theory, have a Geospatial Specialization Area (15 SCH), have a Specific Application area or Technical field (12 SCH), evidence research skills through successful completion and defense of a Ph. D. dissertation, and take related electives as necessary for a total of 90 semester credit hours. In addition, students must satisfy a set of exams and qualifiers. Other courses may be substituted for those listed below with the written permission in advance of the Director of the GIS Doctoral program.

Geospatial Science Core (15 credit hours):

- > GIS Fundamentals.
- > Applied GIS.
- > Spatial Analysis and Modeling.
- > GIS Theories, Models and Issues.
- > Geographic Information Systems Workshop.

Geospatial Specialization Area (select from one, with a minimum of 15 credit hours):

- > Geospatial Computing and Information Management.
- > Advanced Operating Systems.
- > Object Oriented Analysis and Design.
- > Database Design.
- > Spatial Data Management.
- > Artificial Intelligence.
- > Computer Graphics.
- > Computer Vision.
- > Combinatorics and Graph Algorithms.
- > Neural Nets and Machine Learning.
- > GIS Management and Implementation.
- > Internet Mapping and Information Management.
- > GIS Application Development.
- > Database Management Systems.
- > Spatial Analysis and Modeling.
- > Descriptive and Inferential Statistics.
- > Advanced Regression Analysis.
- > Econometrics.
- > GIS Pattern Analysis.

- > Spatial Statistics.
- > GIS Network Modeling.
- > Demographic Analysis and Modeling.
- > Spatial Epidemiology.
- > Data Analysis for Geoscientists.
- > Advanced Raster Modeling.
- > Data Structures.
- > Remote Sensing and Satellite Technologies.
- > Intro to Remote Sensing.
- > Applied Remote Sensing.
- > Remote Sensing Digital Image Processing.
- > Radar Remote Sensing.
- > GPS Satellite Surveying Techniques.
- > GIS Applications to Geosciences.
- > Remote Sensing Workshop.
- > Digital Signal Processing.
- > Digital Image Processing.
- > Customized Geospatial Specialization.

Identified by the student with approval in advance by the Director of the GIS Doctoral Program.

#### Application Area or Technical Field (12 SCH):

Twelve semester-credit hours of specialized course work in an application area or technical field relevant to GIScience. Normally, these will derive from the student's masters degree. These hours may be transferred from another institution, or taken at UTD in an existing master's program area and may be applied toward a master's in that area:

- > Technical field examples: Statistics, computer science, software engineering, management information systems, image analysis, operations research, instrumentation, etc.

#### Research and Dissertation (24-48 credit hours which could include):

- > GIS PhD Research Qualifier.
- > Research Design I.
- > Research Design II.
- > GIS Research Design.
- > Research in GIS.
- > Geoscience Presentations.
- > Dissertation.

#### Other Related Electives (0-24 credit hours):

- > GISC: Geospatial Information Sciences.
- > CS: Computer Science.
- > GEOS: Geoscience.
- > MIS: Management Information Systems.

#### Ph.D. Research Project Qualifier:

All doctoral students must register for and complete GISciences PhD Research Project Qualifier. This requires completion, according to uniform guidelines established by the GIS program, of a GIS Research draft proposal and its evaluation by a committee of at least three GIS faculty, two of whom are chosen by the student with approval of the Director of the GIS Doctoral Program, and the third is appointed by the Director of the GIS Program and represents the program. The



committee will judge the quality of the project as it exemplifies the student's potential to conduct original research (including their ability to define their research objective, survey literature, develop an appropriate design, etc.) and the strength of the student's course record to date, and make a determination of the student's suitability to continue toward the PhD degree. The student must receive a PASS. If a FAIL is recorded, the course may be repeated one time only in the immediate following semester, including Summer. This course will normally be taken after the student has completed between 15 and 30 hours. A student must register for GISC 7389 in the semester immediately following the one in which he/she first accumulates 42 or more hours. GISC 7389: GIScience Research Project Qualifier can substitute for GISC 6389: GIScience Master's Project, but not the reverse unless a special petition is presented and granted.

United Kingdom:

University of Edinburg:

GIS (Honours):

Year 1:

- > Plane Surveying.
- > Information Technology.
- > Quantitative Methods.
- > Mapping (including field scheme).
- > Introduction to GIS.
- > Applications in GIS.

Year 2:

- > Applied Information Technology.
- > Data Acquisition and 3D Modelling.
- > Legal Framework for Geomatics.
- > Handling Spatial Data.
- > Analysing Spatial Data.
- > Digital Cartography.

Year 3:

- > Dissertation.
- > Management Studies in Geomatics.
- > Professional Studies in Geomatics.
- > Options: Choice of two (there may be timetable implications).
- > Geographical Information Management.
- > Spatial Data Analysis.
- > Integrated Water Management.
- > Information Technology Applications.
- > Cadastre and Land Administration.

You will have a mixture of timetabled classes and dedicated.

Kingston University London:

BSC. Honours:

Year 1:

- > Introduction to GIS 1.
- > GIS Techniques 2.
- > Applications of Geo-Analysis 3.
- > Mathematics and Statistics.
- > Sustainable Development: Issues and Concepts.
- > Investigating the Earth and Environment I.
- > Investigating the Earth and Environment II.
- > Understanding the Environment.

Year 2:

- > Geographical Analysis and Modelling 4.
- > GIS Enterprise and Research 5.
- > Spatial Databases 6.
- > GIS Software Development 7.
- > Remote Sensing and Image Processing 8.
- > Digital Mapping 9.
- > Geodemographic Analysis 10.
- > Mobile GIS (overseas fieldwork) 11.

Year 3:

- > Contemporary Issues in GIS 12.
- > Geo-visualisation 13.
- > Crime Patterns and the Environment 14.
- > Systems Analysis and Design.
- > Applications of Remote Sensing 15.
- > Land Information Systems 16.
- > Geodemographic Analysis 10.
- > GIS and hazards 17.
- > GIS Dissertation (double) 18.
- > GIS Dissertation (single).
- > Water Resources Management.
- > Ecology and Conservation in Temperate Ecosystems.
- > Geography of Recreation and Tourism.
- > Global Environments: Strategic Assessment (overseas fieldwork).

Geographical Information Systems (GIS) MSc programmes:

Postgraduate GIS courses at Kingston:

There are two MSc programmes in Geographical Information Systems (GIS) at Kingston:

- > Applied Geographical Information Systems MSc: A mixed mode course with an 'applications' focus, which is taught partly by distance learning and partly in class.
- > Geographical Information Systems and Science MSc: Taught entirely by distance learning using our online course materials (due to start in September 2008 subject to validation).

The two MSc programmes in GIS both operate within Kingston University's modular course system, each comprising eight taught modules and a research project. The courses have been designed to provide a flexible learning environment to suit all needs, whether you prefer face-to-face contact or are currently in employment and wish to take a non-contact course to study in your own time.

What does one study:

The MSc GIS programmes at Kingston University provide the high quality education needed to meet the needs of users of geotechnology or those seeking to enter a career in GIS. Students will gain a high level of competency in the principles of GI Science and the use of geotechnology, they will be able to routinely use professional software for data acquisition, handling, exploration and mapping.

Knowledge and skills in spatial analysis and spatial databases will provide students with the skills to develop GIS in addition to working with GIS in a range of environments for crime mapping, health analysis, hurricane prediction, 3d modelling and animation and many more.

The MSc GIS programmes have a number of key overarching features. You will:

- > Develop a knowledge and understanding of the principles of GI science and the use of geotechnology.
- > Understand the conceptual foundations of geographical information handling.
- > Effectively handle spatial entities for data transformations, generalisation and aggregation.
- > Develop competency in analytical operations, methods and spatial analyses.
- > Effectively implement principles of map design and graphical representation techniques.
- > Understand spatial database systems and application design.
- > Perform storage and retrieval operations, work with alternative data models, 3d modelling and advanced visualisation.
- > Explore the role of GIS in society including organisational and institutional aspects.
- > Study a range of themes in geography and environmental science.
- > Prepare yourself for employment, career advancement, further research and lifelong learning by developing your intellectual, problem solving, technical and other key professional and academic skills.

Core Modules:

- > Geographical Information Fundamentals 2.
- > Spatial Information Analysis and Modelling 3.
- > Contemporary Issues in GIS 4.
- > Digital Mapping 5.
- > Research Methods and Data Analysis 6.
- > Research Methods.
- > Dissertation.

Applied GIS option modules (choose three):

- > Land Information Systems 7.
- > Remote Sensing of the Environment 8.
- > GIS and Hazards 9.
- > Mobile GIS 10.
- > Mineral and Energy Resources 11.
- > Water Resource Management 12.
- > Waste Management and Contaminated Land Remediation 13.

GIS and Science option modules (choose two):

- > Remote Sensing.
- > GeoVisualisation 14.
- > Geodemographic Analysis.
- > Spatial Databases.
- > Mobile GIS 10.

- > GIS and Health 15.
- > Crime Patterns and Environment.

Sweden:

University of Gävle:

Bachelor's Degree:

The bachelor's degree is attained after the student has completed the course requirements of 180 credits with particular focus decided by the individual college, of which at least 90 credits will be for gradual specialisation within the main area of study. To gain the Bachelor's degree the student shall, within the framework of the:

- > Geodesy, photogrammetry.
- > Cartography, geographic information.
- > Technology (GIT) and mathematics:
  - > The use of modern instruments and programme software within the main.
- > Area of geomatics.
  - > Working with and carrying out projects.

As a result of the course the student shall have developed the skill and ability to:

- > Understand the need of society for geographical information.
- > Use modern geographical information technology.
- > Use and evaluate different methods of working.
- > Show an ability to work in the different roles required in project work.
- > Present results both orally and in writing.

On completion of the course the student shall:

- > Show the ability to make judgements of the methods of working within.
- > The area of study.
- > Have knowledge and insight of ethical values and issues within the area of study.

Programme Description:

Main Area:

Main Area Geomatics:

The programme consists of the main area Geomatics which is an internationally accepted comprehensive term for individual academic disciplines concerning geographical information. These comprise: Photogrammetry, geodesy, surveying, cartography, GIT and remote sensing. In GIT, GIS (geographical information systems) plays a central role as an effective tool. Courses in these disciplines are sometimes identical with courses in geography and spatial planning.

Thesis:

The programme concludes with a bachelor's thesis. In the thesis the student shall show that they can independently carry out a bigger project where they both show proof of the ability to integrate knowledge from the areas studied and to choose relevant methods for solving complex problems. Generally it is important that in the thesis knowledge from earlier studies is applied, broadened and deepened. Students shall show through their thesis that those goals for a basic university education as given in the Higher Education Act and the Bachelor's degree education as given in the Higher Education Ordinance and the special goals stated in this course of

teaching have been achieved. Upon completion of the course the student should be able to take into account the human scientific and environmental demands when solving problems and developing programmes, and has the prerequisites to work for an environmentally adapted technology. The working methods that practice these abilities are therefore central to the programme.

Year 1:

Credits Level Main Area:

- > 1 Introduction to Higher Education in Sweden.
- > 15 B Technology.
- > 2 Geographical Information Technology.
- > 7,5 B Geomatics.
- > 2-3 Mathematics: Linear Algebra and Calculus.
- > 15 B Mathematics.
- > 3 Basic Cartography 7,5 B Geomatics.
- > 4 Basic Land Surveying 7,5 B Geomatics.
- > 4 Programming with Visual.
- > Basic.NET.
- > 7,5 B Computer science.

Year 2:

Credits Level Main Area:

- > 1 Field Training in Land Surveying.
- > B Geomatics.
- > 1 Mathematics: Statistics and Algebra.
- > 7,5 B Mathematical Statistics.
- > 1 GIS raster/vector 7,5 B Geomatics.
- > 2 Geodetic Theory of Errors 7,5 B Geomatics.
- > 2 GIS Application Development alt. Thematic Cartography.
- > 7,5 B Geomatics.
- > 3 Photogrammetry 7,5 B Geomatics.
- > 3 Mathematics: Multivariable Calculus.
- > 7,5 B Mathematics.
- > 4 Geodetic Instruments 7,5 B Geomatics.
- > 4 GIS Databases 7,5 B Geomatics.

Year 3:

Credits Level Main Area:

- > 1 Environmental Geography 7,5 B Geography.
- > 1 Spatial Planning in Land Management.
- > 7,5 B Spatial Planning.
- > 2 Remote Sensing and GIS.
- > Analysis in Land Management.
- > 7,5 B Geomatics.
- > 2 Digital Photogrammetry 7,5 B Geomatics.
- > 3 Industrial and Special Measurements.
- > B Geomatics.
- > 3 Scientific writing 7,5 B Geomatics.
- > 4 Bachelor's Thesis 15 B Geomatics.

Those who qualify to be admitted to the Bachelor of Science programme in Geomatics are those who fulfil the conditions for basic qualification as given in the Higher Education Ordinance as well as the following particular qualifications (or equivalent).

Degree of Bachelor of Science in Geomatics, 180 credits.

India:

Centre for Continuing Education, Cept University, Ahmedabad:

Diploma in Geomatics:

The Diploma in Geomatics Programme is of one year duration. It is divided into two semesters. The classes are conducted for six days a week, except Sunday from 6.30 p.m. to 9.00 p.m. This course covers Geospatial Science, Cartography, Physics of Remote Sensing, Principles of Aerial Photography, Fundamentals of GIS, Global Positioning System, Spatial Data Base Management, Programming Language, Research Methodology and Statistics. The hands-on practical knowledge is given equal emphasis to learn Digital Image Interpretation, GIS and GPS applied to real time problem solving through case studies and assignments.

Advance Diploma in Geomatics:

The duration of Advance Diploma is of two years, comprising of four semesters. The curriculum of first two semesters remains similar to that of the course on 'Diploma in Geomatics'. This course covers Advance Remote Sensing, Digital Photogrammetry, Advance GIS, Applications of GPS, Relational Data Base Management System, Advance Programming Language, Web GIS and Internet Mapping, Location Based System and Navigation. The hands-on practical knowledge is given equal emphasis to give applied knowledge of real time problem solving through case studies, assignments and a project.

Masters in Geomatics:

The three year Degree course of Masters in Geomatics primarily aims at creating expertise in the field of Geographic Information System and Remote Sensing. The six semester course provides a complete technological knowledge of the subject leading to design and execution of projects based on Remote Sensing, GIS and GPS. Keeping pace with the advancement in the technology the candidates are prepared to face challenges and adopt futuristic approach to cope up with the requirement and arrive at complete solutions for effective planning and management. This course covers High Level of Remote Sensing, GIS and GPS, Modeling, Software Development and Technical Applications and Dissertation. Periodical group discussions, presentations, preparation of project proposals, their execution, report writing is compulsory.

China:

University of Hong Kong:

Master of Geographic Information Systems (MGIS) degree programme on a two-year part-time and a 16-month full-time basis. Alternatively, a Postgraduate Diploma in Geographic Information Systems (PDipGIS) is available for one-year part-time study.

Programme Requirements:

Applicants will normally be required to hold a good honours degree or a relevant professional qualification of equivalent standard with appropriate experience. Three programme options are

available to suit individual needs: (1) MGIS two-year part-time, (2) MGIS 16-month full-time and, (3) PDipGIS one-year part-time. Pending satisfactory academic performance, PDipGIS candidates may declare their intention to transfer to the second year of the two-year part-time:

- > GIS Data Processing.
- > Programming for GIS.
- > Photogrammetry and Remote Sensing.
- > Digital Terrain Modelling.
- > Cartographic Presentation and Visualisation Programmes.

At the end of completing the PDipGIS programme, students should be able to:

- > Understand the generic concepts in GIS.
- > Develop ability to handle spatial data.
- > Identify data needs, sources, and acquisition procedures.
- > Undertake spatial and cartographic analyses.
- > Operate at least one commercially available GIS.
- > Compile GIS algorithms using a high level language.

In addition to the above skills, students of the MGIS programme should have acquired the knowledge to:

- > Manage GIS projects.
- > Customise applications development at local project, enterprise (Intranet) and distributed (Internet) levels.
- > Resolve standards for data interchange and geospatial processing models.

Additional Pedagogic Requirements for MGIS Programme:

In addition to the courses, students will be required to attend a series of seminars to be offered by scholars and practitioners in the field. Field trips are designed to provide opportunities for students to examine first hand geographic information systems applications in Hong Kong. Candidates of the MGIS programme must also complete a dissertation (see below):

GEOG 7230 MGIS Dissertation:

The course includes two parts: (i) A topic study or research project, and (ii) Oral presentation. A topical study or research project must be completed in the form of a dissertation of 10,000-20,000 words, with a focus on GIS in an applied setting (such as planning, environmental protection and management, transport, housing, civil engineering, or architecture). The choice of topics may vary from year to year in response to demand and student composition. Each candidate is also required to present their research project proposal in the "Dissertation Seminars".

Coursework:

Candidates must satisfy the examiners in coursework assessment for each of the courses (excluding the dissertation). The assessment of coursework will include oral presentation, written assignments, tests, laboratory and practical work.

Examinations:

Examinations will be held at the end of each semester. Some courses are assessed by 100% coursework:

- > Environmental Mapping and Risk Assessment.

- > Internet GIS.
- > GIS in Transport Planning and Management.
- > GIS Project Management.
- > GIS in Workshop or Internship.
- > GIS in Health Studies.
- > Survey and Data Analysis in Transport Studies.
- > Transport Logistics Planning and Services Management.
- > Seminars, fieldtrips and MGIS Dissertation [for MGIS students only].
- > Topics in Database Systems.
- > Spatial and Geostatistical Data Analyses.

Comparisons with similar programs that is available has shown that the South African range of qualifications is much more comprehensive. It is concluded from the above that South Africa compares favourably with countries such as Australia, Canada, India, USA, UK and the Sweden, which are considered to have best practise in GIS Science and Technology research.

### **ARTICULATION OPTIONS**

This qualification has been developed for professional practice across the industry and is intended to provide professional advancement in the industry ensuring the upliftment of the standards in general.

It is applicable to small and large business alike. This qualification builds on other certificates from a range of sub-sectors and will provide articulation with a range of qualifications in both management and service areas of areas of practice such as the geomatics, planning, civil/consulting engineering, and other geo-sciences.

Learners who have successfully completed other qualifications in the GISc sector, which include unit standards, which is used in this qualification, can expect that they will get recognition for those unit standards.

### **MODERATION OPTIONS**

Moderations will be the responsibility of the Educational Advisory Committee of Plato.

Individuals cannot apply to be a moderator. Moderators will be nominated by the user body as described underneath and then appointed by the Plato EAC.

A recognised and representative body of GISc users will nominate moderators.

### **CRITERIA FOR THE REGISTRATION OF ASSESSORS**

For an applicant to register as an assessor, the applicant needs:

- > Declared competent in all the outcomes of the National Assessor Unit Standards as stipulated by SAQA.
- > Assessors must be qualified (in the GISc field) at least one level above the qualification they are assessing.
- > Assessors can apply to be assessors at the ETQA.

### **NOTES**

Learning Pathway:

The SGB has mapped and prioritised the learning pathway for GISc qualification as follows:

> National Certificate: GISc NQF Level 5 -> National Diploma: GISc NQF Level 5 -> B. Degree: GISc NQF Level 6 -> B. Hon. Degree: GISc NQF Level 7 -> Masters Degree: NQF Level 8 -> Doctorate Degree: GISc NQF Level 8+.



This qualification will be amended to comply with the HEQF policy once it is finalised.

It is envisaged that the NQF level will be changed from Level 8+ to Level 10 as illustrated below:

Category      Qualification; Current NQF Level; Envisaged NQF Level:

- > Professional; Doctoral Degree; Level 8+; Level 10.
- > Professional; Master's Degree; Level 8; Level 9.
- > Professional; Bachelor Honours Degree or Post Graduate Diploma; Level 7; Level 8.
- > Technologist; Bachelor's Degree or Advanced Diploma; Level 6; Level 7.
- > Technician; Diploma; Level 5; Level 6.
- > Operator; Higher Certificate; Level 5; Level 5.

Other relevant specifications of the HEQF policy will be included in the qualification.

