No. 1114 **24 October 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.saqa.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 17 November 2008.*** All correspondence should be marked **Standards Setting – SGB for Geographical Information Sciences** and addressed to

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D. MPHUTHING
ACTING DIRECTOR: STANDARDS SETTING AND DEVELOPMENT

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:
Bachelor of Arts: Geographical Information Science

SAQA QUAL ID	*QUALIFICATION TITLE*		
63689	Bachelor of Arts: Geographical Information Science		
ORIGINATOR		*PROVIDER*	
SGB Geographical Information Sciences			
QUALIFICATION TYPE	*FIELD*	*SUBFIELD*	
National First Degree	12 - Physical Planning and Construction	Physical Planning, Design and Management	
ABET BAND	*MINIMUM CREDITS*	*NQF LEVEL*	*QUAL CLASS*
Undefined	362	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:

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 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 Technologist 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:

> Collect and capture data from various formats and sources.
> Analyse and visualise the data to meet the stated requirement.
> Design and manage a database to store the required data sets.
> Operate effectively as a GISc Technologist in a professional practise.

The qualification complies with the PLATO Act (Act 40 of 1984) and regulations framed in terms of the Act, which regulate the conduct and standards of good practise within the profession.

Rationale:

The introduction of a Degree in GISc based on unit standards will allow learners to enter the occupational area as Geographical Information Systems (GIS) Technologists and to reach full potential of advancement without formal education becoming an impassable barrier and 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 GISc practitioner. The qualification seeks to produce capacity

at a Bachelor degree level with the combinations of practical, applied, foundational and reflective competencies to supervise GISc operators and technicians, but that can also independently complete more advanced GIS work. This qualification is aimed at human resources in the industry that wish to gain progressive accumulation of knowledge, skills and competence exceeding that offered at certificate and/or national diploma, NQF Level 5. 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 Bachelor degree can also serve as a building block towards the next level or postgraduate qualification. 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.

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 accessible to learners' who are employed within the Construction Industry, new entrants into the world of work and persons who are unemployed. There is no gender, ethnic or other bias towards learners who wish to enter this qualification.

The development and guidance of learners is facilitated by persons who have achieved the level of qualification recognised by the industry for certification and registration as a GISc practitioner. A learner having gained this qualification and the required experience, will be able to register with the South African Council for Professional and Technical Surveyors (PLATO) in terms of Act 40 of 1984 and through this body's reciprocal agreements with other similar bodies gain international recognition.

RECOGNIZE PREVIOUS LEARNING?
Y

LEARNING ASSUMED IN PLACE
It is assumed that a learner is already competent in the following:

> FET Certificate at NQF Level 4 or equivalent.
> Mathematics and Communication at NQF Level 5.

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:

> Access to the qualification is open bearing in mind learning assumed to be in place. It is important that a learner has a minimum of five years GIS related experience.

QUALIFICATION RULES
To complete this qualification a learner needs to attain at least 362 credits. The credit allocation in this qualification is broken down into three categories. These are in accordance with the SAQA prerequisites and are defined as follows:

> Fundamental: 51 Credits.
> All unit standards under the Fundamentals totalling 51 Credits are compulsory.
> All Core unit standards totalling 256 Credits are compulsory.

> Electives 235 Credits.
> Learners should pick a group of electives with a minimum of 55 credits.

EXIT LEVEL OUTCOMES

1. Collect and capture data from various formats and sources.

2. Analyse and visualise data to meet the stated requirement.

3. Design and manage a database to store the required data sets.

4. Operate effectively as a GISc Technologist in a professional practise.

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 database to facilitate efficient and correct results is designed.
> The database is populated with batch importing and single record capturing.
> Data are captured in an accurate and consistent manner.
> The data are 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.

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.

Specialisation:

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, and 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 master's 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 Edinburgh:

(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 modeling 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 modeling 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 descriptions:

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 Developmental, 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.
> 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.
> 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
Horizontal Articulation is possible with the following:

> Bachelor of Science: Geoinformatics, NQF Level 6.
> Bachelor of Science: Geography, NQF Level 6.

Vertical Articulation is possible with the following:

> ID 63711: Bachelor of GISc at NQF Level 7.
> ID 63310: Master of GIS at NQF Level 8.
> ID 63709: Doctor of Philosophy at NQF Level 8 and above.

