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.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 22 October 2008.*** All correspondence should be marked **Standards Setting – Geographical Information Sciences** addressed to

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SAQA
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DR S BHIKHA
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SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:
Bachelor of Geographical Information Science (GISc)

SAQA QUAL ID	*QUALIFICATION TITLE*		
63711	Bachelor of Geographical Information Science (GISc)		
ORIGINATOR		*PROVIDER*	
SGB Geographical Information Sciences			
QUALIFICATION TYPE	*FIELD*	*SUBFIELD*	
Professional Qualification	12 - Physical Planning and Construction	Physical Planning, Design and Management	
ABET BAND	*MINIMUM CREDITS*	*NQF LEVEL*	*QUAL CLASS*
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?
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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 Satelite 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 advice 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 algorithims 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 Geo-informatics or Geographical Information Science, in any working environment by:

1. Manage the collection and capturing of data from various formats and sources.

2. Mange 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 co mprehensive 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 Diloma 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

SAQA US ID	*UNIT STANDARD TITLE*		
258795	Perform spatial and hybrid queries		
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	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

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

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Acquire Remote Sensing Imagery

SAQA US ID	*UNIT STANDARD TITLE*		
258796	Acquire Remote Sensing Imagery		
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
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

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

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Develop web sites with advanced mapping functionality

SAQA US ID	*UNIT STANDARD TITLE*		
258797	Develop web sites with advanced 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 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

	ID	QUALIFICATION TITLE	LEVEL
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

SAQA US ID	*UNIT STANDARD TITLE*		
258798	Investigate and interpret the Spatial Data Infrastructure Act, No. 54 of 2003 and the regulations framed thereunder		
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
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

	ID	QUALIFICATION TITLE	LEVEL
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

SAQA US ID	*UNIT STANDARD TITLE*		
258799	Demonstrate an in depth knowledge and understanding of photogrammetry		
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	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

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

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate a thorough knowledge of GPS technology

SAQA US ID	*UNIT STANDARD TITLE*		
258800	Demonstrate a thorough knowledge of GPS technology		
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	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

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

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Perform life-cycle management of spatio-temporal data

SAQA US ID	*UNIT STANDARD TITLE*		
258801	Perform life-cycle management of spatio-temporal 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 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

	ID	QUALIFICATION TITLE	LEVEL
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

SAQA US ID	*UNIT STANDARD TITLE*		
258802	Create a Standard Operating Procedure for GI Data capture		
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 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

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

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Perform 2.5D vector surface queries

SAQA US ID	*UNIT STANDARD TITLE*		
258803	Perform 2.5D vector surface queries		
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	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

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

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Understand issues that influence the quality of data

SAQA US ID	*UNIT STANDARD TITLE*		
258804	Understand issues that influence the quality of 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 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

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

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Interpret and apply legislation applicable to GISc practices

SAQA US ID	*UNIT STANDARD TITLE*		
258815	Interpret and apply legislation applicable to GISc practices		
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	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

SAQA US ID	*UNIT STANDARD TITLE*		
258816	Select and undertake an approved research project 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	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
Provided prove 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

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