### UNIT STANDARDS

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Fundamental	242915	Apply research methodologies in order to compile in a major research report in a public sector context	Level 7	12
Fundamental	117434	Conduct research	Level 7	15
Fundamental	12892	Demonstrate an understanding of the use of micro- and macro-economic indicators as forecasting and planning tools within the financial markets	Level 7	18
Fundamental	115083	Explore research problems	Level 7	30
Fundamental	258803	Perform 2.5D vector surface queries	Level 7	13
Fundamental	258795	Perform spatial and hybrid queries	Level 7	12
Core	258796	Acquire Remote Sensing Imagery	Level 6	5
Core	14505	Apply the principles of ethics and professionalism to a business environment	Level 6	6
Core	258758	Collect and capture metadata for spatial data	Level 6	7
Core	258802	Create a Standard Operating Procedure for GI Data capture	Level 6	8
Core	11825	Customise a generic GIS to an individual specification	Level 6	10
Core	258756	Demonstrate GIS Software skills with an additional package	Level 6	2
Core	258661	Demonstrate a basic knowledge and understanding of photogrammetry	Level 6	8
Core	258736	Demonstrate an understanding of general database theory	Level 6	3
Core	258657	Demonstrate an understanding of the context of GI Science	Level 6	4
Core	258737	Design and develop a simple database	Level 6	7
Core	11830	Interpret the Professional and Technical Surveyors' Act, no. 40 of 1984 and the rules framed thereunder	Level 6	3
Core	115348	Oversee the professional execution of daily functions	Level 6	5
Core	258757	Perform spatial error analysis	Level 6	2
Core	11820	Select a map projection and transform data between projections or ellipsoids	Level 6	3
Core	115448	Understand and apply statistical techniques for business and research applications	Level 6	18
Core	258778	Understand and manage spatial data errors	Level 6	4
Core	258762	Understand concepts and processes of data conversion	Level 6	6
Core	258738	Understand concepts and theory of Cartographic modeling	Level 6	12
Core	258775	Understand spatial data transfer protocols	Level 6	3
Core	258653	Understand the basic principles of Remote Sensing Imagery	Level 6	4
Core	258658	Work with map projections	Level 6	6
Core	258800	Demonstrate a thorough knowledge of GPS technology	Level 7	15
Core	258799	Demonstrate an in depth knowledge and understanding of photogrammetry	Level 7	12
Core	11842	Design Geographical Positioning Systems/Geographical Navigation Satellite Systems assisted photography	Level 7	6

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Core	258797	Develop web sites with advanced mapping functionality	Level 7	16
Core	116587	Develop, support and promote RPL practices	Level 7	10
Core	13070	Evaluate and apply the processes of planning and control as it relates to corporate strategy, budgeting, pricing decision, standard costing and decentralised control	Level 7	14
Core	258815	Interpret and apply legislation applicable to GISc practices	Level 7	15
Core	258798	Investigate and interpret the Spatial Data Infrastructure Act, No. 54 of 2003 and the regulations framed thereunder	Level 7	10
Core	14299	Mentor and advise learners in Higher Education and Training	Level 7	10
Core	258761	Perform data generalisation and aggregation	Level 7	3
Core	258801	Perform life-cycle management of spatio-temporal data	Level 7	8
Core	258816	Select and undertake an approved research project in GISc	Level 7	30
Core	242916	Strengthen and implement sustainable public sector ethical practices	Level 7	8
Core	258804	Understand issues that influence the quality of data	Level 7	6
Core	258777	Use the SQL language to create, modify, query and manage a database application	Level 7	8
Elective	12891	Apply concepts and principles of business ethics in the professional environment	Level 6	5
Elective	244247	Apply elementary modelling techniques	Level 6	15
Elective	115387	Apply the principles of creating a computer program using a procedural programming language in a GUI environment	Level 6	14
Elective	115381	Apply the principles of creating a computer program using an OOP language in a GUI environment	Level 6	12
Elective	115382	Apply the principles of creating computer programs containing advanced algorithms using a procedural programming language	Level 6	12
Elective	13102	Apply the processes of planning and control as it relates to budgeting, standard costing and decentralised control	Level 6	15
Elective	258638	Assess fitness for use of spatial data	Level 6	13
Elective	258647	Be aware of the principles of spatial data in database	Level 6	8
Elective	258740	Capture Geo-information from secondary data sources	Level 6	5
Elective	11823	Capture spatial data for Geographical Information System (GIS) using a single-phase Global Navigation Satellite System (GNSS)	Level 6	6
Elective	258654	Demonstrate an understanding of different visual variables used on maps	Level 6	4
Elective	258656	Demonstrate an understanding of map composition elements in map production	Level 6	4
Elective	258652	Demonstrate an understanding of map design and layout	Level 6	3
Elective	258659	Demonstrate an understanding of the basic principles of spatial data	Level 6	6
Elective	258649	Demonstrate an understanding of topology for storing spatial data	Level 6	4
Elective	258650	Demonstrate capability of visual image interpretation of the real world	Level 6	4
Elective	115022	Describe research problems	Level 6	20
Elective	11821	Design a cartographic product according to cartographical specifications and design standards	Level 6	8
Elective	115590	Design public participation processes	Level 6	10
Elective	11778	Investigate and interpret the theory relating to remote sensing including aerial cameras	Level 6	7
Elective	115165	Operate multiple computer software packages exceeding the fundamental ones and practice varying production techniques	Level 6	20
Elective	12882	Perform mathematical and statistical calculations relevant to the financial markets	Level 6	15
Elective	258742	Perform queries of existing networks under supervision	Level 6	10
Elective	258766	Plan and check the capture of Geospatial-information from secondary data sources	Level 6	6
Elective	11824	Selecting a data structure for Geographical Information Systems (GIS)	Level 6	8
Elective	258760	Understand and apply the process of image mosaicing	Level 6	5

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Elective	258645	Understand concepts and theory of networks	Level 6	10
Elective	258739	Understand the conceptual context of spatial visualisations and presentation	Level 6	10
Elective	258741	Understand the theory and practice of exploratory data analysis	Level 6	4

**LEARNING PROGRAMMES RECORDED AGAINST THIS QUALIFICATION****None**



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Perform spatial and hybrid queries***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
258795	Perform spatial and hybrid queries		
<b>ORIGINATOR</b>			<b>PROVIDER</b>
SGB Geographical Information Sciences			
<b>FIELD</b>			<b>SUBFIELD</b>
12 - Physical Planning and Construction			Physical Planning, Design and Management
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 7	12

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Create and execute a vector spatial query in terms of the following range.

**SPECIFIC OUTCOME 2**

Create and execute a raster spatial query.

**SPECIFIC OUTCOME 3**

Create and execute a combination of spatial queries.

**SPECIFIC OUTCOME 4**

Create and execute hybrid queries.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Fundamental	63711	Bachelor of Geographical Information Science (GISc)	Level 7



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:****Acquire Remote Sensing Imagery**

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
258796	Acquire Remote Sensing Imagery		
<b>ORIGINATOR</b>	<b>PROVIDER</b>		
SGB Geographical Information Sciences			
<b>FIELD</b>	<b>SUBFIELD</b>		
12 - Physical Planning and Construction	Physical Planning, Design and Management		
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 6	5

*This unit standard does not replace any other unit standard and is not replaced by another unit standard.*

**SPECIFIC OUTCOME 1**

Specify and acquire airborne imagery.

**SPECIFIC OUTCOME 2**

Specify and acquire spaceborne digital imagery.

**SPECIFIC OUTCOME 3**

Apply advanced image interpretability rating scale (IIRS).

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Core	63711	Bachelor of Geographical Information Science (GISc)	Level 7



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Develop web sites with advanced mapping functionality***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
258797	Develop web sites with advanced mapping functionality		
<b>ORIGINATOR</b>			<b>PROVIDER</b>
SGB Geographical Information Sciences			
<b>FIELD</b>	<b>SUBFIELD</b>		
12 - Physical Planning and Construction	Physical Planning, Design and Management		
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 7	16

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Understand new trends in computing hardware, software and networks.

**SPECIFIC OUTCOME 2**

Understand databases for web mapping.

**SPECIFIC OUTCOME 3**

Develop a website using a web authoring language.

**SPECIFIC OUTCOME 4**

Understand and implement standards in the web site design.

**SPECIFIC OUTCOME 5**

Develop a web map application using web mapping software.

**SPECIFIC OUTCOME 6**

Develop an advanced web site with complex mapping functionality.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Core	63711	Bachelor of Geographical Information Science (GISc)	Level 7



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:**

***Investigate and interpret the Spatial Data Infrastructure Act, No. 54 of 2003 and the regulations framed thereunder***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
258798	Investigate and interpret the Spatial Data Infrastructure Act, No. 54 of 2003 and the regulations framed thereunder		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Geographical Information Sciences			
<b>FIELD</b>		<b>SUBFIELD</b>	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 7	10

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Interpret the purpose of the SDI Act, No. 54 OF 2003.

**SPECIFIC OUTCOME 2**

Investigate the purpose of the Regulations framed under the SDI Act, No. 54 of 2003.

**SPECIFIC OUTCOME 3**

Investigate and interpret provisions of the SDI Act, No. 54 of 2003.

**SPECIFIC OUTCOME 4**

Investigate and interpret provisions of the current (draft) regulations framed under Act No. 54 of 2003.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Core	63711	Bachelor of Geographical Information Science (GISc)	Level 7



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:**

***Demonstrate an in depth knowledge and understanding of photogrammetry***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
258799	Demonstrate an in depth knowledge and understanding of photogrammetry		
<b>ORIGINATOR</b>			<b>PROVIDER</b>
SGB Geographical Information Sciences			
<b>FIELD</b>	<b>SUBFIELD</b>		
12 - Physical Planning and Construction	Physical Planning, Design and Management		
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 7	12

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Demonstrate an understanding of photographic scale in the context of aerial photography.

**SPECIFIC OUTCOME 2**

Demonstrate a basic knowledge and understanding of flight planning for aerial photography.

**SPECIFIC OUTCOME 3**

Demonstrate a basic knowledge and understanding of photo control in the context of user requirements and positional accuracies.

**SPECIFIC OUTCOME 4**

Demonstrate a basic knowledge and understanding of camera orientations in photogrammetry.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Core	63711	Bachelor of Geographical Information Science (GISc)	Level 7





## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Demonstrate a thorough knowledge of GPS technology***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
258800	Demonstrate a thorough knowledge of GPS technology		
<b>ORIGINATOR</b>			<b>PROVIDER</b>
SGB Geographical Information Sciences			
<b>FIELD</b>	<b>SUBFIELD</b>		
12 - Physical Planning and Construction	Physical Planning, Design and Management		
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 7	15

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Demonstrate an understanding of the GPS positioning and satellite systems in the context of the space segment of GPS technology and applications.

**SPECIFIC OUTCOME 2**

Demonstrate an understanding of errors in GPS positions in the context of the control and performance segment of GPS technology and applications.

**SPECIFIC OUTCOME 3**

Demonstrate the ability to perform a simple data survey using a GPS in the context of the user segment of GPS technology and applications.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Core	63711	Bachelor of Geographical Information Science (GISc)	Level 7



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Perform life-cycle management of spatio-temporal data***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
258801	Perform life-cycle management of spatio-temporal data		
<b>ORIGINATOR</b>			<b>PROVIDER</b>
SGB Geographical Information Sciences			
<b>FIELD</b>	<b>SUBFIELD</b>		
12 - Physical Planning and Construction	Physical Planning, Design and Management		
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 7	8

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Understand the life cycle of spatio-temporal data sets used in a GI system.

**SPECIFIC OUTCOME 2**

Establish operating procedures to manage change in spatio-temporal data sets used in a GI system environment.

**SPECIFIC OUTCOME 3**

Develop queries dealing with dynamic systems represented within a GI system.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Core	63711	Bachelor of Geographical Information Science (GISc)	Level 7



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:****Create a Standard Operating Procedure for GI Data capture**

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
258802	Create a Standard Operating Procedure for GI Data capture		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Geographical Information Sciences			
<b>FIELD</b>	<b>SUBFIELD</b>		
12 - Physical Planning and Construction	Physical Planning, Design and Management		
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 6	8

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Demonstrate the ability to define operational environment settings and apply prescribed standards.

**SPECIFIC OUTCOME 2**

Demonstrate an understanding of relevant data models that can be used in the Geographical Information Science study fields and related information systems.

**SPECIFIC OUTCOME 3**

Demonstrate the ability to design and document a standard operating procedure in accordance with client/workplace requirements associated with a GISc practice.

**SPECIFIC OUTCOME 4**

Demonstrate the ability to define and implement operational templates in a GISc environment.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Core	63711	Bachelor of Geographical Information Science (GISc)	Level 7



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:****Perform 2.5D vector surface queries**

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
258803	Perform 2.5D vector surface queries		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Geographical Information Sciences			
<b>FIELD</b>		<b>SUBFIELD</b>	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 7	13

*This unit standard does not replace any other unit standard and is not replaced by another unit standard.*

**SPECIFIC OUTCOME 1**

Understand and explain the principles of a Triangular Irregular Network (TIN) in the context of a surface.

**SPECIFIC OUTCOME 2**

Perform simple surface derived analysis.

**SPECIFIC OUTCOME 3**

Calculate profiles of a geographical area.

**SPECIFIC OUTCOME 4**

Generate visualisations of TINs.

**SPECIFIC OUTCOME 5**

Calculate volumes from surfaces on a geographical area.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Fundamental	63711	Bachelor of Geographical Information Science (GISc)	Level 7



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Understand issues that influence the quality of data***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
258804	Understand issues that influence the quality of data		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Geographical Information Sciences			
<b>FIELD</b>		<b>SUBFIELD</b>	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 7	6

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Understand and explain spatial accuracy in GIS data capture.

**SPECIFIC OUTCOME 2**

Understand and explain temporal issues in spatial data sets.

**SPECIFIC OUTCOME 3**

Analyse the classification accuracy of a dataset.

**SPECIFIC OUTCOME 4**

Understand and explain the non-quantitative elements of geospatial data quality and the interaction of errors in relation to multiple, integrated datasets.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Core	63711	Bachelor of Geographical Information Science (GISc)	Level 7



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:***Interpret and apply legislation applicable to GISc practices*

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
258815	Interpret and apply legislation applicable to GISc practices		
<b>ORIGINATOR</b>	<b>PROVIDER</b>		
SGB Geographical Information Sciences			
<b>FIELD</b>	<b>SUBFIELD</b>		
12 - Physical Planning and Construction	Physical Planning, Design and Management		
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 7	15

*This unit standard replaces:*

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
11756	Interpret and apply legislation applicable to cadastral surveys	Level 7	5	Will occur as soon as 258815 is registered

**SPECIFIC OUTCOME 1**

Interpret and apply relevant legislation that affects a GISc project.

**SPECIFIC OUTCOME 2**

Describe and explain the purpose and relevance of such legislation to any specific GISc project.

**SPECIFIC OUTCOME 3**

Interpret, describe and explain the consequences of non-compliance with relevant legislation.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Core	63711	Bachelor of Geographical Information Science (GISc)	Level 7



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:****Select and undertake an approved research project in GISc**

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
258816	Select and undertake an approved research project in GISc		
<b>ORIGINATOR</b>	<b>PROVIDER</b>		
SGB Geographical Information Sciences			
<b>FIELD</b>	<b>SUBFIELD</b>		
12 - Physical Planning and Construction	Physical Planning, Design and Management		
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 7	30

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Identify a problem in the GISc field that is viable and researchable.

**SPECIFIC OUTCOME 2**

Provide proof that the learner in which he/she has done their research understands the problem in the GISc industry.

**SPECIFIC OUTCOME 3**

Analyse and set out the problem logically in order to arrive at logical conclusions or a diagnosis in the course of the research.

**SPECIFIC OUTCOME 4**

Introduce proposals for the improvement/elimination of the problem that was identified and researched.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Core	63711	Bachelor of Geographical Information Science (GISc)	Level 7

No. 988

22 September 2008

**SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)**

In accordance with Regulation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the Standards Generating Body (SGB) for

**Electrical Engineering and Construction**

registered by Organising Field 12, Physical Planning and Construction, publishes the following Qualification and Unit Standards for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purpose of the Qualification and Unit Standards. The full Qualification and Unit Standards can be accessed via the SAQA web-site at [www.saga.org.za](http://www.saga.org.za). Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, SAQA House, 1067 Arcadia Street, Hatfield, Pretoria.

Comment on the Qualification and Unit Standards should reach SAQA at the address below and **no later 22 October 2008**. All correspondence should be marked **Standards Setting – Electrical Engineering and Construction** addressed to

The Director: Standards Setting and Development  
SAQA

*Attention: Mr. D. Mphuthing*  
Postnet Suite 248  
Private Bag X06  
Waterkloof  
0145  
or faxed to 012 – 431-5144  
e-mail: [dmphuthing@saga.org.za](mailto:dmphuthing@saga.org.za)

**DR S BHIKHA**  
**DIRECTOR: STANDARDS SETTING AND DEVELOPMENT**





SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**QUALIFICATION:****Further Education and Training Certificate: Electrical Engineering**

SAQA QUAL ID	QUALIFICATION TITLE		
63889	Further Education and Training Certificate: Electrical Engineering		
ORIGINATOR		PROVIDER	
SGB Electrical Engineering & Construction			
QUALIFICATION TYPE	FIELD	SUBFIELD	
Further Ed and Training Cert	12 - Physical Planning and Construction	Electrical Infrastructure Construction	
ABET BAND	MINIMUM CREDITS	NQF LEVEL	QUAL CLASS
Undefined	130	Level 4	Regular-Unit Stds Based

**This qualification replaces:**

Qual ID	Qualification Title	NQF Level	Min Credits	Replacement Status
48474	National Certificate: Electrical Engineering	Level 4	134	Will occur as soon as 63889 is registered

**PURPOSE AND RATIONALE OF THE QUALIFICATION****Purpose:**

The purpose of this qualification is to provide learners, education and training providers and employers with the standards and the range of learning required to work effectively within various industries, making use of electrical engineering knowledge and skills to meet the challenges of such an environment.

Qualifying learners will also be able to relate their learning to scientific and technological principles and concepts. They will also be able to maintain and support the various policies and procedures related to the safety, health, environment and quality systems that govern their workplace. This qualification will enable the learner to find employment as a skilled worker to perform Artisan duties in the electrical field.

Qualifying learners at NQF Level 4 will be able to:

- > Understand electrical equipment and protection technology and interpret integrated system schematics.
- > Install and commission electrical equipment on integrated electrical systems.
- > Maintain and repair electrical equipment on integrated electrical systems.
- > Evaluate and solve familiar problems pertaining to electrical equipment, integrated electrical systems and related processes.
- > Accept responsibility for utilising and maintaining equipment without working under direct supervision.

The FETC Electrical Engineering (NQF Level 4) is the culmination of a learning path spanning three qualifications and is intended to produce a highly competent person who will be able to meet the challenges of a competitive and demanding environment.

**Rationale:**

This is the third of a three-level qualification series that reflect the workplace-based needs of the electrical field that is expressed by employers and employees, both now and for the future. This electrical engineering qualification provides the advanced competencies required to work on integrated electrical systems and installations. This qualification provides the learner with accessibility to be employed within the electrical engineering field and provides the flexibility to pursue different careers across various industry sectors and articulate within industries such as:

- > Manufacturing and Engineering.
- > Energy Sector.
- > Mining.
- > Chemical.
- > Transport.
- > Other related engineering industry sectors.

This qualification will enhance the status and productivity of the learner as well as contribute to improved quality, production rate and growth within the engineering sector. The range of typical learners at this level could include individuals preparing to qualify as an Electrician. Qualifying learners will obtain a Further Education Certificate in Electrical Engineering which places the learner in a position to investigate requirements for advancement to qualified artisan status or progress to a National Certificate or Diploma at NQF Level 5.

This qualification could assist with the achievement of national government and industrial development policies and strategies to grow a pool of scarce and other related skills in support of sustainable economic growth. People working in the electrical engineering fields require specialized technical skills and knowledge in order to meet the requirements of continually changing environment of the various industries. Through its design, this qualification will meet the needs of learners within the electrical engineering sectors who require technical expertise and essential knowledge needed to earn formal qualifications. This qualification facilitates access for previously disadvantaged groups and other learners to acquire the technical knowledge and skills that are required as well as provide access and mobility into higher-level more specialised occupations. This will allow the learner greater employability and support the development of small, medium enterprises (SME).