MODERATION OPTIONS
> Anyone assessing a learner or moderating the assessment of a learner against this Qualification must be registered as an assessor with an appropriate Education, Training, and Quality Assurance (ETQA) Body or with an ETQA that has a Memorandum of Understanding 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 or with an ETQA that has a Memorandum of Understanding with the relevant ETQA. Moderation of assessment will be overseen by the relevant ETQA or by an ETQA that has a Memorandum of Understanding with the relevant ETQA, according to the ETQA`s policies and guidelines for assessment and moderation.

> 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 in the exit level outcomes described in the qualification.

CRITERIA FOR THE REGISTRATION OF ASSESSORS
For an applicant to register as an assessor, the applicant needs:

> Well-developed interpersonal skills, subject matter and assessment experience.

> To be competent in the planning and conducting assessment of learning outcomes as described in the unit standard Conduct Outcomes-based assessment at NQF Level 5.
> Well-developed subject matter expertise within GIS.
> Competent in the exit level outcomes of the GIS NQF Level 6.
> To be registered 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
Learning pathway:

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

1. National Certificate: GISc, NQF Level 5.
2. National Diploma: GISc, NQF Level 5.
3. B. Degree: GISc, NQF Level 6.
4. B. Hon. Degree: GISc, NQF Level 7.
5. Masters Degree, NQF Level 8.
6. Doctorate Degree: GISc, NQF Level 8 and above.

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

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

UNIT STANDARDS

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Fundamental	258657	Demonstrate an understanding of the context of GI Science	Level 6	4
Fundamental	115448	Understand and apply statistical techniques for business and research applications	Level 6	18
Fundamental	258741	Understand the theory and practice of exploratory data analysis	Level 6	4
Fundamental	117434	Conduct research	Level 7	15
Fundamental	258764	Demonstrate understanding of spatial modeling in GISc	Level 7	10
Core	7876	Conduct on-the-Job-Training	Level 5	8
Core	115753	Conduct outcomes-based assessment	Level 5	15
Core	258648	Demonstrate fundamental knowledge and understanding of photogrammetry	Level 5	3
Core	119175	Participate in the clarification of issues regarding a consulting engagement	Level 5	5
Core	230078	Apply the principles of ethics to a business environment	Level 6	10
Core	258647	Be aware of the principles of spatial data in database	Level 6	8
Core	258740	Capture Geo-information from secondary data sources	Level 6	5
Core	258758	Collect and capture metadata for spatial data	Level 6	7
Core	258765	Complete a basic GIS project	Level 6	16
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	258735	Demonstrate an ability to read maps	Level 6	4
Core	258654	Demonstrate an understanding of different visual variables used on maps	Level 6	4
Core	258736	Demonstrate an understanding of general database theory	Level 6	3
Core	258656	Demonstrate an understanding of map composition elements in map production	Level 6	4
Core	258659	Demonstrate an understanding of the basic principles of spatial data	Level 6	6

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Core	258650	Demonstrate capability of visual image interpretation of the real world	Level 6	4
Core	258655	Demonstrate knowledge of sources for spatial data	Level 6	4
Core	115022	Describe research problems	Level 6	20
Core	258737	Design and develop a simple database	Level 6	7
Core	258642	Develop simple SQL queries	Level 6	4
Core	115348	Oversee the professional execution of daily functions	Level 6	5
Core	258776	Perform 2.5D vector surface queries under supervision	Level 6	10
Core	258644	Perform basic spatial and hybrid queries under supervision	Level 6	11
Core	258757	Perform spatial error analysis	Level 6	2
Core	258766	Plan and check the capture of Geospatial-information from secondary data sources	Level 6	6
Core	11820	Select a map projection and transform data between projections or ellipsoids	Level 6	3
Core	258639	Supervise the capture of Geo-information from secondary data sources	Level 6	4
Core	115453	Understand and apply mathematical systems for commercial applications	Level 6	18
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	258653	Understand the basic principles of Remote Sensing Imagery	Level 6	4
Core	258739	Understand the conceptual context of spatial visualisations and presentation	Level 6	10
Core	258635	Use field data capture devices	Level 6	4
Core	258658	Work with map projections	Level 6	6
Core	258777	Use the SQL language to create, modify, query and manage a database application	Level 7	8
Elective	252446	Acquire copyright permissions	Level 5	10
Elective	120476	Adhere to professional conduct and organisational ethics	Level 5	4
Elective	15234	Apply efficient time management to the work of a department/division/section	Level 5	4
Elective	242714	Apply elementary statistical methods	Level 5	5
Elective	244501	Apply image analysis methodology	Level 5	12
Elective	244539	Apply image analysis techniques	Level 5	8
Elective	244537	Collate information into a structured image analysis report	Level 5	2
Elective	119335	Conduct and apply statistical analyses required to make informed public sector finance decisions	Level 5	15
Elective	258743	Demonstrate knowledge of statistical averaging or data centre concepts	Level 5	2
Elective	252024	Evaluate current practices against best practice	Level 5	4
Elective	15229	Implement codes of conduct in the team, department or division	Level 5	3
Elective	116832	Manage a work process	Level 5	3
Elective	252025	Monitor, assess and manage risk	Level 5	8
Elective	115835	Operate in a professional manner utilising trouble shooting techniques while applying creative thinking processes	Level 5	5
Elective	119176	Respond to a request for proposal	Level 5	5
Elective	12432	Use mathematical and statistical techniques effectively	Level 5	20
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	258638	Assess fitness for use of spatial data	Level 6	13
Elective	258755	Create Schematic Diagrams	Level 6	4
Elective	258649	Demonstrate an understanding of topology for storing spatial data	Level 6	4
Elective	258637	Demonstrate basic GPS knowledge	Level 6	4
Elective	258759	Demonstrate knowledge of the principles of spatial data in database	Level 6	8