#### **RECOGNIZE PREVIOUS LEARNING?**

Y

#### **LEARNING ASSUMED IN PLACE**

This qualification assumes learners obtained a National Certificate in Electrical Engineering NQF Level 3 or an equivalent qualification. If the learner does not already have such a qualification, learning in preparation for this qualification would also have to include:

- > Language and Maths at NQF Level 3.
- > Advanced concepts of Science and Technology related to electrical engineering, materials and tools used in installation processes.
- > An ability to install integrated electrical equipment and circuits.
- > Occupational health, safety and environmental practices within the electrical environment.
- > An understanding of procedures related to workplace relationships, roles and responsibilities.

#### **Recognition of Prior Learning:**

This qualification can be obtained wholly or in part through the recognition of prior learning (RPL) The learner should be thoroughly briefed on the process. Support and guidance should be provided. The process should not be so onerous as to prevent learners from taking up the RPL option in obtaining the qualification.

#### Access to the Qualification:

Access to this qualification is open. However learners must have completed a National Certificate at NQF Level 3 (in trade-related sub-field) or equivalent. The learner must be physically able to perform the outcomes as specified in the unit standards and be able to differentiate between various colours applicable to the industry.

#### **QUALIFICATION RULES**

##### Fundamental Component:

In the Fundamental Component of the qualification, learners must demonstrate their competence in:

- > Languages and Communication: 40 credits, 20 of these credits must be at NQF Level 4 and 20 credits may be at NQF Level 3 in a second South African language.
- > Mathematical Literacy: 16 credits.

##### Core Component:

The compulsory unit standards in the Core Component of this qualification reflect the generic competencies required in the field of Electrical Engineering for all industrial environments. The learner must demonstrate competence in the Core Component for the total of 54 credits.

##### Elective Component:

This component consists of several specialisations each with its own set of unit standards. Learners are to choose a specialisation area and complete a minimum of 20 credits from the unit standards listed under that specialisation area so as to attain a minimum of 130 credits required for certification purposes.

##### Specialisation Area 1:

##### Mining:

##### Unit Standard Title; Level; Credits:

- > Carry out work on energized medium voltage networks; Level 4; 16 Credits.
- > Inspect, record and report condition of Medium/High Voltage station apparatus and related equipment; Level 4; 6 Credits.
- > Inspect, test and maintain high voltage isolators; Level 4; 12 Credits.
- > Inspect, test and maintain Medium/High Voltage earthing systems; Level 4; 4 Credits.
- > Inspect, test and maintain Medium/High Voltage transformers; Level 4; 6 Credits.
- > Install/replace medium/high voltage equipment and hardware; Level 4; 6 Credits.
- > Install and commission direct current (DC) machines; Level 4; 8 Credits.
- > Install and terminate Medium Voltage cables; Level 4; 6 Credits.
- > Joint Medium Voltage cables; Level 4; 8 Credits.
- > Maintain Direct Current (DC) machines; Level 4; 5 Credits.
- > Maintain low voltage switchgear; Level 4; 4 Credits.
- > Operate on Medium Voltage networks; Level 4; 20 Credits.
- > Troubleshoot on programmable logic controllers; Level 4; 5 Credits.
- > Maintain unit protection devices on transformers; Level 4; 6 Credits.
- > Advance or retreat electrical reticulation in an underground coal section; Level 3; 6 Credits.
- > Control electrical networks from a control centre; Level 4; 14 Credits.
- > Fault-find and repair a DC powered machine; Level 4; 6 Credits.
- > Fault-find and repair the electrical system of winder installations; Level 4; 4 Credits.

- > Fault find and repair the electrical system of a conveyor installation; Level 4; 5 Credits.
- > Fault find and repair the electrical system of a surface mining production machine; Level 4; 4 Credits.
- > Fault find a medium voltage reticulation system; Level 4; 4 Credits.
- > Maintain and repair Medium Voltage Switchgear; Level 4; 7 Credits.
- > Construct, maintain and dismantle HV overhead lines; Level 4; 20 Credits.

#### Specialisation Area 2:

##### Electrical Construction:

###### Unit Standard Title; Level; Credits:

- > Complete certificate of compliance for a single phase domestic installation; Level 4; 5 Credits.
- > Maintain low voltage switchgear; Level 4; 4 Credits.
- > Troubleshoot on programmable logic controllers; Level 4; 5 Credits.
- > Select a back-up generator for a stand-alone renewable energy system; Level 4; 4 Credits.
- > Design a solar pump system; Level 4; 4 Credits.
- > Apply the principles of energy efficiency; Level 4; 4 Credits.

#### Specialisation Area 3:

##### Chemical:

###### Unit Standard Title; Level; Credits:

- > Complete certificate of compliance for a single phase domestic installation; Level 4; 5 Credits.
- > Maintain Direct Current (DC) machines; Level 4; 5 Credits.
- > Maintain low voltage switchgear; Level 4; 4 Credits.
- > Maintain unit protection devices on transformers; Level 4; 6 Credits.
- > Fault-find and repair a DC powered machine; Level 4; 6 Credits.
- > Install electronic motor speed control units; Level 4; 5 Credits.

#### Specialisation Area 4:

##### Electrical Distribution:

###### Unit Standard Title; Level; Credits:

- > Carry out work on energized medium voltage networks; Level 4; 16 Credits.
- > Inspect, record and report condition of Medium/High Voltage station apparatus and related equipment; Level 4; 6 Credits.
- > Inspect, test and maintain high voltage isolators; Level 4; 12 Credits.
- > Inspect, test and maintain Medium/High Voltage earthing systems; Level 4; 4 Credits.
- > Inspect, test and maintain Medium/High Voltage transformers; Level 4; 6 Credits.
- > Install/replace medium/high voltage equipment and hardware; Level 4; 6 Credits.
- > Install and terminate Medium Voltage cables; Level 4; 6 Credits.
- > Joint Medium Voltage cables; Level 4; 8 Credits.
- > Maintain unit protection devices on transformers; Level 4; 6 Credits.
- > Operate on Medium Voltage networks; Level 4; 20 Credits.
- > Spray-wash energized medium / high voltage networks; Level 4; 4 Credits.
- > Fault find a medium voltage reticulation system; Level 4; 4 Credits.
- > Maintain and repair Medium Voltage Switchgear; Level 4; 7 Credits.
- > Apply the principles of energy efficiency; Level 4; 4 Credits.
- > Construct, maintain and dismantle HV overhead lines; Level 4; 20 Credits.

**Specialisation Area 5:****Electrical Generation:****Unit Standard Title; Level; Credits:**

- > Inspect, test and maintain high voltage isolators; Level 4; 12 Credits.
- > Inspect, test and maintain Medium/High Voltage transformers; Level 4; 6 Credits.
- > Install and commission direct current (DC) machines; Level 4; 8 Credits.
- > Install and terminate Medium Voltage cables; Level 4; 6 Credits.
- > Joint Medium Voltage cables; Level 4; 8 Credits.
- > Maintain Direct Current (DC) machines; Level 4; 5 Credits.
- > Maintain low voltage switchgear; Level 4; 4 Credits.
- > Maintain unit protection devices on transformers; Level 4; 6 Credits.
- > Troubleshoot on programmable logic controllers; Level 4; 5 Credits.
- > Fault find and repair the electrical system of a conveyor installation; Level 4; 5 Credits.
- > Maintain and repair Medium Voltage Switchgear; Level 4; 7 Credits.
- > Apply the principles of energy efficiency; Level 4; 4 Credits.

**Specialisation Area 6:****Transport:****Unit Standard Title; Level; Credits:**

- > Control electrical networks from a control centre; Level 4; 14 Credits.
- > Inspect, test and maintain 3-kV DC high-speed circuit breaker(HSCB) in traction sub-stations; Level 4; 8 Credits.
- > Inspect, test and maintain 3-kV DC rectifiers and associated equipment in traction sub-stations; Level 4; 8 Credits.
- > Inspect, test and maintain 3-kV DC busbar chamber and associated equipment in traction sub-stations; Level 4; 8 Credits.
- > Inspect, test and maintain earthing and negative return systems on 3-kV DC traction substations; Level 3; 7 Credits.
- > Inspect, test and maintain 3-kV DC regeneration equipment in traction sub-stations; Level 5; 8 Credits.
- > Fault find and repair a stand-alone battery charging wind turbine; Level 4; 5 Credits.
- > Inspect, maintain, repair and do faultfinding on Medium/High Voltage networks; Level 4; 8 Credits.
- > Inspect, record and report condition of Medium/High Voltage station apparatus and related equipment; Level 4; 6 Credits.
- > Install and terminate Medium Voltage cables; Level 4; 6 Credits.
- > Joint Medium Voltage cables; Level 4; 8 Credits.
- > Maintain low voltage switchgear; Level 4; 4 Credits.
- > Maintain unit protection devices on transformers; Level 4; 6 Credits.
- > Troubleshoot on programmable logic controllers; Level 4; 5 Credits.

**EXIT LEVEL OUTCOMES**

1. Install and commission electrical equipment in integrated systems.
2. Demonstrate the ability to test, fault find, maintain and repair electrical equipment and installations in integrated systems.

3. Demonstrate operational knowledge of mathematical, technological and theoretical concepts during the execution of tasks with an ability to read, interpret technical drawings, sketch electrical/electronic wiring diagrams applicable to integrated systems.

4. Demonstrate the ability to gather and interpret information from a range of sources and apply solutions to familiar problems related to working in the electrical engineering field with some scope for personal decision-making and responsibility.

Critical Cross-Field Outcomes:

These are embedded in the unit standards, which make up the qualification and are thus also reflected in the Exit Level Outcomes of the qualification.

The critical cross-field outcomes are supported by the exit level outcomes as follows:

Identifying and solving problems in which responses display that responsible decisions using critical thinking have been made:

Solving problems related to the installation and maintenance of electrical machinery, components and circuits.

Working effectively with others as a member of a team, group, organization and community:

- > All tasks and work-related experience are performed within a team environment.
- > Taking into account, the safety of others.
- > Communicating with production, quality control and supervisory personnel and/or clients.

Organising and managing oneself and one's activities responsibly and effectively:

- > Related to planning and preparation for installation and maintenance activities.
- > Developing best practice behaviour in work performance and adhering to standard operating procedures.
- > Focussing on housekeeping, safe practices and care and storage of tools and equipment.

Collecting, analyzing, organizing and critically evaluating information:

- > Completion of technical reports related to the job activity.
- > Interpret findings to solve familiar problems during the execution of electrical tasks.

Communicating effectively using visual, mathematical and/or language skills:

- > Execution of commands and completion of technical reports related to the job activity.
- > Communicating as a part of a team.

Using science and technology effectively and critically, showing responsibility toward the environment and health of others:

- > Application of science and technology during the installation and maintenance of electrical machinery, components and circuits.
- > Relating to the safety of others and paying attention to environmental issues.
- > Solving problems and applying science and technology to the job activity.

Demonstrate an understanding of the world as a set of related systems by recognizing that problem contexts do not exist in isolation:

- > Integrating the task with the functionality of electrical installations.
- > Solving problems through the integration of various sources of information.
- > Demonstrating and understanding of related systems through the use of general and specific channels of communication when dealing with peers, production, quality control and supervisory personnel and/or clients.

#### **ASSOCIATED ASSESSMENT CRITERIA**

Associated Assessment Criteria for Exit-Level-Outcome 1:

- 1.1 Skills and ability to install and commission integrated systems are demonstrated according to work instructions and manufacturers' operational specifications.
- 1.2 Cables and conductors are installed, joined, terminated and tested for integrated systems.
- 1.3 Components and equipment are joined in integrated systems.

Associated Assessment Criteria for Exit-Level-Outcome 2:

- 2.1 Integrated systems are isolated and made secure.
- 2.2 Solutions to problems are demonstrated during the fault finding, testing and commissioning processes and are based on a clear analysis of information gathered through the use of diagnostic procedures.
- 2.3 Skills and ability to test, overhaul and commission integrated systems are demonstrated according to work instructions and manufacturers' operational specifications.

Associated Assessment Criteria for Exit-Level-Outcome 3:

- 3.1 Advanced principles of electricity are applied.
- 3.2 Integrated system, electrical drawings and diagrams are read and interpreted.
- 3.3 Understanding of the principle and operation of electrical components utilised in integrated systems is demonstrated.

Associated Assessment Criteria for Exit-Level-Outcome 4:

- 4.1 Own work is planned and scheduled in terms of productivity, safety, health and the environment.
- 4.2 A variety of common problems, both familiar and unfamiliar are solved by applying knowledge of advanced electrical theory and practice.
- 4.3 Responsibility for own actions is demonstrated within sphere of operation.
- 4.4 Effective interaction and communication is conducted with clients, colleagues and management.
- 4.5 Knowledge of and application of statutory requirements is demonstrated as they relate to integrated systems.

Integrated Assessment:

Integrated assessment during the implementation of this qualification provides an opportunity for learners to show that they are able to integrate knowledge, skills and values integral to a range of unit standards and practical contexts. Some assessment aspects will demand practical demonstration.

Assessors will be required to collect evidence of the learner's competence by:

- > Observing the learner at work (both in primary activities, as well as other interactions) or by relevant simulations.
- > Asking questions and initiating formative discussions to assess understanding.
- > Evaluating records and reports.

Learners may choose in which language they want to be assessed. This should be established as part of a process of preparing the learner for assessment and familiarising the learner with the approach.

### **INTERNATIONAL COMPARABILITY**

This qualification forms part of a progression across the three levels of the Further Education and Training band. The international comparability section for the field of Electrical Engineering applies to Levels 2, 3 and 4 of the qualification series.

The qualification series was compared to similar outcomes-based qualifications in New Zealand, Australia, United Kingdom, and to some African countries in the Southern African Development Community (SADC); Mozambique, Namibia, Botswana, Zimbabwe, as well as countries in the East African Community (EAC); Kenya, Tanzania and Uganda.

#### **SADC:**

Mozambique, Zimbabwe and Zambia:

Amongst the Southern African Development Community (SADC) there are countries which align with the United Kingdom's model of Vocational Education and Training (VET), through the London City and Guilds qualification framework and the National Vocational Qualification system (NVQ). Despite the fact that SADC countries are not as industrialised as the United Kingdom, it could be concluded that countries using the British qualifications compare favourably to similar South African qualifications as discussed under the U.K. section. In all SADC countries researched, none currently have an active training infrastructure in electrical engineering.

#### **Botswana:**

The Botswana Training Authority website provides information on the development and co-ordination of an integrated and standards-based vocational training system. At this present time, focus on the development of standards-based qualifications through a Botswana Vocation Education and Training System (BVET) has focused on the Wholesale and Retail and Tourism sectors.

Currently, electricians in Botswana are trained through the apprenticeship system. The length and duration of the practical and theoretical components differ slightly to the South African apprenticeship system, but the learning competencies are similar, with a focus on the predominant diamond mining and small local manufacturing and engineering industries.

#### **Namibia:**

There are currently no qualifications or unit standards for electrical training registered on the Namibian Training Framework.

#### **EAC:**

In Kenya, Tanzania, and Uganda, the three member states of the East African Community (EAC), no comparable qualification systems and related infrastructure could be identified.

Through enquiry and research in the Mining and Chemical sectors, it has been established that training, in the field of electrical engineering, of foreign nationals from Mozambique, Nigeria, Tanzania as well as, Zambia and Zimbabwe employed in International companies, takes place in South Africa. These candidates are trained in-house and achieve company certificates for Unit Standards completed.

#### **New Zealand:**



The South African 'National Certificate: Electrical Engineering NQF Level 2 has elements of both Levels 2 and 3 of the NZ 'National Certificate in Electrical Engineering'. Although NZ qualifications are also unit standard based, the focus of the NZ unit standards at Level 2 [NQF Ref:0174] and 3 [NQF Ref:0223] is largely on knowledge acquisition whereas the practical competencies are assessed only at Level 4.

In New Zealand, a learner could register for the Level 4 qualification over a 3-4 year period and be awarded the Level 2 and 3 certificates as well because the Level 4 NZ qualification shares credit/unit standards with both levels 2 and 3 qualifications. Holders of the NZ National Certificate in Electrical Engineering (Electrician for Registration) (Level 4) [NQF Ref: 1195] can apply to the Electrical Workers Registration Board (EWRB) for electrical registration and practising license. The SA Electrical.

Engineering qualifications in comparison require competencies achieved at levels 2 and 3 or through RPL processes to gain entry to Level 4 and a further trade test before full licensing is achieved. The NZ Level 5 qualification [NQF Ref: 0951] focuses mainly on management skills and business skills in the elective component but the core electrical unit standards are similar to the level of those in the SA Level 4 qualification.

#### United Kingdom:

To qualify as an electrician in the U.K. the learner must have the Electrotechnical Services NVQ at Level 3, which is awarded by City and Guilds (2356) and EMTA Awards Limited. As another option in England, Wales and Northern Ireland, an apprentice between the ages of 16-19 may sign up with an electrical contractor or building company. An alternative for those not eligible for apprenticeship or direct access into the NVQ is the City and Guilds (2330) Technical Certificate in

Electrotechnical Technology Levels 2 and 3 at a college. Graduates would then need to gain employment in the industry to complete the NVQ. These technical certificates would compare with the SA National certificates: Electrical Engineering Levels 2 and 3. The NVQ (Level 3) compares with the SA Level 4 qualification.

#### Australia:

The following information was obtained on the website: <http://www.ntis.au> (National Information Training System) with regards to qualifications in electrical engineering training streams in Australia.

"Australian Apprenticeships" is the new name for the scheme formerly known as 'New Apprenticeships'.

Australian Apprenticeships encompass all apprenticeships and traineeships. They combine time at work with training and can be full-time, part-time or school-based. The change of name and appearance is the first step in a range of improvements to be introduced in Australian Apprenticeships. The qualifications for electricians cover:

- > ASCO4311-11: General Electrician.
- > ANZSCO341111: Electrician (General).

#### Comments:

> Apprenticeships and VET programmes: In all the examples found, learning is vocational-based. In some countries (England, Scotland, New Zealand and Australia) these are called "modern apprenticeships". These take the form of two categories, namely a programme-led apprenticeship where learners are able to follow a vocational programme at a college and then

seek employment as trainees/apprentice/interns in order to qualify as artisans; and an employer-led apprenticeship, in which learners are engaged in a formal contract of learning and most learning is workplace-based. In most cases learners "earn while they learn".

> International qualifications researched, do not lead to three different qualifications, but in most cases culminate in one qualification over a four-year period. It is only in the vocational context, that we find the tendency to "break up" the traditional trades into levels of learning. This practice is endemic of those countries which have a close association with outcomes-based methodology and standards-based qualifications development.

### **ARTICULATION OPTIONS**

The Qualification has been designed and structured so that qualifying learners can move from one engineering context to another. This can be achieved by the appropriate selection of credits in the elective category. Equally, holders of other similar fitting Qualifications may be evaluated against this Qualification for the purpose of RPL.

Vertical articulation may exist (wholly or in part) in the HET band on application by the individual.

Horizontal articulation:

Fundamental learning at this level applies to equivalent credit accrual for most engineering qualifications at NQF Level 4.

Core learning at this level applies to equivalent credit accrual for some unit standards in the following qualification:

SAQA ID No: 50371: National Certificate in Domestic Appliance Repair at NQF Level 4.

Other horizontal articulation options may exist and need further investigation in cases where recognition of prior learning is sought.

### **MODERATION OPTIONS**

> Anyone assessing a learner against this qualification must be registered as an assessor with a relevant ETQA.

> Any institution or learning provider offering learning towards the achievement of this qualification should be accredited as a provider with a relevant ETQA.

> Moderation of assessment should be overseen by a relevant ETQA according to the moderation guidelines provided for in this qualification as well as the agreed ETQA guidelines.

### **CRITERIA FOR THE REGISTRATION OF ASSESSORS**

The following criteria should be applied by a relevant ETQA as a minimum requirement:

Assessors should be in possession of an appropriate qualification, namely:

- > Electrical Engineering at NQF level 4 and a minimum of 2 years related experience.
- > An artisan qualification in Electrical Engineering (Trade test certificate or completed contract of apprenticeship) with a minimum of 2 years related experience.
- > Subject matter experience of at least five years, which may be established through recognition of prior learning (RPL).

Evidence of competency in a unit standard related to assessment theory, processes and practices.

### **NOTES**

This qualification replaces qualification 48474, "National Certificate: Electrical Engineering", Level 4, 134 credits.