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Elective	258763	Develop a web site with simple mapping functionality	Level 6	12
Elective	11830	Interpret the Professional and Technical Surveyors' Act, no. 40 of 1984 and the rules framed thereunder	Level 6	3
Elective	258742	Perform queries of existing networks under supervision	Level 6	10
Elective	258760	Understand and apply the process of image mosaicing	Level 6	5
Elective	258778	Understand and manage spatial data errors	Level 6	4
Elective	258645	Understand concepts and theory of networks	Level 6	10
Elective	258775	Understand spatial data transfer protocols	Level 6	3
Elective	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
Elective	258761	Perform data generalisation and aggregation	Level 7	3

LEARNING PROGRAMMES RECORDED AGAINST THIS QUALIFICATION
None

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate an ability to read maps

SAQA US ID	*UNIT STANDARD TITLE*		
258735	Demonstrate an ability to read maps		
ORIGINATOR		*PROVIDER*	
SGB Geographical Information Sciences			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 6	4

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

SPECIFIC OUTCOME 1
Demonstrate an ability to conceptualise space in the real world and a map representation of the real world.

SPECIFIC OUTCOME 2
Understand the characteristics of space in the real world and a map representation of the real world.

SPECIFIC OUTCOME 3
Demonstrate an ability to think spatially in the context of the real world and a map representation of the real world.

SPECIFIC OUTCOME 4
Understand the difference between the real world and a map representation of the real world, i.e. field-based and object-based views of geographical space.

SPECIFIC OUTCOME 5
Understand elementary spatial relationships within the real world and a map representation of the real world.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	63689	Bachelor of Geographical Information Science	Level 6

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate an understanding of general database theory

SAQA US ID	***UNIT STANDARD TITLE***		
258736	Demonstrate an understanding of general database theory		
ORIGINATOR		***PROVIDER***	
SGB Geographical Information Sciences			
FIELD		***SUBFIELD***	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 6	3

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

SPECIFIC OUTCOME 1
Demonstrate knowledge of different database types.

SPECIFIC OUTCOME 2
Demonstrate knowledge of the relational database model.

SPECIFIC OUTCOME 3
Explain properties of data structures in a relational database in terms of geo-spatial data.

SPECIFIC OUTCOME 4
Demonstrate knowledge of the object orientated database model.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	63689	Bachelor of Geographical Information Science	Level 6
Core	63711	Bachelor of Geographical Information Science (GISc)	Level 7

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Design and develop a simple database

SAQA US ID	*UNIT STANDARD TITLE*		
258737	Design and develop a simple database		
ORIGINATOR		*PROVIDER*	
SGB Geographical Information Sciences			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 6	7

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

SPECIFIC OUTCOME 1
Design a simple database for data storage and data manipulation within an integrated geographical information system (GIS).

SPECIFIC OUTCOME 2
Explain techniques that can be used to validate data.

SPECIFIC OUTCOME 3
Understand and explain advanced principles related to relational databases used within a GIS environment.

SPECIFIC OUTCOME 4
Create a database from a logical design within a GIS environment.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	63689	Bachelor of Geographical Information Science	Level 6
Core	63711	Bachelor of Geographical Information Science (GISc)	Level 7

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Understand concepts and theory of Cartographic modeling

SAQA US ID	*UNIT STANDARD TITLE*		
258738	Understand concepts and theory of Cartographic modeling		
ORIGINATOR		*PROVIDER*	
SGB Geographical Information Sciences			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 6	12

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

SPECIFIC OUTCOME 1
Understand the concept of cartographic modeling within the context of a geographical information system (GIS).

SPECIFIC OUTCOME 2
Interpret and execute an existing, simple cartographic model within the context of a GIS.

SPECIFIC OUTCOME 3
Understand and explain the stages in the development of a cartographic model that will meet the requirements of a geographical information system (GIS).

SPECIFIC OUTCOME 4
Perform data conversions between different spatial data formats within a GI system environment.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	63689	Bachelor of Geographical Information Science	Level 6
Core	63711	Bachelor of Geographical Information Science (GISc)	Level 7

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Understand the conceptual context of spatial visualisations and presentation

SAQA US ID	*UNIT STANDARD TITLE*		
258739	Understand the conceptual context of spatial visualisations and presentation		
ORIGINATOR		*PROVIDER*	
SGB Geographical Information Sciences			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
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
Understand and explain the history of cartography and visualisation in the context of GIS&T. (Cartographic symbolization and visualization).

SPECIFIC OUTCOME 2
Explain and apply Cartographic generalization.

SPECIFIC OUTCOME 3
Explain and apply Cartographic symbolization.

SPECIFIC OUTCOME 4
Demonstrate the use of visual variables and their effectiveness in signifying the three levels of measurement of data.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	63689	Bachelor of Geographical Information Science	Level 6
Elective	63711	Bachelor of Geographical Information Science (GISc)	Level 7

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Capture Geo-information from secondary data sources

SAQA US ID	*UNIT STANDARD TITLE*		
258740	Capture Geo-information from secondary data sources		
ORIGINATOR		*PROVIDER*	
SGB Geographical Information Sciences			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
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
Prepare and digitise a map from a digital map document using conventional digitising methods in compliance with industry best practice and procedures.

SPECIFIC OUTCOME 2
Prepare and scan a map document according to task requirements and specifications.

SPECIFIC OUTCOME 3
Prepare and digitise a map from a digital map document using the "heads-up" digitising method in compliance with industry best practice and procedures.

SPECIFIC OUTCOME 4
Capture co-ordinates and alphanumeric data from a survey or other document containing text and vector data.

SPECIFIC OUTCOME 5
Import digital Geo-Information data from other secondary sources such as storage devices, file transfer devices, survey instruments, web facilities and portable hard disks, including CD's, DVDS and magnetic tapes.

SPECIFIC OUTCOME 6
Clean and add identifiers to captured geospatial data in terms of the task requirements and specifications.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	63689	Bachelor of Geographical Information Science	Level 6
Elective	63711	Bachelor of Geographical Information Science (GISc)	Level 7

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Understand the theory and practice of exploratory data analysis

SAQA US ID	*UNIT STANDARD TITLE*		
258741	Understand the theory and practice of exploratory data analysis		
ORIGINATOR		*PROVIDER*	
SGB Geographical Information Sciences			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 6	4

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

SPECIFIC OUTCOME 1
Understand and construct frequency bar charts.

SPECIFIC OUTCOME 2
Understand scatterplots.

SPECIFIC OUTCOME 3
Understand and interpret Stem and Leaf displays.

SPECIFIC OUTCOME 4
Understand and explain Box Plots.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Fundamental	63689	Bachelor of Geographical Information Science	Level 6
Elective	63711	Bachelor of Geographical Information Science (GISc)	Level 7

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Perform queries of existing networks under supervision

SAQA US ID	*UNIT STANDARD TITLE*		
258742	Perform queries of existing networks under supervision		
ORIGINATOR		*PROVIDER*	
SGB Geographical Information Sciences			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
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
Understand Networks.

SPECIFIC OUTCOME 2
Understand different network applications.

SPECIFIC OUTCOME 3
Understand and perform basic route analysis.