A generic qualification was developed to give meaning to NQF objectives to provide articulation possibilities, enable learners to get recognition for learning achievements across economic sub-sectors and to support the notion of life long learning.

### UNIT STANDARDS

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Fundamental	119472	Accommodate audience and context needs in oral/signed communication	Level 3	5
Fundamental	119457	Interpret and use information from texts	Level 3	5
Fundamental	119467	Use language and communication in occupational learning programmes	Level 3	5
Fundamental	119465	Write/present/sign texts for a range of communicative contexts	Level 3	5
Fundamental	9015	Apply knowledge of statistics and probability to critically interrogate and effectively communicate findings on life related problems	Level 4	6
Fundamental	119462	Engage in sustained oral/signed communication and evaluate spoken/signed texts	Level 4	5
Fundamental	119469	Read/view, analyse and respond to a variety of texts	Level 4	5
Fundamental	9016	Represent analyse and calculate shape and motion in 2- and 3-dimensional space in different contexts	Level 4	4
Fundamental	119471	Use language and communication in occupational learning programmes	Level 4	5
Fundamental	7468	Use mathematics to investigate and monitor the financial aspects of personal, business, national and international issues	Level 4	6
Fundamental	119459	Write/present/sign for a wide range of contexts	Level 4	5
Core	113899	Demonstrate an understanding of basic programmable logic controllers	Level 3	6
Core	259200	Design, construct and commission three phase electrical circuits	Level 4	10
Core	259217	Install and commission AC machines and control gear	Level 4	8
Core	259177	Maintain, test and repair AC machines and control gear	Level 4	12
Core	259197	Test and inspect a three phase industrial/commercial installation	Level 4	10
Core	113873	Understand basic electrical and mechanical engineering principles	Level 4	8
Elective	10639	Advance or retreat electrical reticulation in an underground coal section	Level 3	6
Elective	259218	Apply the principles of energy efficiency	Level 4	4
Elective	259237	Carry out work on energised medium voltage networks	Level 4	16
Elective	113898	Complete certificate of compliance for a single phase domestic installation	Level 4	5
Elective	259184	Construct, maintain and dismantle High Voltage overhead networks	Level 4	20
Elective	116434	Control electrical networks from a control centre	Level 4	10
Elective	113901	Demonstrate an understanding of process communication systems	Level 4	8
Elective	113892	Design a solar pump system	Level 4	4
Elective	113888	Design a stand alone renewable energy system	Level 4	10
Elective	113890	Design a wind/solar hybrid system	Level 4	5
Elective	259179	Fault find a medium voltage reticulation system	Level 4	4
Elective	113884	Fault find and repair a stand-alone battery charging wind turbine	Level 4	5
Elective	259185	Fault find and repair the electrical system of a conveyor installation	Level 4	5
Elective	259193	Fault find and repair the electrical system of a surface mining production machine	Level 4	4
Elective	259180	Fault-find and repair a DC powered machine	Level 4	6
Elective	259183	Fault-find and repair the electrical system of winder installations	Level 4	4

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Elective	259207	Inspect, record and report condition of Medium/High Voltage station apparatus and related equipment	Level 4	6
Elective	259198	Inspect, test and maintain 3-kV DC busbar chamber and associated equipment in traction sub-stations	Level 4	8
Elective	259195	Inspect, test and maintain 3-kV DC high-speed circuit breaker(HSCB) in traction sub-stations	Level 4	8
Elective	259194	Inspect, test and maintain 3-kV DC rectifiers and associated equipment in traction sub-stations	Level 4	8
Elective	259205	Inspect, test and maintain Medium/High Voltage earthing systems	Level 4	4
Elective	259191	Inspect, test and maintain Medium/High Voltage transformers	Level 4	6
Elective	259199	Inspect, test and maintain earthing and negative return systems on 3-kV DC traction substations	Level 4	7
Elective	259202	Inspect, test and maintain high voltage isolators	Level 4	12
Elective	259188	Install and commission direct current (DC) machines	Level 4	8
Elective	259187	Install and terminate Medium Voltage cables	Level 4	6
Elective	259196	Install, connect and commission a stand-alone battery charging wind turbine	Level 4	8
Elective	259206	Install/replace medium/high voltage equipment and hardware	Level 4	6
Elective	259189	Joint Medium Voltage cables	Level 4	8
Elective	113885	Lower, inspect service and maintain a stand-alone battery charging wind turbine	Level 4	5
Elective	259201	Maintain Direct Current machines and control gear	Level 4	5
Elective	259186	Maintain and repair Medium Voltage Switchgear	Level 4	7
Elective	13818	Maintain low voltage switchgear	Level 4	4
Elective	259192	Maintain unit protection devices on transformers	Level 4	6
Elective	259181	Operate on High Voltage networks	Level 4	20
Elective	259204	Operate on Medium Voltage networks	Level 4	20
Elective	259182	Select a back-up generator for a stand-alone renewable energy system	Level 4	4
Elective	259178	Spray-wash energised Medium/High Voltage networks	Level 4	4
Elective	113897	Troubleshoot on programmable logic controllers	Level 4	5
Elective	259190	Inspect, test and maintain 3-kV DC regeneration equipment in traction sub-stations	Level 5	8

**LEARNING PROGRAMMES RECORDED AGAINST THIS QUALIFICATION**

**None**



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

## UNIT STANDARD:

*Maintain, test and repair AC machines and control gear*

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259177	Maintain, test and repair AC machines and control gear		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Electrical Engineering & Construction			
<b>FIELD</b>		<b>SUBFIELD</b>	
12 - Physical Planning and Construction		Electrical Infrastructure Construction	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	12

*This unit standard replaces:*

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
10262	Maintain and repair three phase AC machines and control gear	Level 4	12	Will occur as soon as 259177 is registered

**SPECIFIC OUTCOME 1**

Prepare to maintain and repair AC machines and control gear.

**SPECIFIC OUTCOME 2**

Maintain AC machines and control gear.

**SPECIFIC OUTCOME 3**

Carry out fault finding and repairs on AC machines and control gear.

**SPECIFIC OUTCOME 4**

Conclude maintenance and repairs on AC machines and control gear.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Core	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Spray-wash energised Medium/High Voltage networks***

SAQA US ID	UNIT STANDARD TITLE		
259178	Spray-wash energised Medium/High Voltage networks		
ORIGINATOR	PROVIDER		
SGB Electrical Engineering & Construction			
FIELD	SUBFIELD		
12 - Physical Planning and Construction	Electrical Infrastructure Construction		
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 4	4

***This unit standard replaces:***

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
113878	Spray-wash energised medium / high voltage networks	Level 4	4	Will occur as soon as 259178 is registered

**SPECIFIC OUTCOME 1**

Plan to spray-wash energised Medium/High Voltage networks.

**SPECIFIC OUTCOME 2**

Prepare to spray-wash energised Medium/High Voltage networks.

**SPECIFIC OUTCOME 3**

Remove pollution from Medium/High Voltage networks with high pressure spray-wash plant.

**SPECIFIC OUTCOME 4**

Complete the work task.

**SPECIFIC OUTCOME 5**

Carry out routine inspections and tests of spray-wash equipment used on energised Medium/High Voltage networks.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Fault find a medium voltage reticulation system***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259179	Fault find a medium voltage reticulation system		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Electrical Engineering & Construction			
<b>FIELD</b>	<b>SUBFIELD</b>		
12 - Physical Planning and Construction	Electrical Infrastructure Construction		
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	4

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Explain the factors critical to fault finding a medium voltage reticulation system.

**SPECIFIC OUTCOME 2**

Prepare to fault find a medium voltage reticulation system.

**SPECIFIC OUTCOME 3**

Fault find the medium voltage reticulation system.

**SPECIFIC OUTCOME 4**

Complete the fault finding process and perform reporting duties.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Fault-find and repair a DC powered machine***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259180	Fault-find and repair a DC powered machine		
<b>ORIGINATOR</b>	<b>PROVIDER</b>		
SGB Electrical Engineering & Construction			
<b>FIELD</b>	<b>SUBFIELD</b>		
12 - Physical Planning and Construction	Electrical Infrastructure Construction		
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	6

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Explain the factors critical to fault-finding and repairing DC powered machines.

**SPECIFIC OUTCOME 2**

Prepare to fault-find and repair a DC powered machine.

**SPECIFIC OUTCOME 3**

Fault-find and repair the DC powered machine.

**SPECIFIC OUTCOME 4**

Test the machine and prepare for operation.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4





## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:****Operate on High Voltage networks**

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259181	Operate on High Voltage networks		
<b>ORIGINATOR</b>	<b>PROVIDER</b>		
SGB Electrical Engineering & Construction			
<b>FIELD</b>	<b>SUBFIELD</b>		
12 - Physical Planning and Construction	Electrical Infrastructure Construction		
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	20

*This unit standard does not replace any other unit standard and is not replaced by another unit standard.*

**SPECIFIC OUTCOME 1**

Plan and prepare to operate on High Voltage networks.

**SPECIFIC OUTCOME 2**

Switch apparatus on High Voltage networks.

**SPECIFIC OUTCOME 3**

Link/isolate apparatus on High Voltage networks.

**SPECIFIC OUTCOME 4**

Safety test and earth apparatus on High Voltage networks.

**SPECIFIC OUTCOME 5**

Restore supply to High Voltage networks.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:**

*Select a back-up generator for a stand-alone renewable energy system*

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259182	Select a back-up generator for a stand-alone renewable energy system		
<b>ORIGINATOR</b>	<b>PROVIDER</b>		
SGB Electrical Engineering & Construction			
<b>FIELD</b>	<b>SUBFIELD</b>		
12 - Physical Planning and Construction	Electrical Infrastructure Construction		
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	4

*This unit standard replaces:*

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
116681	Select a back-up generator for a stand-alone renewable energy system	Level 4	4	Will occur as soon as 259182 is registered

**SPECIFIC OUTCOME 1**

Assess wind and solar data to determine the need for a standby generator.

**SPECIFIC OUTCOME 2**

Assess the load to determine the need for a standby generator.

**SPECIFIC OUTCOME 3**

Determine the rating of a standby generator.

**SPECIFIC OUTCOME 4**

Understand and make provision for the logistics in respect of a standby generator.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Fault-find and repair the electrical system of winder installations***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259183	Fault-find and repair the electrical system of winder installations		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Electrical Engineering & Construction			
<b>FIELD</b>		<b>SUBFIELD</b>	
12 - Physical Planning and Construction		Electrical Infrastructure Construction	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	4

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Explain the factors critical to fault-finding and repairing the electrical system of winder installations.

**SPECIFIC OUTCOME 2**

Prepare to fault-find and repair the electrical system of winder installations.

**SPECIFIC OUTCOME 3**

Fault-find and repair the electrical system of winder installations.

**SPECIFIC OUTCOME 4**

Test the electrical system of the winder and prepare for operation.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Construct, maintain and dismantle High Voltage overhead networks***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259184	Construct, maintain and dismantle High Voltage overhead networks		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Electrical Engineering & Construction			
<b>FIELD</b>		<b>SUBFIELD</b>	
12 - Physical Planning and Construction		Electrical Infrastructure Construction	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	20

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Plan and prepare to construct, maintain and dismantle High Voltage networks.

**SPECIFIC OUTCOME 2**

Construct High Voltage networks.

**SPECIFIC OUTCOME 3**

Inspect, maintain and repair High Voltage networks.

**SPECIFIC OUTCOME 4**

Dismantle High Voltage networks.

**SPECIFIC OUTCOME 5**

Complete the work task.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Fault find and repair the electrical system of a conveyor installation***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259185	Fault find and repair the electrical system of a conveyor installation		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Electrical Engineering & Construction			
<b>FIELD</b>		<b>SUBFIELD</b>	
12 - Physical Planning and Construction		Electrical Infrastructure Construction	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	5

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Explain the factors critical to fault finding and repairing the electrical system of conveyor installations.

**SPECIFIC OUTCOME 2**

Prepare to fault find and repair the electrical system of conveyor installations.

**SPECIFIC OUTCOME 3**

Fault find and repair the electrical system of conveyor installations.

**SPECIFIC OUTCOME 4**

Test the repaired electrical system of conveyor installations.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

## UNIT STANDARD:

*Maintain and repair Medium Voltage Switchgear*

SAQA US ID	UNIT STANDARD TITLE		
259186	Maintain and repair Medium Voltage Switchgear		
ORIGINATOR			PROVIDER
SGB Electrical Engineering & Construction			
FIELD			SUBFIELD
12 - Physical Planning and Construction			Electrical Infrastructure Construction
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 4	7

*This unit standard does not replace any other unit standard and is not replaced by another unit standard.*

**SPECIFIC OUTCOME 1**

Explain the requirements of a maintaining and repairing medium voltage switchgear.

**SPECIFIC OUTCOME 2**

Prepare to maintain and repair the switchgear.

**SPECIFIC OUTCOME 3**

Maintain and repair the switchgear.

**SPECIFIC OUTCOME 4**

Test the switchgear and perform reporting and housekeeping duties.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Install and terminate Medium Voltage cables***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259187	Install and terminate Medium Voltage cables		
<b>ORIGINATOR</b>	<b>PROVIDER</b>		
SGB Electrical Engineering & Construction			
<b>FIELD</b>	<b>SUBFIELD</b>		
12 - Physical Planning and Construction	Electrical Infrastructure Construction		
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	6

***This unit standard replaces:***

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
113862	Install and terminate Medium/High Voltage cables	Level 4	6	Will occur as soon as 259187 is registered

**SPECIFIC OUTCOME 1**

Plan to install Medium Voltage cables.

**SPECIFIC OUTCOME 2**

Prepare the Medium Voltage cable ways and work areas.

**SPECIFIC OUTCOME 3**

Install Medium Voltage cables.

**SPECIFIC OUTCOME 4**

Terminate and connect Medium Voltage cables.

**SPECIFIC OUTCOME 5**

Complete the work task.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Install and commission direct current (DC) machines***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259188	Install and commission direct current (DC) machines		
<b>ORIGINATOR</b>	<b>PROVIDER</b>		
SGB Electrical Engineering & Construction			
<b>FIELD</b>	<b>SUBFIELD</b>		
12 - Physical Planning and Construction	Electrical Infrastructure Construction		
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	8

***This unit standard replaces:***

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
13657	Install and commission direct current (DC) machines	Level 4	8	Will occur as soon as 259188 is registered

**SPECIFIC OUTCOME 1**

Plan task and select DC machines.

**SPECIFIC OUTCOME 2**

Install DC machines.

**SPECIFIC OUTCOME 3**

Connect DC machines.

**SPECIFIC OUTCOME 4**

Commission DC machines.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4





## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:****Joint Medium Voltage cables**

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259189	Joint Medium Voltage cables		
<b>ORIGINATOR</b>	<b>PROVIDER</b>		
SGB Electrical Engineering & Construction			
<b>FIELD</b>	<b>SUBFIELD</b>		
12 - Physical Planning and Construction	Electrical Infrastructure Construction		
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	8

**This unit standard replaces:**

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
113874	Joint Medium / High Voltage cables	Level 4	8	Will occur as soon as 259189 is registered

**SPECIFIC OUTCOME 1**

Plan to joint Medium Voltage cable.

**SPECIFIC OUTCOME 2**

Prepare the Medium Voltage cable and work area.

**SPECIFIC OUTCOME 3**

Joint Medium Voltage cable.

**SPECIFIC OUTCOME 4**

Complete the work task.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Inspect, test and maintain 3-kV DC regeneration equipment in traction sub-stations***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259190	Inspect, test and maintain 3-kV DC regeneration equipment in traction sub-stations		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Electrical Engineering & Construction			
<b>FIELD</b>	<b>SUBFIELD</b>		
12 - Physical Planning and Construction	Electrical Infrastructure Construction		
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 5	8

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Plan and prepare for inspection, testing, maintenance and repairs on 3-kV DC regeneration equipment in traction sub-stations.

**SPECIFIC OUTCOME 2**

Communicate clearly and concisely without misunderstanding with relevant role players and complete relevant documentation.

**SPECIFIC OUTCOME 3**

Carry out inspection and tests on 3-kV DC regeneration equipment in traction sub-station.

**SPECIFIC OUTCOME 4**

Carry out maintenance and repairs on 3-kV DC regeneration equipment in traction sub-stations.

**SPECIFIC OUTCOME 5**

Perform function tests and checks on 3-kV DC regeneration equipment in traction sub-stations.

**SPECIFIC OUTCOME 6**

Complete all tasks on 3-kV DC regeneration equipment in traction sub-stations.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Inspect, test and maintain Medium/High Voltage transformers***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259191	Inspect, test and maintain Medium/High Voltage transformers		
<b>ORIGINATOR</b>			<b>PROVIDER</b>
SGB Electrical Engineering & Construction			
<b>FIELD</b>	<b>SUBFIELD</b>		
12 - Physical Planning and Construction	Electrical Infrastructure Construction		
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	6

***This unit standard replaces:***

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
113880	Inspect, test and maintain Medium / High Voltage transformers	Level 4	6	Will occur as soon as 259191 is registered

**SPECIFIC OUTCOME 1**

Plan to maintain Medium/High Voltage transformers.

**SPECIFIC OUTCOME 2**

Prepare to maintain Medium/High Voltage transformers.

**SPECIFIC OUTCOME 3**

Inspect, test and maintain Medium/High Voltage transformers.

**SPECIFIC OUTCOME 4**

Complete Work Task.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:****Maintain unit protection devices on transformers**

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259192	Maintain unit protection devices on transformers		
<b>ORIGINATOR</b>	<b>PROVIDER</b>		
SGB Electrical Engineering & Construction			
<b>FIELD</b>	<b>SUBFIELD</b>		
12 - Physical Planning and Construction	Electrical Infrastructure Construction		
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	6

**This unit standard replaces:**

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
113895	Maintain unit protection devices on transformers	Level 4	6	Will occur as soon as 259192 is registered

**SPECIFIC OUTCOME 1**

Plan to maintain transformer unit protection devices.

**SPECIFIC OUTCOME 2**

Prepare to maintain transformers unit protection devices.

**SPECIFIC OUTCOME 3**

Maintain transformer unit protection devices.

**SPECIFIC OUTCOME 4**

Complete work task.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Fault find and repair the electrical system of a surface mining production machine***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259193	Fault find and repair the electrical system of a surface mining production machine		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Electrical Engineering & Construction			
<b>FIELD</b>		<b>SUBFIELD</b>	
12 - Physical Planning and Construction		Electrical Infrastructure Construction	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	4

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Explain the factors critical to fault find and repair electrical systems of surface mining production machines.

**SPECIFIC OUTCOME 2**

Prepare to fault find and repair the electrical system.

**SPECIFIC OUTCOME 3**

Fault find and repair the electrical system.

**SPECIFIC OUTCOME 4**

Prepare and test the machine for operation.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Inspect, test and maintain 3-kV DC rectifiers and associated equipment in traction sub-stations***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259194	Inspect, test and maintain 3-kV DC rectifiers and associated equipment in traction sub-stations		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Electrical Engineering & Construction			
<b>FIELD</b>		<b>SUBFIELD</b>	
12 - Physical Planning and Construction		Electrical Infrastructure Construction	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	8

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Communicate clearly and concisely without misunderstanding with relevant role players and complete relevant documentation.

**SPECIFIC OUTCOME 2**

Plan and prepare for inspection, testing and maintenance on 3-kV DC rectifiers and associated equipment in traction sub-stations.

**SPECIFIC OUTCOME 3**

Prepare the 3-kV DC rectifiers and associated equipment in traction sub-stations for inspection, tests and maintenance.

**SPECIFIC OUTCOME 4**

Carry out inspection on 3-kV DC rectifiers and associated equipment in traction sub-stations.

**SPECIFIC OUTCOME 5**

Carry out maintenance on 3-kV DC rectifiers and associated equipment in traction sub-stations.

**SPECIFIC OUTCOME 6**

Perform function tests and post-maintenance checks on 3-kV DC rectifiers and associated equipment in traction sub-stations.

**SPECIFIC OUTCOME 7**

Complete all tasks on 3-kV DC rectifiers and associated equipment in traction sub-stations.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Inspect, test and maintain 3-kV DC high-speed circuit breaker(HSCB) in traction sub-stations***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259195	Inspect, test and maintain 3-kV DC high-speed circuit breaker(HSCB) in traction sub-stations		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Electrical Engineering & Construction			
<b>FIELD</b>		<b>SUBFIELD</b>	
12 - Physical Planning and Construction		Electrical Infrastructure Construction	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	8

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Communicate clearly and concisely without misunderstanding with relevant role players and complete relevant documentation.