SPECIFIC OUTCOME 4
Perform network analysis.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	63689	Bachelor of Geographical Information Science	Level 6
Elective	63711	Bachelor of Geographical Information Science (GISc)	Level 7

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate knowledge of statistical averaging or data centre concepts

SAQA US ID	*UNIT STANDARD TITLE*		
258743	Demonstrate knowledge of statistical averaging or data centre concepts		
ORIGINATOR		*PROVIDER*	
SGB Geographical Information Sciences			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 5	2

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

SPECIFIC OUTCOME 1
Demonstrate understanding of the different measures of "centre" for data sets.

SPECIFIC OUTCOME 2
Demonstrate understanding of the simple data distribution.

SPECIFIC OUTCOME 3
Demonstrate understanding of a moving average.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	63689	Bachelor of Geographical Information Science	Level 6

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Create Schematic Diagrams

SAQA US ID	***UNIT STANDARD TITLE***		
258755	Create Schematic Diagrams		
ORIGINATOR		***PROVIDER***	
SGB Geographical Information Sciences			
FIELD		***SUBFIELD***	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 6	4

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

SPECIFIC OUTCOME 1
Understand the components of a diagram.

SPECIFIC OUTCOME 2
Review different types of schematic diagrams.

SPECIFIC OUTCOME 3
Create a schematic diagram.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	63689	Bachelor of Geographical Information Science	Level 6

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate GIS Software skills with an additional package

SAQA US ID	*UNIT STANDARD TITLE*		
258756	Demonstrate GIS Software skills with an additional package		
ORIGINATOR		*PROVIDER*	
SGB Geographical Information Sciences			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 6	2

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

SPECIFIC OUTCOME 1
Launch application and access spatial information.

SPECIFIC OUTCOME 2
Perform basic queries and data manipulation.

SPECIFIC OUTCOME 3
Produce basic output.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	63689	Bachelor of Geographical Information Science	Level 6
Core	63711	Bachelor of Geographical Information Science (GISc)	Level 7

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Perform spatial error analysis

SAQA US ID	***UNIT STANDARD TITLE***		
258757	Perform spatial error analysis		
ORIGINATOR		***PROVIDER***	
SGB Geographical Information Sciences			
FIELD		***SUBFIELD***	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 6	2

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

SPECIFIC OUTCOME 1
Demonstrate knowledge and understanding of positional error.

SPECIFIC OUTCOME 2
Demonstrate knowledge and understanding of the spatial quality of data.

SPECIFIC OUTCOME 3
Identify and manage spatial errors leading to propa-gation.

SPECIFIC OUTCOME 4
Perform spatial error analysis.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	63689	Bachelor of Geographical Information Science	Level 6
Core	63711	Bachelor of Geographical Information Science (GISc)	Level 7

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Collect and capture metadata for spatial data

SAQA US ID	***UNIT STANDARD TITLE***		
258758	Collect and capture metadata for spatial data		
ORIGINATOR		***PROVIDER***	
SGB Geographical Information Sciences			
FIELD		***SUBFIELD***	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 6	7

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

SPECIFIC OUTCOME 1
Describe metadata for spatial data.

SPECIFIC OUTCOME 2
Understand and explain the use of metadata in the context of either the South African Metadata Standard (SANS 1878) or the International Organisation for Standardization (ISO) Technical Committee (TC) 211 work. See ISO 19115, metadata.

SPECIFIC OUTCOME 3
Understand and explain national and international metadata standardisation efforts in the context of either the South African Metadata Standard (SANS 1878) or the International Organisation for Standardization (ISO) Technical Committee (TC) 211 work.

SPECIFIC OUTCOME 4
Give a detailed account of sources of metadata information in the context of the Spatial Data Infrastructure Act (Act 54 of 2003).

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	63689	Bachelor of Geographical Information Science	Level 6
Core	63711	Bachelor of Geographical Information Science (GISc)	Level 7

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate knowledge of the principles of spatial data in database

SAQA US ID	*UNIT STANDARD TITLE*		
258759	Demonstrate knowledge of the principles of spatial data in database		
ORIGINATOR		*PROVIDER*	
SGB Geographical Information Sciences			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
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 an understanding of unique identifiers.

SPECIFIC OUTCOME 2
Demonstrate an understanding of label properties.

SPECIFIC OUTCOME 3
Demonstrate an understanding of Spatial Data Types and the representation thereof.

SPECIFIC OUTCOME 4
Demonstrate an understanding of Spatial Data Indexes.