**SPECIFIC OUTCOME 2**

Plan and prepare for inspection, testing and maintenance on 3-kV DC high-speed circuit breaker (HSCB) in traction sub-stations.

**SPECIFIC OUTCOME 3**

Prepare the 3-kV DC high-speed circuit breaker (HSCB) in traction sub-stations for inspection, tests and maintenance.

**SPECIFIC OUTCOME 4**

Carry out inspection and tests on 3-kV DC high-speed circuit breaker (HSCB) in traction sub-station.

**SPECIFIC OUTCOME 5**

Carry out maintenance on 3-kV DC high-speed circuit breaker (HSCB) in traction sub-stations.

**SPECIFIC OUTCOME 6**

Perform function tests and post-maintenance checks on 3-kV DC high-speed circuit breaker (HSCB) in traction sub-stations.

**SPECIFIC OUTCOME 7**

Complete all tasks on 3-kV DC high-speed circuit breaker (HSCB) in traction sub-stations.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
-----------	----------------------------	--------------

---

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4





## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Install, connect and commission a stand-alone battery charging wind turbine***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259196	Install, connect and commission a stand-alone battery charging wind turbine		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Electrical Engineering & Construction			
<b>FIELD</b>		<b>SUBFIELD</b>	
12 - Physical Planning and Construction		Electrical Infrastructure Construction	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	8

***This unit standard replaces:***

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
116679	Install, connect and commission a stand-alone battery charging wind turbine	Level 4	8	Will occur as soon as 259196 is registered

**SPECIFIC OUTCOME 1**

Plan to install, connect and commission a wind turbine.

**SPECIFIC OUTCOME 2**

Prepare to install, connect and commission a wind turbine.

**SPECIFIC OUTCOME 3**

Install and connect a wind turbine.

**SPECIFIC OUTCOME 4**

Connect wind turbine to charge regulator.

**SPECIFIC OUTCOME 5**

Commission a wind turbine.

**SPECIFIC OUTCOME 6**

Complete installation, connection and commissioning of a wind turbine.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Test and inspect a three phase industrial/commercial installation***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259197	Test and inspect a three phase industrial/commercial installation		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Electrical Engineering & Construction			
<b>FIELD</b>		<b>SUBFIELD</b>	
12 - Physical Planning and Construction		Electrical Infrastructure Construction	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	10

***This unit standard replaces:***

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
113894	Test and inspect a three phase industrial/commercial installation	Level 4	10	Will occur as soon as 259197 is registered

**SPECIFIC OUTCOME 1**

Plan the electrical installation tests to be done.

**SPECIFIC OUTCOME 2**

Inspect the electrical installation.

**SPECIFIC OUTCOME 3**

Test the electrical installation.

**SPECIFIC OUTCOME 4**

Complete the required test and inspection documentation.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Core	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:**

***Inspect, test and maintain 3-kV DC busbar chamber and associated equipment in traction sub-stations***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259198	Inspect, test and maintain 3-kV DC busbar chamber and associated equipment in traction sub-stations		
<b>ORIGINATOR</b>			<b>PROVIDER</b>
SGB Electrical Engineering & Construction			
<b>FIELD</b>			<b>SUBFIELD</b>
12 - Physical Planning and Construction			Electrical Infrastructure Construction
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	8

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Communicate clearly and concisely without misunderstanding with relevant role players and complete relevant documentation.

**SPECIFIC OUTCOME 2**

Plan and prepare for inspection, testing and maintenance on 3-kV DC rectifiers and associated equipment in traction sub-stations.

**SPECIFIC OUTCOME 3**

Prepare the 3-kV DC rectifiers and associated equipment in traction sub-stations for inspection, tests and maintenance.

**SPECIFIC OUTCOME 4**

Carry out inspection on 3-kV DC rectifiers and associated equipment in traction sub-stations.

**SPECIFIC OUTCOME 5**

Carry out maintenance on 3-kV DC rectifiers and associated equipment in traction sub-stations.

**SPECIFIC OUTCOME 6**

Perform function tests and post-maintenance checks on 3-kV DC rectifiers and associated equipment in traction sub-stations.

**SPECIFIC OUTCOME 7**

Complete all tasks on 3-kV DC rectifiers and associated equipment in traction sub-stations.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:**

***Inspect, test and maintain earthing and negative return systems on 3-kV DC traction substations***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259199	Inspect, test and maintain earthing and negative return systems on 3-kV DC traction substations		
<b>ORIGINATOR</b>			<b>PROVIDER</b>
SGB Electrical Engineering & Construction			
<b>FIELD</b>	<b>SUBFIELD</b>		
12 - Physical Planning and Construction	Electrical Infrastructure Construction		
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	7

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Communicate clearly and concisely without misunderstanding with relevant role players and complete relevant documentation.

**SPECIFIC OUTCOME 2**

Plan to maintain earthing and negative return systems on 3-kV DC traction substations.

**SPECIFIC OUTCOME 3**

Prepare to maintain earthing and negative return systems on 3-kV DC traction substations.

**SPECIFIC OUTCOME 4**

Inspect and maintain earthing and negative return systems on 3-kV DC traction substations.

**SPECIFIC OUTCOME 5**

Complete work task.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Design, construct and commission three phase electrical circuits***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259200	Design, construct and commission three phase electrical circuits		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Electrical Engineering & Construction			
<b>FIELD</b>		<b>SUBFIELD</b>	
12 - Physical Planning and Construction		Electrical Infrastructure Construction	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	10

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Design a three phase Circuit diagram.

**SPECIFIC OUTCOME 2**

Plan work task.

**SPECIFIC OUTCOME 3**

Construct three phase electrical circuits.

**SPECIFIC OUTCOME 4**

Commission three phase electrical circuits.

**SPECIFIC OUTCOME 5**

Complete work task.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Core	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Maintain Direct Current machines and control gear***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259201	Maintain Direct Current machines and control gear		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Electrical Engineering & Construction			
<b>FIELD</b>		<b>SUBFIELD</b>	
12 - Physical Planning and Construction		Electrical Infrastructure Construction	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	5

***This unit standard replaces:***

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
13682	Maintain Direct Current (DC) machines	Level 4	5	Will occur as soon as 259201 is registered

**SPECIFIC OUTCOME 1**

Plan the maintenance task.

**SPECIFIC OUTCOME 2**

Prepare the work area.

**SPECIFIC OUTCOME 3**

Repair DC machines and control gear.

**SPECIFIC OUTCOME 4**

Complete the maintenance activity.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:***Inspect, test and maintain high voltage isolators*

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259202	Inspect, test and maintain high voltage isolators		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Electrical Engineering & Construction			
<b>FIELD</b>		<b>SUBFIELD</b>	
12 - Physical Planning and Construction		Electrical Infrastructure Construction	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	12

***This unit standard replaces:***

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
13681	Inspect, test and maintain high voltage isolators	Level 4	12	Will occur as soon as 259202 is registered

**SPECIFIC OUTCOME 1**

Plan and prepare for inspection, testing and maintenance on high voltage isolators.

**SPECIFIC OUTCOME 2**

Carry out inspection and tests on switch gear.

**SPECIFIC OUTCOME 3**

Carry out maintenance on Isolators.

**SPECIFIC OUTCOME 4**

Perform function tests and post-maintenance checks.

**SPECIFIC OUTCOME 5**

Complete all tasks on isolators.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:****Operate on Medium Voltage networks**

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259204	Operate on Medium Voltage networks		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Electrical Engineering & Construction			
<b>FIELD</b>		<b>SUBFIELD</b>	
12 - Physical Planning and Construction		Electrical Infrastructure Construction	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	20

**This unit standard replaces:**

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
113900	Operate on Medium Voltage radial networks	Level 4	20	Will occur as soon as 259204 is registered

**SPECIFIC OUTCOME 1**

Plan and prepare to operate on Medium Voltage networks.

**SPECIFIC OUTCOME 2**

Switch apparatus on Medium Voltage networks.

**SPECIFIC OUTCOME 3**

Link/isolate apparatus on Medium Voltage networks.

**SPECIFIC OUTCOME 4**

Safety test and earth apparatus on Medium Voltage networks.

**SPECIFIC OUTCOME 5**

Restore supply to Medium Voltage networks.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4





## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Inspect, test and maintain Medium/High Voltage earthing systems***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259205	Inspect, test and maintain Medium/High Voltage earthing systems		
<b>ORIGINATOR</b>	<b>PROVIDER</b>		
SGB Electrical Engineering & Construction			
<b>FIELD</b>	<b>SUBFIELD</b>		
12 - Physical Planning and Construction	Electrical Infrastructure Construction		
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	4

***This unit standard replaces:***

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
113882	Inspect, test and maintain Medium / High Voltage earthing systems	Level 4	4	Will occur as soon as 259205 is registered

**SPECIFIC OUTCOME 1**

Plan and prepare to inspect, test and maintain/repair Medium/High Voltage earthing systems.

**SPECIFIC OUTCOME 2**

Inspect Medium/High Voltage earthing grids/networks.

**SPECIFIC OUTCOME 3**

Test Medium/High Voltage earthing grids/networks.

**SPECIFIC OUTCOME 4**

Maintain and repair/replace earthing on Medium/High Voltage networks.

**SPECIFIC OUTCOME 5**

Complete the work task.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

## UNIT STANDARD:

*Install/replace medium/high voltage equipment and hardware*

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259206	Install/replace medium/high voltage equipment and hardware		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Electrical Engineering & Construction			
<b>FIELD</b>		<b>SUBFIELD</b>	
12 - Physical Planning and Construction		Electrical Infrastructure Construction	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	6

*This unit standard replaces:*

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
113883	Install / replace medium / high voltage equipment and hardware	Level 4	6	Will occur as soon as 259206 is registered

**SPECIFIC OUTCOME 1**

Plan to install Medium/High Voltage equipment.

**SPECIFIC OUTCOME 2**

Prepare to install Medium/High Voltage equipment.

**SPECIFIC OUTCOME 3**

Remove Medium/High Voltage equipment.

**SPECIFIC OUTCOME 4**

Install Medium/High Voltage equipment.

**SPECIFIC OUTCOME 5**

Complete work task.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:**

***Inspect, record and report condition of Medium/High Voltage station apparatus and related equipment***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259207	Inspect, record and report condition of Medium/High Voltage station apparatus and related equipment		
<b>ORIGINATOR</b>			<b>PROVIDER</b>
SGB Electrical Engineering & Construction			
<b>FIELD</b>			<b>SUBFIELD</b>
12 - Physical Planning and Construction			Electrical Infrastructure Construction
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	6

***This unit standard replaces:***

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
113969	Inspect, record and report condition of Medium / High Voltage station apparatus and related equipment	Level 4	6	Will occur as soon as 259207 is registered

**SPECIFIC OUTCOME 1**

Plan and prepare to inspect Medium/High Voltage station apparatus and related equipment.

**SPECIFIC OUTCOME 2**

Inspect and identify defects on Medium/High Voltage station apparatus and associated hardware.

**SPECIFIC OUTCOME 3**

Inspect, record readings and carry out functional tests on Medium/High Voltage station.

**SPECIFIC OUTCOME 4**

Complete the work task.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

## UNIT STANDARD:

*Install and commission AC machines and control gear*

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259217	Install and commission AC machines and control gear		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Electrical Engineering & Construction			
<b>FIELD</b>		<b>SUBFIELD</b>	
12 - Physical Planning and Construction		Electrical Infrastructure Construction	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	8

*This unit standard replaces:*

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
10264	Install and commission three phase AC machines and control gear	Level 4	8	Will occur as soon as 259217 is registered

**SPECIFIC OUTCOME 1**

Plan to install and commission AC machines and control gear.

**SPECIFIC OUTCOME 2**

Prepare to install, connect and commission AC machines and control gear.

**SPECIFIC OUTCOME 3**

Install A.C. machines and control gear.

**SPECIFIC OUTCOME 4**

Connect A.C. machines and control gear.

**SPECIFIC OUTCOME 5**

Commission AC machines and control gear.

**SPECIFIC OUTCOME 6**

Complete installation, connection and commissioning of AC machines and control gear.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Core	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:***Apply the principles of energy efficiency*

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259218	Apply the principles of energy efficiency		
<b>ORIGINATOR</b>			<b>PROVIDER</b>
SGB Electrical Engineering & Construction			
<b>FIELD</b>			<b>SUBFIELD</b>
12 - Physical Planning and Construction			Electrical Infrastructure Construction
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	4

*This unit standard replaces:*

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
113968	Apply the principles of energy efficiency	Level 4	6	Will occur as soon as 259218 is registered

**SPECIFIC OUTCOME 1**

Understand and select energy efficient devices.

**SPECIFIC OUTCOME 2**

An energy audit.

**SPECIFIC OUTCOME 3**

Energy management.

**SPECIFIC OUTCOME 4**

An understanding of the importance of system design.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:****Carry out work on energised medium voltage networks**

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259237	Carry out work on energised medium voltage networks		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Electrical Engineering & Construction			
<b>FIELD</b>		<b>SUBFIELD</b>	
12 - Physical Planning and Construction		Electrical Infrastructure Construction	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	16

**This unit standard replaces:**

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
114604	Carry out work on energised medium voltage networks	Level 4	16	Will occur as soon as 259237 is registered

**SPECIFIC OUTCOME 1**

Prepare to work on energised Medium Voltage networks.

**SPECIFIC OUTCOME 2**

Carry out work on energised Medium Voltage networks.

**SPECIFIC OUTCOME 3**

Complete the work task.

**SPECIFIC OUTCOME 4**

Carry out routine inspections, maintenance and testing of insulated/insulating and lifting equipment used for work on energised Medium Voltage networks.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Elective	63889	Further Education and Training Certificate: Electrical Engineering	Level 4

No. 989

22 September 2008

**SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)**

In accordance with Regulation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the Task Team for

**Computer Sciences and Information Systems**

registered by Organising Field 10, Physical, Mathematical, Computer and Life Sciences, publishes the following Qualification and Unit Standards for public comment.

This notice contains the title, field, sub-field, NQF level, credits, and purpose of the Qualification and Unit Standards. The full Qualification and Unit Standards can be accessed via the SAQA web-site at [www.saqqa.org.za](http://www.saqqa.org.za). Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, SAQA House, 1067 Arcadia Street, Hatfield, Pretoria.

Comment on the Qualification and Unit Standards should reach SAQA at the address below and **no later than 22 October 2008**. All correspondence should be marked **Standards Setting – SGB for Computer Sciences and Information Systems** and addressed to

The Director: Standards Setting and Development  
SAQA  
*Attention: Mr. D. Mphuthing*  
Postnet Suite 248  
Private Bag X06  
Waterkloof  
0145  
or faxed to 012 – 431-5144  
e-mail: [dmphuthing@saqa.org.za](mailto:dmphuthing@saqa.org.za)

**DR. S. BHIKHA**  
**DIRECTOR: STANDARDS SETTING AND DEVELOPMENT**



**SOUTH AFRICAN QUALIFICATIONS AUTHORITY**

**QUALIFICATION:  
National Certificate: Business Analysis**

SAQA QUAL ID	QUALIFICATION TITLE		
63909	National Certificate: Business Analysis		
ORIGINATOR		PROVIDER	
SGB Computer Sciences and Information Systems			
QUALIFICATION TYPE	FIELD	SUBFIELD	
National Certificate	10 - Physical, Mathematical, Computer and Life Sciences	Information Technology and Computer Sciences	
ABET BAND	MINIMUM CREDITS	NQF LEVEL	QUAL CLASS
Undefined	169	Level 6	Regular-Unit Stds Based

*This qualification does not replace any other qualification and is not replaced by another qualification.*

**PURPOSE AND RATIONALE OF THE QUALIFICATION**

Purpose:

Business analysis is a vital instrument within the business environment to ensure that information technology is able to provide effective solutions for business enterprises. The development of business analysts through a suite of qualifications will have a positive impact on the broader economy of South Africa. It will also assist with bringing South Africa inline with international trends and satisfy industry requirements.

The qualifying learner will be able to:

- > Analyse a business scenario.
- > Develop a business case.
- > Compile user requirement specifications.
- > Develop functional specifications.
- > Monitor quality assurance activities throughout the life cycle of the project.

Rationale:

A business analyst works as a liaison amongst stakeholders in order to elicit, analyse, communicate and validate requirements for changes to business processes, policies and information systems. The business analyst understands business problems and opportunities in the context of the requirements and recommends solutions that enable the organisation to achieve its goals. Traditionally business analysts were drawn from senior information technology (IT) and business people, whereas this qualification provides lower level access for the development of such competencies. It has also been developed to enable learners to access higher education and provide flexible access to life-long learning.

This qualification provides opportunities for people to engage in further learning towards a specialisation in business analysis or achieve competencies that are portable to other specialisations such as systems development or systems support. This will therefore enable business analysis competencies to be strengthened, and enable individuals who are currently working in a business systems environment, to better contribute to the implementation of



solutions that support the business requirements. The competencies of business analysis have been identified as a target development area for the ICT sector and the South African government. The demand for this qualification is evidenced by these National initiatives as well as international demands and trends. It is intended to empower learners to acquire knowledge, skills, attitudes and values required to operate confidently as individuals in the South African community and to respond to the challenges of the economic environment and changing world of work. Ultimately, this qualification is aimed at improving the productivity and efficiency of business analysts within all sectors in South Africa.

### **RECOGNIZE PREVIOUS LEARNING?**

Y

### **LEARNING ASSUMED IN PLACE**

- > Communication at NQF Level 5.
- > Computer Literacy at NQF Level 5.
- > Knowledge of Business analysis.

Recognition of Prior Learning:

The Qualification may be obtained in whole or in part through the process of Recognition of Prior Learning. Learners who may meet the requirements of any Unit Standard in this Qualification may apply for recognition of prior learning to the Relevant ETQA, and will be assessed against the assessment criteria of the exit level outcomes of this qualification and specific outcomes for the relevant Unit Standard/s.

Anyone wishing to be assessed against this Qualification may apply to be assessed by any assessment agency, assessor or provider institution, which is accredited by the relevant ETQA.

Access to the Qualification:

Open.

### **QUALIFICATION RULES**

All fundamental unit standards to the value of 49 credits must be completed.

All core unit standards to the value of 110 credits must be completed.

Learners must complete additional unit standards from the elective category to the value of at least 10 credits to achieve the full credit value of 169 for this qualification.

### **EXIT LEVEL OUTCOMES**

On completion of this Qualification learners are able to:

1. Analyse a business scenario.
2. Develop a business case.
3. Compile user requirement specifications.
4. Develop functional specifications.
5. Monitor quality assurance activities throughout the life cycle of the project.

Critical Cross-Field Outcomes:

This qualification promotes, in particular, the following critical cross-field outcomes:

Identifying and solving problems in which responses display that responsible decisions using critical and creative thinking have been made when:

> Gathering information for the production of requirements documents and specifying requirements for new business solutions.

Working effectively with others as a member of a team, group, organisation, and community during:

> Working as a member of a multi-disciplinary project team when developing and implementing specifications to achieve the desired product or service.

Organising and managing oneself and one's activities responsibly and effectively when:

> Applying information gathering techniques for business system development.

Communicate effectively using visual, mathematical and/or language in the modes of oral and/or written persuasion when:

> Analysing, interpreting and communicating requirements information through presentations, documents and workshops.

Participating as responsible citizens in the life of local, national and global communities by:

> Demonstrating an awareness of ethics and professionalism.

Collecting, analysing, organising and critically evaluating information when:

> Gathering information to assist with the production of requirements specification.

Using science and technology effectively and critically, showing responsibility towards the environment and health of others when:

> Setting up and perform testing and acceptance procedures.

> Using business system applications and the use of technology to produce documentation and communicate with stakeholders.

Demonstrating an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation when:

> Identifying and interpreting related legislation and its impact on the team, department or division and ensure compliance.

> Impact of industry best practice on business systems environments.

#### **ASSOCIATED ASSESSMENT CRITERIA**

On completion of this Qualification learners are able to:

Associated Assessment Criteria for Exit Level Outcome 1:

1.1 The boundaries and scope of the business are modelled in order to communicate the functioning of a business.

1.2 The business environment is interpreted to reflect the impact of the context and constraints.

1.3 The business facets are identified and specified within different types and contexts of a business.

> Range: Business facets include but are not limited to different types of businesses, ways of operation, structures, type of industry, value chain, generic business processes, regulatory requirements.

1.4 The possibilities for improvement in the organisation are examined to reflect their impact on a business scenario.

Associated Assessment Criteria for Exit Level Outcome 2:

2.1 The business situation is interpreted in order to determine the opportunities and problems of an existing business.

2.2 Solutions are projected for business problems and goals in order to improve the business in accordance with the cost benefit analysis.

2.3 A cost benefit analysis is generated to determine the cost of specific benefits identified as a potential solution.

2.4 A risk analysis is conducted to identify elements that may have a negative impact on the implementation of the proposed solutions.

> Range: Elements include but are not limited to people, financial, political, and environmental.

2.5 A business case is produced integrating the business scenario, solutions, costs and risks.

#### Associated Assessment Criteria for Exit Level Outcome 3:

3.1 The principles of needs analysis are applied to identify the requirements of the business.

3.2 The requirement specification tools are applied in order to document the components of the user requirements specification.

> Range: Tools include but are not limited to principles, techniques, notation standards and methodologies.

3.3 Logical models of the business are generated to facilitate agreement regarding the business requirements.

> Range: Entity relationship, organization structure, process, object, and domain.

3.4 A user requirement specifications is produced in accordance with the business problem.

#### Associated Assessment Criteria for Exit Level Outcome 4:

4.1 The business processes are analysed in order to identify changes and improvements to the business operation.

4.2 Functional models are generated to represent the proposed operation of the business.

4.3 Functional specifications are produced in accordance with business requirements.

4.4 The tools are applied in order to document the components of the functional specification.

> Range: Tools include but are not limited to principles, techniques, notation standards and methodologies.

4.5 The capacity of current technology is analysed to make recommendations regarding solutions.

#### Associated Assessment Criteria for Exit Level Outcome 5:

5.1 Test requirements are discussed in accordance with the functionality of the proposed solution.

5.2 Test reports are analysed to ensure that functionality is achieved.

5.3 Performance of the quality management process is assessed to ensure compliance with the project life cycle.

5.4 The change management proposals are monitored in terms of the project implementation process.

5.5 Assessment activities are performed for continuous improvement of project processes.

#### Integrated Assessment:

Formative assessments conducted during the learning process will consist of written assessments, simulation in a practical environment and a number of self-assessments.

Summative assessment consists of written assessments, assignments and simulation in a practical environment, integrating the assessment of all unit standards and embedded knowledge. Summative assessments is only conducted once the learner has demonstrated proficiency during formative assessment.

In particular assessors should check that the learner is able to demonstrate the ability to consider a range of options and make decisions about:

- > The quality of the observed practical performance as well as the theory and embedded knowledge behind it.
- > The different methods that can be used by the learner to display thinking and decision making in the demonstration of practical performance.
- > Reflexive competencies.
- > The fundamental competencies included in this qualification need to be assessed in an integrated way with the rest of the competencies.

### **INTERNATIONAL COMPARABILITY**

The choice of selected countries in comparative information:

In order to ensure a valid international comparability study three categories of countries were identified: developed countries (United States of America, New Zealand, Australia and England); developing countries outside of Africa (Brazil, India, Turkey, Singapore); and African countries (Nigeria, Egypt, Botswana, Namibia, Ghana and Mauritius).

The inherent multi-disciplinary nature of business analysis makes international comparability challenging because of the various facets that such a qualification can cover. In many of the instances in the African countries, business analysis training takes on the format of high-impact short courses with very limited long-term learning taking place. In some of the developing countries outside of Africa more long-term qualifications in business analysis are offered which allow for a more thorough comparison. The most useful comparison that could be made was with the developed countries, which have well-developed programmes in business analysis. Internationally recognised best practices in business analysis represented by bodies such as the International Institute for Business Analysis (IIBA) and the British Computer Society (BCS) were also compared.

African countries:

Qualification standards in Nigeria, Egypt, Botswana, Namibia, Ghana and Mauritius were examined but only Nigeria was found to have any qualification standards and these were not directly comparable to this business analysis qualification. There are many tertiary institutions throughout Africa that offer qualifications that include business analysis related topics, but these are typically included in a limited way in general Information Technology, Computer Science and Information Systems curricula. Business Analysis is taught in these institutions but no African countries have extracted these into unit standards.

Developing countries outside of Africa:

Most of the information in the developing countries outside of Africa were hard to come by and relates mostly to post-graduate studies. Brazil, India, Turkey, Singapore were examined to find whether they had any business analysis qualification standards. No standards were found to be in place specific to business analysis as the business analysis discipline is usually included with other IT related qualifications.

Developed countries:

United States of America, Australia, New Zealand and United Kingdom were examined to find comparable business analysis qualifications.

USA:

Business Analysis qualification standards in the USA and Canada are primarily governed by the International Institute of Business Analysis (IIBA) which is discussed in the International Best Practices section below.

Australia:

Australia is by far the most advanced country in terms of offering structured qualifications relating to Business Analysis in a multi-disciplinary environment. Business Analysis can be found in the following nationally registered qualification:

> ICA50399 Diploma of Information Technology (Business Analysis).

New Zealand:

New Zealand does not have any business analysis qualification standard but does have several unit standards in place in their various IT diploma qualifications that cover the business analysis discipline and are comparable to this qualification.

England:

Business Analysis qualification standards in the United Kingdom are defined by the British Computer Society (BCS) which is discussed in the International Best Practices section below.

International Best Practice:

Business analysis is a relatively new discipline. International best practice in business analysis is best exemplified by certain internationally recognised organisations. These include:

The International Institute of Business Analysis - IIBA ([www.theiiba.org](http://www.theiiba.org)):

The IIBA mission is: "To develop and maintain standards for the practice of Business Analysis and for the certification of its practitioners". It has formulated a Business Analysis Body of Knowledge (BABOK) which defines the best practices and skills required by a professional business analyst. They have also formulated a certification known as Certified Business Analysis Professional (CBAP). This organisation was chosen for comparison purposes as it is increasingly becoming the internationally recognised standard for defining business analysis activities and skills. It has chapters in more than 90 countries worldwide including USA, UK, Australia, SA, Nigeria, Brazil, India, Turkey, Singapore and Egypt.

The British Computer Society - BCS ([www.bcs.org](http://www.bcs.org)):

Technology education in the UK, outside the universities, has primarily been delegated to the BCS. This organisation is a leading professional body for those working in the IT profession. They have over 60000 members in more than 100 countries including UK, USA, Canada, Singapore, Pakistan and Mauritius. Their qualifications are controlled by the Information Systems Examination Board (ISEB). The ISEB have 2 business analysis qualifications which are directly comparable to this qualification discussed in the table below.

The Nigerian Computer Society - NCS ([www.ncs.org.ng](http://www.ncs.org.ng)):

The NCS is a professional body formed in Nigeria with a specified goal being: "advancement of Computer Science and Information Technology & Systems, their applications and deployments to Professional Practice in education". Their IT related qualification standards are not directly comparable to this qualification as they include the business analysis discipline is included in more general IT qualifications.

Typical qualifications that were benchmarked against this standard are illustrated below:

Organisation:

> IIBA.

Qualification:

> Certified Business Analysis Professional (CBAP).

Content:

- > Business Analysis Planning.
- > Enterprise Analysis.
- > Elicitation.
- > Requirements Analysis.
- > Solution Assessment and Validation.
- > Requirements Analysis and Communication.
- > Fundamentals.

Level 5-7.

Organisation:

> BCS.

Qualification:

> ISEB Certificate in Business Analysis Essentials.

Content:

- > Business strategy.
- > Effective team member.
- > Analyse and model business systems.
- > Assist in development of business case.
- > Identify business requirements.

Level 5.

Qualification:

> ISEB Diploma in Business Analysis.

Content:

- > Business Analysis Essentials.
- > Requirements Engineering.
- > Organisational context.
- > Modelling Business Processes.
- > System modelling techniques.
- > System development essentials.
- > Benefits management and business acceptance.

Level 6.

Organisation:

> NCS.

Qualification:

- > Computer Professionals Examination CPE1.
- > Computer Professionals Examination CPE2.
- > Computer Professionals Examination CPE3.

Qualification Frameworks:

The concept of qualifications based on unit standards is not unique to South Africa. This qualification and unit standards have been evaluated against, and are comparable to core knowledge and specialised knowledge elements found in several international qualifications frameworks, including the following:

- > New Zealand Qualifications Authority ([www.nzqa.govt.nz](http://www.nzqa.govt.nz)).
- > Australian NQF ([www.aqf.edu.au](http://www.aqf.edu.au)).
- > Mauritius Qualifications Authority ([www.gov.mu/portal/site/mqa](http://www.gov.mu/portal/site/mqa)).

The examples of the qualifications that were assessed are listed below:

Authority:

- > New Zealand Qualifications Authority.

Qualification:

- > Diploma in Information Systems.
- > Diploma in Information Systems development.
- > Diploma in Software and Information Technology.

Unit Standard:

- > Demonstrate an understanding of information systems analysis, 3 credits.
- > Analyse an information system using structured systems analysis techniques, 15 credits.
- > Conduct an environmental analysis for an organisation, 10 credits.
- > Evaluate the effectiveness of a computer information system, 20 credits.

Authority:

- > Australian Qualifications Framework.

Qualification:

- > ICA50399 Diploma of Information Technology (Business Analysis).

Unit Standard:

Core:

- > BSX154L501 Guide application of project integrative processes.
- > BSX154L602 Manage scope.
- > BSX154L604 Manage cost.
- > BSX154L605 Manage quality.
- > BSX154L606 Manage human resources.
- > BSX154L607 Manage communications.
- > BSX154L608 Manage risk.
- > BSX154L609 Manage procurement.
- > ICAITSP036B IT strategy meets business solution requirements.
- > ICAITAD050A Develop detailed component specification from project specification.
- > ICAITB059B Develop detailed technical design.

- > ICAITT077C Develop detailed test plan.
- > ICAITAD042B Confirm client business needs.
- > ICAITAD043B Develop and present a feasibility report.
- > ICAITB074B Monitor the system pilot.
- > ICAITAD056B Prepare disaster recovery/contingency plans.

Electives:

- > BSX154L601 Manage project integration.
- > BSX154L603 Manage time.
- > ICAITT083B Develop and conduct client acceptance tests.
- > ICAITAD044B Develop system infrastructure design plan.
- > ICAITAD046B Model preferred system solutions.
- > ICAITB072B Develop integration blueprint.
- > ICAITB073B Pilot the developed system.
- > ICAITAD052B Design IT security framework.
- > ICAITAD054B Validate quality and completeness of design.
- > ICAITB064B Prepare software development review.
- > ICAITB071B Review developed software.
- > ICAITI090B Conduct pre installation audit of software installation.
- > ICAITB066B Coordinate the build phase.
- > ICAITB067B Prepare for software development using RAD.
- > ICAITI085B Review site for implementation.
- > ICAITI086B Scope implementation requirements.
- > ICAITI087B Acquire system components.
- > ICAITI088B Evaluate and negotiate vendor offerings.
- > ICAITS104B Determine maintenance coverage.
- > ICAITAD053B Design system security and controls.
- > ICAITSP038B Set strategic plans.
- > ICAITSP039B Match the IT needs with the strategic direction of the enterprise.
- > ICAITSP040B Manage and review contracts.
- > ICAITI091B Conduct post implementation review.
- > ICAITTW214A Maintain ethical conduct.

Short Courses, In-House training, Vocational programs:

Business analysis is taught throughout the world and many short programs exist and are offered by universities, private training providers, adult education providers, business schools and in-house at major companies.

A sample of the organisations whose programs have been used to compare to this standard is shown below. In some cases qualifications are equivalent to this standard; in other cases the courses cover one or more unit standards.

Organisation:

- > B2T Training (USA - International).

Course/Qualification:

- > BA Associate Program.
- > BA Certified Program.

Timeframe/Level:

- > 8-10 days/Level 5.
- > Workplace experience.
- > Exam/Level 6.



**Organisation:**

> Boston University Corporate Education (International).

**Course/Qualification; Timeframe/Level:**

> Certificate in Applied Business Analysis; Level 5.  
> Business Analysis Masters Certificate; Level 6.

**Organisation:**

> ESI International (USA, UK, Asia).

**Course/Qualification; Timeframe/Level:**

> The Professional Certificate in Business Analysis; 30 days/Level 6.

**Organisation:**

> Schulich School of Business (York University - Canada).

**Course/Qualification; Timeframe/Level:**

> Masters certificate in business analysis; 18 days/Level 6.

**Organisation:**

> University of North Carolina Office of continuing education (USA).

**Course/Qualification:**

> Process mapping and analysis.  
> Effective business requirements.  
> Enterprise analysis.

**Organisation:**

> Grapesoft Technologies (India).

**Course/Qualification:**

> Creating business requirements.

**Conclusion:**

Business analysis is taught throughout the world and many short programs exist and are offered by universities, private training providers, adult education providers, business schools and in-house at major companies. However business analysis is a fairly new discipline in the Information Technology industry and for this reason there are not many registered qualifications that deal specifically with business analysis. The most widely recognised business analysis qualification is the IIBA CBAP and this qualification compares very favourably with CBAP.

**ARTICULATION OPTIONS**

This qualification has been developed to provide career opportunities as well as to facilitate progression to other related qualifications. Learners can move horizontally or vertically between defence related qualifications, although in most cases, some standards will be required horizontally before moving to another qualification vertically.

This qualification has horizontal articulation with the following qualification:

> ID 48967: National Certificate: Business Advising Operations, NQF Level 6.

This qualification has vertical articulation with the following qualifications:

- > Any IT Systems Development qualification, NQF Level 7.
- > Any Technical Support qualification, NQF Level 7.

### **MODERATION OPTIONS**

> Moderation of learner achievements takes place at providers accredited by the applicable ETQA for the provision of programmes that result in the outcomes specified in this qualification.

> Anyone moderating the assessment of a learner against this Qualification must be registered as a moderator with the relevant ETQA. Any institution offering learning that will enable the achievement of this Qualification must be accredited as a provider with the relevant ETQA.

> Moderation must include both internal and external moderation of assessments at exit points of the Qualification, unless ETQA policies specify otherwise. Moderation should also encompass achievement of the competence described both in individual Unit Standards as well as the integrated competence described in the Qualification.

### **CRITERIA FOR THE REGISTRATION OF ASSESSORS**

For an applicant to register as an assessor, the applicant needs:

- > Subject relevant tertiary level qualification.
- > A minimum of three years relevant occupational experience.
- > Well-developed interpersonal skills, subject matter and assessment experience.
- > Well-developed subject matter expertise within the field.
- > To be a registered assessor with the relevant Education and Training Quality Assurance Body.
- > Detailed documentary proof of educational qualification, practical training undergone, and experience gained by the applicant must be provided (Portfolio of evidence). Assessment competencies and subject matter experience of the assessor can be established by recognition of prior learning.

### **NOTES**

The elective unit standard category is open ended to allow the learner to choose the 10 credits associated to the elective unit standards from any discipline that would add value to the purpose of the qualification or the learners own development on a learning pathway within the sector.

### **UNIT STANDARDS**

	<b>ID</b>	<b>UNIT STANDARD TITLE</b>	<b>LEVEL</b>	<b>CREDITS</b>
Fundamental	10622	Conduct communication within a business environment	Level 5	8
Fundamental	115367	Demonstrate logical problem solving and error detection techniques	Level 5	8
Fundamental	258838	Investigate implementation options for Information Technology (IT) solutions	Level 5	6
Fundamental	12979	Analyse and participate in the design of Information Systems	Level 6	12
Fundamental	12891	Apply concepts and principles of business ethics in the professional environment	Level 6	5
Fundamental	12138	Conduct an organisational needs analysis	Level 6	10
Core	259297	Conduct solution assessment and validation	Level 6	20
Core	259278	Manage and communicate requirements	Level 6	10
Core	259257	Perform Enterprise Analysis	Level 6	15
Core	259277	Perform requirements analysis	Level 6	30
Core	259279	Perform requirements elicitation	Level 6	20
Core	259280	Plan and monitor the business analysis process	Level 6	15
Elective	115365	Apply the principles of designing computer system inputs and outputs	Level 5	7
Elective	13099	Contribute to the implementation, post-implementation review and maintenance of information systems	Level 6	16
Elective	114044	Demonstrate an understanding of change management for computer systems	Level 6	3

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Elective	230072	Demonstrate insight into current global events and their potential impact on a business sector in South Africa	Level 6	10
Elective	252404	Design an organisational structure which supports the achievement of the organisational mandate	Level 6	13
Elective	13107	Develop understanding within an organisation about the risks associated with its functioning and contexts	Level 6	5
Elective	116360	Manage information technology resources in a municipal finance environment	Level 6	8
Elective	243116	Promote and uphold strategic leadership in line with Public Sector vision, values, objectives and priorities	Level 6	10

**LEARNING PROGRAMMES RECORDED AGAINST THIS QUALIFICATION**

**None**



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Perform Enterprise Analysis***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259257	Perform Enterprise Analysis		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Computer Sciences and Information Systems			
<b>FIELD</b>		<b>SUBFIELD</b>	
10 - Physical, Mathematical, Computer and Life Sciences		Information Technology and Computer Sciences	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 6	15

*This unit standard does not replace any other unit standard and is not replaced by another unit standard.*

**SPECIFIC OUTCOME 1**

Identify business needs, opportunities and requirements.

**SPECIFIC OUTCOME 2**

Determine an approach to identifying the most appropriate solution.

**SPECIFIC OUTCOME 3**

Define the project and solution scope.

**SPECIFIC OUTCOME 4**

Develop the business case.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Core	63909	National Certificate: Business Analysis	Level 6



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:***Perform requirements analysis*

SAQA US ID	UNIT STANDARD TITLE		
259277	Perform requirements analysis		
ORIGINATOR	PROVIDER		
SGB Computer Sciences and Information Systems			
FIELD	SUBFIELD		
10 - Physical, Mathematical, Computer and Life Sciences	Information Technology and Computer Sciences		
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 6	30

*This unit standard does not replace any other unit standard and is not replaced by another unit standard.*

**SPECIFIC OUTCOME 1**

Organise requirements.

**SPECIFIC OUTCOME 2**

Prioritise requirements.

**SPECIFIC OUTCOME 3**

Specify and model requirements.

**SPECIFIC OUTCOME 4**

Determine assumptions and constraints.

**SPECIFIC OUTCOME 5**

Verify and validate requirements.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Core	63909	National Certificate: Business Analysis	Level 6



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Manage and communicate requirements***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259278	Manage and communicate requirements		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Computer Sciences and Information Systems			
<b>FIELD</b>		<b>SUBFIELD</b>	
10 - Physical, Mathematical, Computer and Life Sciences		Information Technology and Computer Sciences	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 6	10

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Ensure that changes to project work products are agreed by all stakeholders and documented.

**SPECIFIC OUTCOME 2**

Maintain relationships between components to trace requirement changes and update relevant documentation.

**SPECIFIC OUTCOME 3**

Maintain requirements for re-use.

**SPECIFIC OUTCOME 4**

Prepare a requirements package.

**SPECIFIC OUTCOME 5**

Communicate requirements and changes to all stakeholders.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Core	63909	National Certificate: Business Analysis	Level 6



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:****Perform requirements elicitation**

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259279	Perform requirements elicitation		
<b>ORIGINATOR</b>	<b>PROVIDER</b>		
SGB Computer Sciences and Information Systems			
<b>FIELD</b>	<b>SUBFIELD</b>		
10 - Physical, Mathematical, Computer and Life Sciences	Information Technology and Computer Sciences		
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 6	20

*This unit standard does not replace any other unit standard and is not replaced by another unit standard.*

**SPECIFIC OUTCOME 1**

Prepare for requirements elicitation.

**SPECIFIC OUTCOME 2**

Conduct a variety of activities to elicit requirements from all stakeholders.

**SPECIFIC OUTCOME 3**

Document elicitation results.