SPECIFIC OUTCOME 5
Demonstrate an understanding of location and spatial reference identification.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	63689	Bachelor of Geographical Information Science	Level 6

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Understand and apply the process of image mosaicing

SAQA US ID	*UNIT STANDARD TITLE*		
258760	Understand and apply the process of image mosaicing		
ORIGINATOR		*PROVIDER*	
SGB Geographical Information Sciences			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
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
Understand and apply mosaicing concepts.

SPECIFIC OUTCOME 2
Mosaic imagery.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	63689	Bachelor of Geographical Information Science	Level 6
Elective	63711	Bachelor of Geographical Information Science (GISc)	Level 7

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Perform data generalisation and aggregation

SAQA US ID	*UNIT STANDARD TITLE*		
258761	Perform data generalisation and aggregation		
ORIGINATOR		*PROVIDER*	
SGB Geographical Information Sciences			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 7	3

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

SPECIFIC OUTCOME 1
Understand different methods to generalise spatial entities in either a cartographic or GIS project.

SPECIFIC OUTCOME 2
Understand the context of spatial data generalisation in either a cartographic or GIS project.

SPECIFIC OUTCOME 3
Understand the context within which to aggregate spatial data in either a cartographic or GIS project.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	63689	Bachelor of Geographical Information Science	Level 6
Core	63711	Bachelor of Geographical Information Science (GISc)	Level 7

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Understand concepts and processes of data conversion

SAQA US ID	*UNIT STANDARD TITLE*		
258762	Understand concepts and processes of data conversion		
ORIGINATOR		*PROVIDER*	
SGB Geographical Information Sciences			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 6	6

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

SPECIFIC OUTCOME 1
Perform data conversions across spatial data models.

SPECIFIC OUTCOME 2
Explain the consequence of converting datasets within a GI system environment.

SPECIFIC OUTCOME 3
Perform data conversions across spatial reference systems within a GI system environment.

SPECIFIC OUTCOME 4
Perform data conversions between different spatial data formats within a GI system environment.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	63689	Bachelor of Geographical Information Science	Level 6
Core	63711	Bachelor of Geographical Information Science (GISc)	Level 7

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Develop a web site with simple mapping functionality

SAQA US ID	*UNIT STANDARD TITLE*		
258763	Develop a web site with simple mapping functionality		
ORIGINATOR		*PROVIDER*	
SGB Geographical Information Sciences			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 6	12

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

SPECIFIC OUTCOME 1
Develop a general understanding of the Internet.

SPECIFIC OUTCOME 2
Develop a basic understanding of how the Internet is managed.

SPECIFIC OUTCOME 3
Develop a simple web site and publish it on the local host.

SPECIFIC OUTCOME 4
Create and modify graphic components for a web site.

SPECIFIC OUTCOME 5
Develop web pages that include a variety of static (non-interactive) maps with hyperlinks.

SPECIFIC OUTCOME 6
Develop a simple web site with mapping functionality from specification.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	63689	Bachelor of Geographical Information Science	Level 6

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate understanding of spatial modeling in GISc

SAQA US ID	*UNIT STANDARD TITLE*		
258764	Demonstrate understanding of spatial modeling in GISc		
ORIGINATOR		*PROVIDER*	
SGB Geographical Information Sciences			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
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
Demonstrate an understanding of the role of models in science.

SPECIFIC OUTCOME 2
Demonstrate an understanding of the nature of different types of spatial models.

SPECIFIC OUTCOME 3
Understand how to construct a spatial model.

SPECIFIC OUTCOME 4
Demonstrate the ability to use an existing spatial model in GIS.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Fundamental	63689	Bachelor of Geographical Information Science	Level 6

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Complete a basic GIS project

SAQA US ID	*UNIT STANDARD TITLE*		
258765	Complete a basic GIS project		
ORIGINATOR		*PROVIDER*	
SGB Geographical Information Sciences			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 6	16

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

SPECIFIC OUTCOME 1
Define the GIS project requirements in terms of the scope, user requirements, deliverables and costs.

SPECIFIC OUTCOME 2
Define and implement the project environment and technical parameters that will meet the requirements of the project.

SPECIFIC OUTCOME 3
Define models needed to fulfill the GIS project requirements successfully.

SPECIFIC OUTCOME 4
Execute the project analysis successfully in order to meet the requirements and objectives of the GIS project selected.