**SPECIFIC OUTCOME 4**

Confirm elicitation results.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Core	63909	National Certificate: Business Analysis	Level 6



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Plan and monitor the business analysis process***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259280	Plan and monitor the business analysis process		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Computer Sciences and Information Systems			
<b>FIELD</b>		<b>SUBFIELD</b>	
10 - Physical, Mathematical, Computer and Life Sciences		Information Technology and Computer Sciences	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 6	15

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Conduct stakeholder analysis to identify all stakeholders for a particular project.

**SPECIFIC OUTCOME 2**

Plan business analysis activities for a project.

**SPECIFIC OUTCOME 3**

Plan business analysis communication for a project.

**SPECIFIC OUTCOME 4**

Plan requirements management process for a project.

**SPECIFIC OUTCOME 5**

Manage business analysis performance.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Core	63909	National Certificate: Business Analysis	Level 6





## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:****Conduct solution assessment and validation**

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259297	Conduct solution assessment and validation		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Computer Sciences and Information Systems			
<b>FIELD</b>		<b>SUBFIELD</b>	
10 - Physical, Mathematical, Computer and Life Sciences		Information Technology and Computer Sciences	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 6	20

*This unit standard does not replace any other unit standard and is not replaced by another unit standard.*

**SPECIFIC OUTCOME 1**

Determine conformance of solutions design options with requirements.

**SPECIFIC OUTCOME 2**

Allocate requirements to specific releases and/or solutions components.

**SPECIFIC OUTCOME 3**

Determine organisational readiness to effectively operate the new solution.

**SPECIFIC OUTCOME 4**

Validate that the deployed solution meets the business objectives.

**SPECIFIC OUTCOME 5**

Assess the value of the solution as deployed to the business.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Core	63909	National Certificate: Business Analysis	Level 6

No. 990

19 September 2008

**SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)**

In accordance with Regulation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the Task Team for

**Electronics**

registered by Organising Field 10, Physical, Mathematical, Computer and Life Sciences, publishes the following Qualification and Unit Standards for public comment.

This notice contains the title, field, sub-field, NQF level, credits, and purpose of the Qualification and Unit Standards. The full Qualification and Unit Standards can be accessed via the SAQA web-site at [www.saga.org.za](http://www.saga.org.za). Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, SAQA House, 1067 Arcadia Street, Hatfield, Pretoria.

Comment on the Qualification and Unit Standards should reach SAQA at the address below and *no later than 22 October 2008*. All correspondence should be marked **Standards Setting – SGB for Electronics** and addressed to

The Director: Standards Setting and Development  
SAQA  
*Attention: Mr. D. Mphuthing*  
Postnet Suite 248  
Private Bag X06  
Waterkloof  
0145  
or faxed to 012 – 431-5144  
e-mail: [dmphuthing@saqa.org.za](mailto:dmphuthing@saqa.org.za)

**DR. S. BHIKHA**  
**DIRECTOR: STANDARDS SETTING AND DEVELOPMENT**



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**QUALIFICATION:****Further Education and Training Certificate: Electronics**

SAQA QUAL ID	QUALIFICATION TITLE		
63849	Further Education and Training Certificate: Electronics		
ORIGINATOR		PROVIDER	
SGB Electronics			
QUALIFICATION TYPE	FIELD	SUBFIELD	
Further Ed and Training Cert	10 - Physical, Mathematical, Computer and Life Sciences	Information Technology and Computer Sciences	
ABET BAND	MINIMUM CREDITS	NQF LEVEL	QUAL CLASS
Undefined	122	Level 4	Regular-Unit Stds Based

***This qualification does not replace any other qualification and is not replaced by another qualification.***

**PURPOSE AND RATIONALE OF THE QUALIFICATION**

Purpose:

This Qualification is intended for persons who are working or intending to study in the electronics field as Electronics Technicians. Learners accessing this Qualification will be provided with knowledge, skills and attitudes that will enable them to diagnose faults, repair and maintain electronics equipment. Learners will be able to interpret electronic circuits in order to do component level repairs. This Qualification comprise of Unit Standards that will serve as the building blocks towards progression to a NQF Level 5 Qualification in Electronics as part of career advancement.

It will also provide opportunities for those persons who do not have formal education in electronics currently working in the field of electronics for formal recognition of work experience through Recognition of Prior Learning.

Rationale:

Currently the electronics industry is proliferated with individuals who are trained on the job without formal Qualification. Hence the need for a formal Qualification at this level that is targeted for people who wish to join the electronics field or those that are working as general operators performing duties related to fault-finding, repair and maintenance of electronic equipment.

The general perception in the electronics field is that most general operators lack the necessary knowledge and technical skills to meet the global trends regarding repairing and maintaining of newly introduced electronic equipment due to the growing supply of advanced technology competencies that will enable such individuals to perform quality repair and maintenance work. Thus this Qualification will provide learners with the theoretical and practical experience related to electronic environment in order to satisfy client's needs and expectations.

Electronics plays an important role in the national economy in that the majority of industries in the country use technology in order to be productive to sustain economic growth. Therefore, this Qualification will create employment opportunities for general operators to deal with electronics

related matters. The Qualification represents the work based needs of employers within the electronics industry in order to develop a pool of qualified electronics operators who progress through learning towards a Qualification as Chief Engineering Technicians at NQF Level 6. This Qualification will facilitate articulation to other Qualifications which include amongst others, mechatronics and autotronics thus facilitating mobility and personal growth within the electronics field and improve productivity in general.

### **RECOGNIZE PREVIOUS LEARNING?**

Y

### **LEARNING ASSUMED IN PLACE**

Learners are assumed to be competent in:

- > Communication skills at NQF Level 3, or equivalent.
- > Mathematics at NQF Level 3, or equivalent.
- > Computer literacy at NQF Level 3, or equivalent.

Access to the Qualification:

This Qualification is open to learners who have achieved a Qualification at NQF Level 3 or equivalent. Learners who demonstrated competence at NQF Level 3 through recognition of prior learning can also access this Qualification.

Recognition of Prior Learning (RPL):

This Qualification can be achieved wholly or in part through recognition of prior learning. Learners able to demonstrate competency through the formative and summative assessment processes attached to this Qualification will receive recognition of prior learning. It is assumed that candidates may have been performing duties that reflect competencies contained in this Qualification at the workplace any formal Qualification.

### **QUALIFICATION RULES**

The Qualification consists of a Fundamental, a Core and an Elective Component.

To be awarded the Qualification learners are required to obtain a minimum of 122 credits as detailed below.

Fundamental Component:

The Fundamental Component consists of Unit Standards in:

- > Mathematical Literacy at NQF Level 4 to the value of 16 credits.
- > Communication at NQF Level 4 in a First South African Language to the value of 20 credits.
- > Communication in a Second South African Language at NQF Level 3 to the value of 20 credits.

It is compulsory therefore for learners to do Communication in two different South African languages, one at NQF Level 4 and the other at NQF Level 3.

All Unit Standards in the Fundamental Component are compulsory.

Core Component:

The Core Component consists of Unit Standards to the value of 56 credits all of which are compulsory.

**Elective Component:**

The Elective Component consists of a number of specializations each with its own set of Unit Standards. Learners are to choose a specialization area and must choose Elective Unit Standards to the value of 10 credits from the Unit standards listed under that specialization so as to attain a minimum of 122 credits.

**Electrical Cluster:**

- > ID 115242: Draw and interpret electrical diagram.
- > ID 119256: Inspect and test electrical circuit.
- > ID 115245: Fabricate aircraft electrical harnesses and looms.
- > ID 14057: Demonstrate knowledge and understanding of electrical systems and related concepts.

**Mechanical Cluster:**

- > ID 244663: Conduct advanced tests on electro-mechanical components.

**Electronic Cluster:**

- > ID 259163: Use software to design and simulate electronics circuits.
- > ID 120228: Demonstrate an understanding of the process of design.

**Telecommunication Cluster:**

- > ID 246680: Demonstrate an understanding of Telecommunications Transport concepts and principles.
- > ID 246665: Perform operational activities on digital microwave radio systems.
- > ID 246670: Demonstrate an understanding of the value added services platforms used in a telecommunications environment.
- > ID 246656: Demonstrate an understanding of the basic equipment and components used in a telecommunications environment.

**Automotive Cluster:**

- > ID 12229: Fit and wire up auxiliary auto-electrical equipment.
- > ID 259144: Perform industrial repair inspections.

**Generic Cluster:**

- > ID 9532: Demonstrate basic knowledge of computers.
- > ID 117499: Demonstrate entrepreneurial competence.
- > ID 114598: Demonstrate an understanding of entrepreneurial profile.
- > ID 259138: Apply soldering techniques for thru-hole and surface mount technologies.

**EXIT LEVEL OUTCOMES**

1. Communicate in a variety of ways to achieve personal and workplace objectives.
2. Apply mathematics and physics principles to determine the specific values in electronics circuits.
3. Operate electronics equipment and instruments.
4. Apply knowledge and understanding of the principles and concepts of electronics circuits.

5. Rework and repair electronic circuits and systems.
6. Demonstrate entrepreneurial skills in the electronics environment.

Critical Cross-Field Outcomes (CCFOs):

This Qualification promotes, in particular, the following Critical Cross-Field Outcomes:

Unit standard CCFO Identifying:

> Identifying and solving problems related to damages and malfunctioning of the electronics equipment by using relevant test instruments for repair purposes in order meet the Occupational Health and Safety regulations.

Unit standard CCFO Working:

> Working effectively with others by coordinating activities pertaining to the repair work and when referring repaired equipment for quality assurance purposes.

Unit standard CCFO Organising:

> Planning and preparing oneself by organising time and resources needed to be used for repairing electronic equipment.

Unit Standard CCFO Science:

> Using science and technology effectively and critically, showing responsibility towards the environment and others by understanding the role of technology in society and using technology appropriately to retrieve, manage information and solve problems as well as facilitating communication.

Unit standard CCFO Understanding the world as a set of related systems:

> Recognise that problem-solving contexts do not exist in isolation by using electrical, mechanical and electronics knowledge and skills to repair electronic equipment.

**ASSOCIATED ASSESSMENT CRITERIA**

Associated Assessment Criteria for Exit Level Outcome 1:

- 1.1 Verbal and non-verbal communication skills are applied when interacting with team members, supervisors and clients in the working environment.
- 1.2 The role of feedback is explained in terms of its effect on the team members and the client.

Associated Assessment Criteria for Exit Level Outcome 2:

- 2.1 Calculations are performed in order to determine specific unknown values.
- 2.2 Laws of Physics are applied in order to determine specific values in electronics circuits.

Associated Assessment Criteria for Exit Level Outcome 3:

- 3.1 Different equipments are identified and explained in term their uses for measuring, power supply and signal injection.

> Range: Different equipment included but is not limited to oscilloscope, multi meter, logic probe, function generator, RF generator, spectrum analyser, logic analyser, a.c and d.c variable power supply.

3.2 Measuring results are explained in terms of their impact in fault-finding activities.

Associated Assessment Criteria for Exit Level Outcome 4:

4.1 Circuits and diagrams are reproduced in accordance with design standards.

4.2 Values of components in circuits are determined to ensure operation.

4.3 The operation of circuits is explained in terms of specific functions.

Associated Assessment Criteria for Exit Level Outcome 5:

5.1 Trouble-shooting of circuits is performed safely and in accordance with manufacturer's specifications.

5.2 Faulty components are replaced without damage to the PC Board and adjacent components according to soldering and de-soldering procedures.

5.3 PC boards are checked for short/open circuits to ensure that repairs are done in accordance with design specifications.

5.4 Standard maintenance procedures are followed in order to determine the functioning of the system.

5.5 Calibration is carried out on systems in order to ensure the functioning of the system.

Associated Assessment Criteria for Exit Level Outcome 6:

6.1 The importance for creating a business venture in the electronics environment is explained with examples.

6.2 The need to develop, interpret and utilise a business plan is explained for the purpose of starting a new business venture.

6.3 The need to conduct a business analysis in order to establish the viability of a market of electronics products and services is explained with examples.

6.4 The process of managing and controlling stock activities is explained to ensure compliance with procedures.

6.5 The importance of developing a business promotion plan is explained with examples.

6.6 The characteristics of a successful entrepreneur are identified and explained in the context of skills, personality and values.

6.7 The strategies required for a successful entrepreneurship is explained in order to identify strengths, weaknesses and ways to improve.

Integrated Assessment:

Assessment should be focused on the candidate's ability to apply their theoretical knowledge and understanding in authentic contexts. Assessors should use a range of strategies, which will allow candidates to demonstrate applied competence. Applied competence (practical, foundational and reflective) competencies regarding electronics knowledge and skills will be achieved if a candidate can integrate the various outcomes of the Unit Standards of this Qualification. Assessment strategies and procedures should be aligned with the purpose and exist level outcomes of the Qualification. They should consists of projects, written assignment, tests and examinations and also include a variety of problem solving assignments, portfolios of learning, materials and projects. The Qualification should be assessed on the basis of evidence of demonstrated performance in the workplace or in simulated work situations designed to draw upon similar performance to that required at the workplace.

All Exit Level Outcomes, Critical Cross-Field Outcomes, and Essential Embedded Knowledge required by the component Unit Standards are to be assessed. Evidence of the achievement of

the Critical Cross-Field Outcomes should be found both in performance and in explaining and applying the essential embedded knowledge.

### **INTERNATIONAL COMPARABILITY**

The electronics industry is a highly recognized sector in that the modern world relies on electrical and electronics devices which impact considerably on the domestic and business world. Due to the fact that the electrical and electronic engineering field is broad and vibrant and interfacing with physics, computer science and engineering, the comparison was made on Qualifications that deal with basic electronics and electrical engineering, which include electronic components.

The leaders in the field for this subject field in terms of Qualifications and provision are Japan, United States of America (USA) and Germany. In addition, other countries such as New Zealand, United Kingdom, Australia, India, China and Southern African Developing Countries (SADC) regions also offer short courses in this field. Countries such as China and India are considered to be leading in electronics products, but unfortunately such information could not be accessed. The research revealed that most countries offered qualifications in engineering qualifications of which electronics forms part, and they were pitched at a Degree, Honours and Masters including PhDs levels. Although the USA, Japan and Germany were recommended to be the leading countries in electronics, unfortunately such information was not accessible.

#### United States of America (USA):

The Institute of Electrical and Electronics Engineers -USA (IEEE-USA) is an organisational unit of the Institute of Electrical and Electronics Engineers international, Inc., that is created to promote the careers and public policy interests of the more than 235 000 electrical, electronics, computer and software engineers including the promotion of engineering awareness and encouraging technological literacy reaching out to two different segments of the public - from nine-13 year-olds and to adults. The IEEE-USA produces a range of distance-learning packs for training and educational use in the electrical engineering, electronics, and manufacturing and computer software industries. However, most of the Qualifications accessed that are recognized by the IEEE in the USA are predominantly offered at a degree level thus making it difficult to find compare with the South African Qualification at NQF Level 3.

#### Electronics Supply Centre, USA:

##### Basic Electronics for schools:

The search has identified a certificate course that compares favourably with the South African Qualification as it provides basic knowledge packaged for beginners in the electronics field. The course is divided into four modules comprised of different lessons in each module. These modules can be benchmarked against the Unit Standards contained in the South African Qualification that provides learners with key competencies contained in the lessons provided in each module. The modules are depicted as follows:

##### Basic Electronics DC (direct Current):

- > Lesson 1: Basic electronics theories and principles.
- > Lesson 2: Series Circuits.
- > Lesson 3: Parallel Circuits.
- > Lesson 4: Combination Circuits.
- > Lesson 5: Rheostats, symbols of variables and potentiometers.

##### Basic Electronics AC (Alternating Current):

- > Lesson 1: Magnetism.



- > Lesson 2: Sine Wave Voltages.
- > Lesson 3: Basic principles of Capacitors.
- > Lesson 4: Capacitors (reactance and various types of capacitors).
- > Lesson 5: Inductors (self induced voltages and calculation of inductors in series).
- > Lesson 6: Inductors (Autotransformers).
- > Lesson 7: RLC Circuits.

Basic Electronics (Semiconductors):

- > Lesson 1: The Atom.
- > Lesson 2: Diodes.
- > Lesson 3: Bipolar Junction Transistors (NPN and PNP).
- > Lesson 4: Field Effect Transistors.
- > Lesson 5: Specialty Devices (Semiconductor devices).

Basic Electronics (Power Supplies):

- > Lesson 1: Rectifying circuits.
- > Lesson 2: Filtering.
- > Lesson 3: Regulators (I.C Regulator circuits, switch mode regulators).
- > Lesson 4: UPS System (uninterruptible power supplies).

Skagit Valley College, USA:

Short Courses:

- > Electronics Fundamentals I [5 credits]:
  - > Departmental standards on laboratory conduct, reporting, and safety.
  - > Ohm's law.
  - > Watt's law.
  - > Series circuits.
  - > Parallel circuits.
  - > Series-parallel circuits.
  - > Computer solutions.
  - > Voltage and current dividers.
  - > Resistance, voltage and current meters.
  - > Conductors and insulators.
  - > Kirchoff's voltage law.
  - > Kirchoff's current law.
  - > Network theorems.
- > Electronic Fundamentals II [5 credits]:
  - > Organisational standards on laboratory conduct, reporting and safety.
  - > Review of DC concepts.
  - > Introduction to AC Theory.
  - > Inductors and Capacitors.
  - > Reactance and Impedance.
  - > RL, RC and RLC circuit analysis and characteristics.

Penn Foster Career College, USA:

Electronics Technician Certificate:

This course is a distance learning course which provides skills and techniques needed to begin a career as an Electronics Technician. Due to the fact that this course is distance learning, it

may be completed between a few months or two years depending of the choice and circumstances of the learner. Learners completing this course will be able to:

- > Work as a service technician in the growing field of computers and office machinery.
- > Work for an existing electronics services business, or begin one of your own.

The course content includes:

Instruction Set 1:

- > Learning Strategies.
- > Introduction to Electronics.

Instruction Set 2:

- > Nature of Electricity.
- > Practical Exercise 1.

Instruction Set 3:

- > Conductors, Insulators, and Batteries.
- > Circuit Analysis and Ohms Law.
- > Multi-meter Usage Manual.
- > Practical Exercise 2.

Instruction Set 4:

- > Basic Measuring Instruments.
- > Electronics Hardware.
- > Switches.
- > Practical Exercise 3.

Instruction Set 5:

- > Magnetism and Electromagnetism.
- > Capacitors and Inductors.
- > Basic Semiconductor Components: Diodes.
- > Basic Semiconductor Components: Transistors.
- > Practical Exercise: 4.

Instruction Set 6:

- > Alternating Current.
- > Capacitors in AC Circuits.
- > Inductors in AC Circuits.
- > Transformers.
- > Practical Exercise 5.

Instruction Set 7:

- > Reactance and Impedance.
- > Resonant Circuits.
- > Applications of Resonant Circuits.
- > Practical Exercise 6.

Instruction Set 8:

- > Rectifiers and Power Supplies.
- > Amplifiers.
- > Oscillators.
- > Fiber Optic and Optoelectronic Components.
- > Practical Exercise 7.

## Instruction Set 9:

- > Electronic Sensors.
- > Modulation and Detection Circuits.
- > Electronic Devices and Amplifiers.
- > Using Basic Oscilloscopes.
- > Practical Exercise 8.

## Instruction Set 10:

- > Audio and RF Circuits.
- > Oscillator and Feedback Waveforms.
- > Electronic Power Supplies.
- > Practical Exercise 9.

## Instruction Set 11:

- > Resonant Circuits.
- > Applications of Resonant Circuits.
- > Pulse Generators and Techniques.
- > Waveshaping Circuits.
- > Timing and Synchronization.
- > Pulse Circuit Applications.
- > Troubleshooting Pulse Circuits.

## Instruction Set 12:

- > Logic Circuit Fundamentals.
- > Introduction to Number Systems.
- > Logic Devices and Diagrams.
- > Logic Families.
- > Applications of Logic Circuits.
- > Troubleshooting Logic Circuits.

## Instruction Set 13:

- > Linear and Digital Integrated Circuits.
- > Integrated Circuit Techniques.
- > Linear Integrated Circuits.
- > Digital Integrated Circuits.
- > Linear and Digital Principles.
- > Integrated Circuit Logic Systems.
- > Troubleshooting Linear and Digital IC Systems.

## Instruction Set 14:

- > Experiments with Pulse Circuits.
- > Experiments with Logic Circuits.
- > Experiments with Linear Integrated Circuits.

## Instruction Set 15:

- > Industrial Computer Fundamentals.
- > Digital and Analogy Systems.
- > Software and Programming Systems.
- > Computer Aided Control.
- > Interfacing Principles.

Canada, Toronto:

George Brown College:

### Electronics Technician Certificate:

George Brown College offers the Electronics Technician Certificate programme that is targeting technicians who work in the field of consumer, commercial and industrial electronics. Many schools and organisations, which have adopted it as part of their training programmes, use the programme. People who intend to work within the electronics environment thus preparing them for employment can also access the programme. The programme offered on a modular basis with at least 23 Modules and most of the Modules offered here above are comparing favourably with the South African Qualification. The duration of the programme is 32 weeks. The Modules are as follows:

- > Introduction to Electronics.
- > Current, Voltage and Resistance.
- > Ohm's Law, Power and Energy.
- > Series Circuits.
- > Parallel Circuits.
- > Series Parallel Circuits.
- > DC Measuring Instruments.
- > Network Theorems.
- > Magnetism.
- > Magnetic Circuits.
- > Alternating Voltage and Current.
- > Digital Electronics.
- > AC Measuring Instruments.
- > Capacitance and Capacitors.
- > Inductance and Inductors.
- > Transformers.
- > Alternating Current Circuits.
- > Resonance.
- > Semiconductor Fundamentals.
- > Coupling and Filter Circuits.
- > Transistors and Thyristors.
- > Amplifier Circuits.
- > Integrated Circuits.

### Fiji Islands - South Pacific:

Fiji Institute of Technology: School of Electrical and Electronic Engineering:

### Trade Certificate in Electronics Engineering:

Fiji is a highly recognized institution that is registered as an Academy that offers very dynamic comprehensive programmes to school leavers who wish to pursue training in electrical and electronics engineering and their allied industries. The above programme compare favourably with the South African Qualification (Introductory Electronics, NQF Level 3) in terms of the units offered except Applied Mathematics unit although the level of the Qualification is not known. The certificate is comprised of the following units:

- > Basic electronics.
- > Applied Mathematics.
- > Electrical Principles.
- > Electronics fundamentals.
- > Electrical Measurements.
- > Occupational Health and Safety.
- > Digital Electronics.

- > Analogue Electronics.
- > Components and Measurements.
- > Computer Applications.
- > Technical communication.
- > Workshop Practice.
- > Electronics Project.

Japan (Japan Qualifications Authority):

Tasmanian Secondary Assessment Board:

The following programme is offered:

- > EL772 C, EL770 B: Introduction to Electronics.

The syllabuses are designed particularly for students with an interest in Electronics. The opportunity to develop a knowledge and understanding of Electronics through practical experience is offered. Syllabus is designed to be taught and assessed as either a 150 hour 'C' Course or a two 100 hours 'B' Courses.

Learners who complete the course are able to:

- > Understand and apply fundamental concepts of electronics.
- > Plan, construct and test circuits.
- > Undertake electrical measurements.
- > Demonstrate safe working practices.
- > Research, record and recall information.
- > Solve problems.
- > Communicate ideas and information in a variety of ways.

The course outline is as follows:

- > Electrical Safety.
- > Fundamental Aspects.
- > Basic Electrical Concepts.
- > Transistors as Switches.
- > Transistors as Amplifiers.
- > Timing Circuits.
- > Switching Circuits.
- > Audio/Radio.
- > Power Supplies.
- > Semiconductor Logic Circuits.
- > Combination of Gates.
- > Introduction to the 555 Timer.
- > Negotiated Project (possibly related to the 555 Timer).

United Kingdom (UK):

The comparison was done using the National Database of Accredited Qualifications (Qualification and Curriculum Authority) in which electronics related Qualifications found were at NVQ Level.

Edexcel: BTEC National Certificate in Electrical/Electronic Engineering (4322):

Edexcel is known to be the largest awarding body in the United Kingdom, which develops a diverse range of vocational and academic Qualifications including courses. The 'BTEC National Certificate in Electrical/Electronic Engineering is at the UK NQF Level 3, which has an equivalence level between our NQF Levels 4 and 5. The comparison was done focusing on the level, content and outcomes of the Qualification that is equivalent to our Level 3 Qualification. Although this is a 12-unit Qualification which is made up of six core Unit Standards and six specialist Unit Standards which compare slightly with few of our Unit Standards as follows:

- > Electrical and Electronic principles.
- > Digital electronics.
- > Analogue electronics.
- > Electronic fault finding.
- > Further Electrical Principles.
- > Health, Safety and Welfare.

New Zealand:

Electro Technology Industry Training Organisation: National Certificate in Electronics Technology (Level 3):

This Qualification is designed for people who are interested in electronics who may wish to pursue further training and employment in this field. The Qualification has been developed for people interested in electronics who may wish to pursue further training and employment in this field and is offered in high schools. Some of the units standards contained in this Qualification compares favourably with the South African Qualification as it addresses basic knowledge and skills of electronics although it is comprised of 43 credits as follows:

- > Demonstrate and apply knowledge of basic semiconductor devices.
- > Demonstrate basic knowledge of basic digital and analogue electronic concepts.
- > Describe the development of a new electronic product.
- > Demonstrate basic knowledge of signals and the transmission of information.
- > Demonstrate basic knowledge of electronic product quality and reliability.
- > Demonstrate and apply basic knowledge of microcontrollers.

In addition, there are Unit Standards identified which do not form part of any Qualification within the New Zealand Qualifications Framework, pegged at level 3 which are core electronics for electronics technicians that compare favourably with the South African Qualification. These are:

- > Demonstrate and apply introductory knowledge of d.c. principles for electronics technicians.
- > Demonstrate and apply introductory knowledge of a.c. principles for electronics technicians.
- > Demonstrate and apply introductory knowledge of digital electronics for electronics technicians.
- > Demonstrate and apply introductory knowledge of analogue electronics for electronics technicians.

Universal College of Learning, New Zealand:

Certificate in Electronics and Electrical Technology, Level 3:

This programme is designed to provide new entrants with knowledge and skills in the field of electronics. The programme is targeting individuals who are interested in a career in the electrical and electronics industries as well as offering the stepping-stone to gain broad education and training in this field. The programme compares favourably with our Qualification in terms of the content, duration and level as well as covering the fundamental component in relation to mathematical and communication literacy, including computer skills. The course content is as follows:

- > Communication.
- > Digital electronics.
- > Introduction to measurement and fault diagnosis.
- > Introductory physics.
- > Electronics theory.
- > Electrical theory.

Zimbabwe:

In relation to South African developing countries (SADC), it has been discovered that countries in the SADC region tend to benchmark their Qualifications against the South African Qualifications. The only country found to provide a programme in the subject field is Zimbabwe through SIRDC (Electronics and Communications Institute) which offers technology transfer and training services in specialized areas of electronics, electronics circuit design and electronic instrumentation which does not compare fairly well with the standards offered by the South African Qualification in that the content/modules of their programme that is partly relevant to our Qualification but not addressed at this level are:

- > Electronic circuit design fundamentals.
- > Electronic instrumentation and control.

Conclusion:

The South African Qualification compares with the aspects of other qualifications identified but not in their entirety. Our Qualification falls well within the occupational profiles and training standards of the other relevant countries that we have investigated.

#### **ARTICULATION OPTIONS**

This Qualification articulates horizontally with the following registered Qualifications:

- > ID 48978: Further Education and Training Certificate: Electrical Network Control, NQF Level 4.
- > Certificate: Electrical Engineering, NQF Level 4.
- > National Certificate: Electrical Technology: FET Phase, NQF Level 4.
- > ID 48978: Further Education and Training Certificate: Electrical Network Control, NQF Level 4.
- > ID 58861: Further Education and Training Certificate: Electro-Mechanical Winding, NQF Level 4.
- > ID 59731: Further Education and Training Certificate: Automotive Repair and Maintenance, NQF Level 4.

This Qualification articulates vertically with the following Qualification:

- > National Certificate: Electronics Engineering Technology, NQF Level 5.

#### **MODERATION OPTIONS**

Moderation must include both internal and external moderation of assessments. Moderation of assessments will be overseen by the relevant ETQA according to the moderation guidelines and agreed ETQA procedures. This Qualification can be internally assessed by assessors of the provider and moderated by a moderator registered with the relevant ETQA. Moderation shall comply with SAQA requirements.

#### **CRITERIA FOR THE REGISTRATION OF ASSESSORS**

Assessors for this Qualification will hold a NQF Level 5 Qualification in Electronics or equivalent Qualification in related disciplines within the field of electronics, or will be competent in the outcomes of this Qualification and have at least two years experience in the field. The Assessor must include both internal and external moderation of assessments.

Anyone assessing a learner or moderating the assessment of a learner against this Qualification or its Unit Standards must be a constituent registered assessor with the relevant accredited ETQA or an ETQA that has a Memorandum of Understanding with the relevant accredited ETQA.

### NOTES

Knowledge of basic computer is essential therefore it is encouraged that learners must choose from the elective components any Unit Standards together with a computer unit standard.

### UNIT STANDARDS

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Fundamental	119472	Accommodate audience and context needs in oral/signed communication	Level 3	5
Fundamental	119457	Interpret and use information from texts	Level 3	5
Fundamental	119467	Use language and communication in occupational learning programmes	Level 3	5
Fundamental	119465	Write/present/sign texts for a range of communicative contexts	Level 3	5
Fundamental	9015	Apply knowledge of statistics and probability to critically interrogate and effectively communicate findings on life related problems	Level 4	6
Fundamental	119462	Engage in sustained oral/signed communication and evaluate spoken/signed texts	Level 4	5
Fundamental	119469	Read/view, analyse and respond to a variety of texts	Level 4	5
Fundamental	9016	Represent analyse and calculate shape and motion in 2- and 3-dimensional space in different contexts	Level 4	4
Fundamental	119471	Use language and communication in occupational learning programmes	Level 4	5
Fundamental	7468	Use mathematics to investigate and monitor the financial aspects of personal, business, national and international issues	Level 4	6
Fundamental	119459	Write/present/sign for a wide range of contexts	Level 4	5
Core	253094	Perform electronic fault-finding	Level 3	3
Core	14939	Assemble a personal computer or handheld computer and peripherals from modules	Level 4	7
Core	246659	Demonstrate an Understanding of basic electrical and electronic principles	Level 4	5
Core	259139	Demonstrate and apply knowledge of basic digital electronic principles	Level 4	10
Core	259142	Demonstrate knowledge of applied communications technology	Level 4	8
Core	259170	Operate electronic test instruments	Level 4	5
Core	113873	Understand basic electrical and mechanical engineering principles	Level 4	8
Core	259137	Analyse fault reports and make decisions according to work policies and procedures	Level 5	5
Core	259169	Construct DC power supplies	Level 5	5
Elective	246680	Demonstrate an understanding of Telecommunications Transport concepts and principles	Level 3	8
Elective	120228	Demonstrate an understanding of the process of design	Level 3	3
Elective	9532	Demonstrate basic knowledge of computers	Level 3	6
Elective	115242	Draw and interpret electrical diagrams	Level 3	3
Elective	115245	Fabricate aircraft electrical looms and harnesses	Level 3	10
Elective	259138	Apply soldering techniques for thru-hole and surface mount technologies	Level 4	10
Elective	244663	Conduct advanced tests on electro-mechanical components	Level 4	10
Elective	114598	Demonstrate an understanding of an entrepreneurial profile	Level 4	5
Elective	246656	Demonstrate an understanding of the basic equipment and components used in a telecommunications environment	Level 4	5



	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Elective	246670	Demonstrate an understanding of the value added services platforms used in a telecommunications environment	Level 4	2
Elective	117499	Demonstrate entrepreneurial competence	Level 4	12
Elective	14057	Demonstrate knowledge and understanding of electrical systems and related concepts	Level 4	6
Elective	12229	Fit and wire up auxiliary auto-electrical equipment	Level 4	12
Elective	119256	Inspect and test electrical circuits	Level 4	6
Elective	259144	Perform industrial repair inspection for quality control	Level 4	2
Elective	246665	Perform operational activities on-Digital Microwave Radio systems	Level 4	15
Elective	259163	Use software to develop and simulate electronic circuit	Level 4	4
Elective	259168	Inspect and design of looms and harnesses	Level 5	10
Elective	259166	Rework and repair electronics assemblies	Level 5	15

**LEARNING PROGRAMMES RECORDED AGAINST THIS QUALIFICATION**

**None**



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:**

**Analyse fault reports and make decisions according to work policies and procedures**

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259137	Analyse fault reports and make decisions according to work policies and procedures		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Electronics			
<b>FIELD</b>		<b>SUBFIELD</b>	
10 - Physical, Mathematical, Computer and Life Sciences		Information Technology and Computer Sciences	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 5	5

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Demonstrate knowledge of the various electronic systems in accordance with manufacturer's specifications.

**SPECIFIC OUTCOME 2**

Interpret fault-finding report for decision-making.

**SPECIFIC OUTCOME 3**

Interpret electronic circuit diagram.

**SPECIFIC OUTCOME 4**

Repair components in accordance with manufacture's specifications standard.

**SPECIFIC OUTCOME 5**

Test the repaired equipment for functionality.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Core	63849	Further Education and Training Certificate: Electronics	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Apply soldering techniques for thru-hole and surface mount technologies***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259138	Apply soldering techniques for thru-hole and surface mount technologies		
<b>ORIGINATOR</b>	<b>PROVIDER</b>		
SGB Electronics			
<b>FIELD</b>	<b>SUBFIELD</b>		
10 - Physical, Mathematical, Computer and Life Sciences	Information Technology and Computer Sciences		
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	10

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Prepare for soldering.

**SPECIFIC OUTCOME 2**

Identify and place components on the PC board.

**SPECIFIC OUTCOME 3**

Perform soldering.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Elective	63849	Further Education and Training Certificate: Electronics	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:***Demonstrate and apply knowledge of basic digital electronic principles*

SAQA US ID	UNIT STANDARD TITLE		
259139	Demonstrate and apply knowledge of basic digital electronic principles		
ORIGINATOR		PROVIDER	
SGB Electronics			
FIELD		SUBFIELD	
10 - Physical, Mathematical, Computer and Life Sciences		Information Technology and Computer Sciences	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 4	10

*This unit standard does not replace any other unit standard and is not replaced by another unit standard.*

**SPECIFIC OUTCOME 1**

Demonstrate knowledge of microprocessor and microcontroller systems.

**SPECIFIC OUTCOME 2**

Programme and test a microprocessor or microcontroller application.

**SPECIFIC OUTCOME 3**

Demonstrate knowledge of external serial bus systems to enable expansion.

**SPECIFIC OUTCOME 4**

Demonstrate knowledge of analogue-to-digital and digital-to-analogue conversion within the controller.

**SPECIFIC OUTCOME 5**

Test analogue-to-digital and digital-to-analogue converters.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Core	63849	Further Education and Training Certificate: Electronics	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Demonstrate knowledge of applied communications technology***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259142	Demonstrate knowledge of applied communications technology		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Electronics			
<b>FIELD</b>		<b>SUBFIELD</b>	
10 - Physical, Mathematical, Computer and Life Sciences		Information Technology and Computer Sciences	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	8

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Identify and discuss the different kinds of communications technology and their application.

**SPECIFIC OUTCOME 2**

Demonstrate knowledge of hardware and/or software installation.

**SPECIFIC OUTCOME 3**

Demonstrate knowledge of the use of communications software and hardware.

**SPECIFIC OUTCOME 4**

Interface different kinds of communications technology.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Core	63849	Further Education and Training Certificate: Electronics	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Perform industrial repair inspection for quality control***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259144	Perform industrial repair inspection for quality control		
<b>ORIGINATOR</b>	<b>PROVIDER</b>		
SGB Electronics			
<b>FIELD</b>	<b>SUBFIELD</b>		
10 - Physical, Mathematical, Computer and Life Sciences	Information Technology and Computer Sciences		
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	2

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Plan workflow.

**SPECIFIC OUTCOME 2**

Interpret fault -finding report for decision-making.

**SPECIFIC OUTCOME 3**

Interpret electronic circuit diagram.

**SPECIFIC OUTCOME 4**

Repair components in accordance with manufacture's specifications standard.

**SPECIFIC OUTCOME 5**

Test the repaired equipment for functionality.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Elective	63849	Further Education and Training Certificate: Electronics	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:***Use software to develop and simulate electronic circuit*

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259163	Use software to develop and simulate electronic circuit		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Electronics			
<b>FIELD</b>		<b>SUBFIELD</b>	
10 - Physical, Mathematical, Computer and Life Sciences		Information Technology and Computer Sciences	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	4

*This unit standard does not replace any other unit standard and is not replaced by another unit standard.*

**SPECIFIC OUTCOME 1**

Obtain, update and use component libraries.

**SPECIFIC OUTCOME 2**

Use components libraries to draw a circuit diagram.

**SPECIFIC OUTCOME 3**

Create a useable paper result.

**SPECIFIC OUTCOME 4**

Apply design rule check.

**SPECIFIC OUTCOME 5**

Use a circuit analysis programme to analyse the circuit behaviour.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Elective	63849	Further Education and Training Certificate: Electronics	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Rework and repair electronics assemblies***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259166	Rework and repair electronics assemblies		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Electronics			
<b>FIELD</b>		<b>SUBFIELD</b>	
10 - Physical, Mathematical, Computer and Life Sciences		Information Technology and Computer Sciences	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 5	15

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Set up work area for repairing and reworking electronic assemblies.

**SPECIFIC OUTCOME 2**

Remove components from the PC boards.

**SPECIFIC OUTCOME 3**

Repair damaged PC boards.

**SPECIFIC OUTCOME 4**

Replace components on PC board.

**SPECIFIC OUTCOME 5**

Remove coatings and encapsulations.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Elective	63849	Further Education and Training Certificate: Electronics	Level 4





## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:***Inspect and design of looms and harnesses*

SAQA US ID	UNIT STANDARD TITLE		
259168	Inspect and design of looms and harnesses		
ORIGINATOR	PROVIDER		
SGB Electronics			
FIELD	SUBFIELD		
10 - Physical, Mathematical, Computer and Life Sciences	Information Technology and Computer Sciences		
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 5	10

*This unit standard does not replace any other unit standard and is not replaced by another unit standard.*

**SPECIFIC OUTCOME 1**

Demonstrate knowledge of and analyse the IPC/WHMA-A-620 standards.

**SPECIFIC OUTCOME 2**

Prepare the inspection workstation.

**SPECIFIC OUTCOME 3**

Conduct inspection according to IPC/WHMA-A-620 standards.

**SPECIFIC OUTCOME 4**

Interpret product documentation.

**SPECIFIC OUTCOME 5**

Design cable and harness system according to IPC/WHMA-A-620 standards and customer specifications.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Elective	63849	Further Education and Training Certificate: Electronics	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:****Construct DC power supplies**

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259169	Construct DC power supplies		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Electronics			
<b>FIELD</b>		<b>SUBFIELD</b>	
10 - Physical, Mathematical, Computer and Life Sciences		Information Technology and Computer Sciences	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 5	5

*This unit standard does not replace any other unit standard and is not replaced by another unit standard.*

**SPECIFIC OUTCOME 1**

Describe and use basic DC power supplies.

**SPECIFIC OUTCOME 2**

Build DC power supply.

**SPECIFIC OUTCOME 3**

Perform fault finding.

**SPECIFIC OUTCOME 4**

Measure regulation and ripple of the power supply.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Core	63849	Further Education and Training Certificate: Electronics	Level 4



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:****Operate electronic test instruments**

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259170	Operate electronic test instruments		
<b>ORIGINATOR</b>	<b>PROVIDER</b>		
SGB Electronics			
<b>FIELD</b>	<b>SUBFIELD</b>		
10 - Physical, Mathematical, Computer and Life Sciences	Information Technology and Computer Sciences		
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 4	5

*This unit standard does not replace any other unit standard and is not replaced by another unit standard.*

**SPECIFIC OUTCOME 1**

Demonstrate knowledge of test instruments.

**SPECIFIC OUTCOME 2**

Set up electronic instruments.

**SPECIFIC OUTCOME 3**

Demonstrate knowledge of measuring techniques.

**SPECIFIC OUTCOME 4**

Interpret the results of the readings.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Core	63649	Further Education and Training Certificate: Electronics	Level 4