SPECIFIC OUTCOME 5
Complete the GIS project selected in terms of the following criteria: outputs, procedures, metadata and analyse the results.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	63689	Bachelor of Geographical Information Science	Level 6

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Plan and check the capture of Geospatial-information from secondary data sources

SAQA US ID	*UNIT STANDARD TITLE*		
258766	Plan and check the capture of Geospatial-information from secondary data sources		
ORIGINATOR		*PROVIDER*	
SGB Geographical Information Sciences			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 6	6

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

SPECIFIC OUTCOME 1
Understand the concepts of scanning as a secondary data source for the capturing of geospatial-information as raster data.

SPECIFIC OUTCOME 2
Understand the concepts of digitising as a secondary data source for the capturing of geospatial-information as vector data.

SPECIFIC OUTCOME 3
Understand the basic principles of Photogrammetry when used as a secondary data source for the capture of geospatial-information.

SPECIFIC OUTCOME 4
Understand the basic principles of the South African geodetic model as defined by the South African National Mapping organisation.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	63689	Bachelor of Geographical Information Science	Level 6
Elective	63711	Bachelor of Geographical Information Science (GISc)	Level 7

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Understand spatial data transfer protocols

SAQA US ID	*UNIT STANDARD TITLE*		
258775	Understand spatial data transfer protocols		
ORIGINATOR		*PROVIDER*	
SGB Geographical Information Sciences			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 6	3

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

SPECIFIC OUTCOME 1
Understand and explain simple feature specification for SQL in relation to data storage, included but not limited to: OGC and ISO.

SPECIFIC OUTCOME 2
Understand and explain the Geographic information - Web Map Server standards in relation to data transfer.

SPECIFIC OUTCOME 3
Understand and explain the OGC Web Coverage Service standard in relation to data transfer.

SPECIFIC OUTCOME 4
Understand and explain the OGC Web Catalogue Service standard in relation to data transfer.

SPECIFIC OUTCOME 5
Understand and explain Web Feature Service standards in relation to data transfer.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	63689	Bachelor of Geographical Information Science	Level 6
Core	63711	Bachelor of Geographical Information Science (GISc)	Level 7

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Perform 2.5D vector surface queries under supervision

SAQA US ID	*UNIT STANDARD TITLE*		
258776	Perform 2.5D vector surface queries under supervision		
ORIGINATOR		*PROVIDER*	
SGB Geographical Information Sciences			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
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
Understand and explain the principles of a TIN.

SPECIFIC OUTCOME 2
Perform simple surface derived analysis under supervision.

SPECIFIC OUTCOME 3
Calculate profiles under supervision.

SPECIFIC OUTCOME 4
Generate visualisations of TINs under supervision.

SPECIFIC OUTCOME 5
Calculate volumes from surfaces under supervision.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	63689	Bachelor of Geographical Information Science	Level 6

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Use the SQL language to create, modify, query and manage a database application

SAQA US ID	*UNIT STANDARD TITLE*		
258777	Use the SQL language to create, modify, query and manage a database application		
ORIGINATOR		*PROVIDER*	
SGB Geographical Information Sciences			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
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 and explain the SQL language structure in the context of international SQL: 2003 standards.

SPECIFIC OUTCOME 2
Use SQL to define a relational database environment in the context of international SQL: 2003 standards.

SPECIFIC OUTCOME 3
Use SQL to manipulate data in a relational database environment in the context of international SQL: 2003 standards.

SPECIFIC OUTCOME 4
Use SQL to query a database in the context of international SQL: 2003 standards.

SPECIFIC OUTCOME 5
Understand advanced concepts in SQL needed to perform query and database management tasks in the context of international SQL: 2003 standards.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	63689	Bachelor of Geographical Information Science	Level 6
Core	63711	Bachelor of Geographical Information Science (GISc)	Level 7

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Understand and manage spatial data errors

SAQA US ID	*UNIT STANDARD TITLE*		
258778	Understand and manage spatial data errors		
ORIGINATOR		*PROVIDER*	
SGB Geographical Information Sciences			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Physical Planning, Design and Management	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 6	4

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

SPECIFIC OUTCOME 1
Identify and manage positional measurement errors in spatial data.

SPECIFIC OUTCOME 2
Identify and manage attribute errors in spatial data used in a GIS.

SPECIFIC OUTCOME 3
Identify and manage compilation errors in spatial data used in a GIS environment.

SPECIFIC OUTCOME 4
Identify and manage processing errors in spatial data used in a GIS project.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	63689	Bachelor of Geographical Information Science	Level 6
Core	63711	Bachelor of Geographical Information Science (GISc)	Level 7