

## GISc Technician model. Diploma in GISc / Geoinformatics

### NQF level 6. Minimum 240 credits

The workforce and competency requirements of a GISc technicians is defined in terms of the Geomatics Act 19 of 2013, section 2(a). This implies a basic understanding of sub-sections 2(a)(i), (ii), (iii) & (v) and a sound knowledge of sub-section (iv). A GISc technician must be competent to assist GISc professionals and technologists or related professionals with GISc related work as described in sub-section 2(a)(iv) of the Geomatics Act 19 of 2013.

**To be used in conjunction with knowledge area (KA) content specifications**

Date Approved  
22 April 2015

**One credit is considered to be 10 hours of notional learning**

**KA teaching may be included in more than one course / module**

**10% leeway per KA is allowed as long as there is no material impact on the qualification**

Knowledge area	Outcomes	Units	Themes and / or key words	Credits for Units	Total credits for KA	%
GS: Geographical science	Ability to understand Geographical science as it relates to GISc				24	10
		GSc1 Area and spatial analysis	Comprises the reading, analysis and interpretation of spatial information; Basic concepts and terminology. Broader understanding of what GIS is and what it involves. Historical perspective. Application fields. Understand different fields contributing and forming part of GISc. Components of a GIS. Functionality, analysis and processes involved.	12		
		GSc2 Earth and environmental science	GIS in earth and environmental studies: A combination of any of the following: Climatology, Geomorphology, Hydrology, Ecology structural geology, engineering geology, interpretation of geological maps, integrated environmental management, environmental impact assessment, development science and theory, urban systems and human settlement, population geography, Disasters (natural and manmade), sustainable development, natural environmental systems (water, atmospheric, oceanographic, fauna/flora etc.), tourism, conservation (natural or heritage), climate change:	12		
MS: Mathematics and statistics	Ability to apply mathematics and statistics in solving GISc related problems				24	10

		MS1 Mathematics: Introduction to higher mathematics and problem solving.	Differential and integral calculus of functions of one variable, partial derivatives, solving systems of linear and non-linear equations, trigonometric functions, conic sections, vector geometry, matrix algebra, linear transformations, differential geometry. Basic statistics: regression, distributions, error theory, correlation, sampling. including sets, probability, mean standard deviation.	24		
PS: Physical science	Ability to understand the principles of Physics in geomatics practice, instrumentation and technology related to GISc				12	5
		PS1 Kinematics, Newton's laws of motion, Friction, Momentum, and work.	Kinematics, Newton's laws of motion, work, energy, power, gravity, periodic motion, interference, diffraction, refraction and reflection of waves, electricity and magnetism, electromagnetic spectrum. Optics.	12		
AM: Analytical methods	Understand and apply different analytical methods related to GISc				18	8
		AM3 Geometric measures	Distances and lengths; direction; shape; area; volume proximity and distance decay; adjacency and connectivity. Terrain Analysis.	9		
		AM4 Basic analytical operations	Buffer; overlay; neighborhoods; map algebra	9		
CF: Conceptual Foundation	Ability to work in a information technology environment				12	5
		CF1 Introduction to information technology	Introduction to computer hardware, operating systems, data communications (local and wide area cover networks), word processing, spread sheets, internet, distributed systems, CAD, security of systems and data/information, data storage, data dissemination, spatial data integration (coordinate systems, projections, resembling rasters).	12		
CV: Cartography and visualization	Understand and apply cartography and visualization tecqniques				24	10
		CV2 Data considerations	Source materials for mapping; Data abstraction: classification, selection, and generalization; Projections as a map design issue.	8		

		CV3 Principles of map design	Map design fundamentals; Basic concepts of symbolization; Color for cartography and visualization; Typography for cartography and visualization; Visual perception, graphicacy, cartographic communication (including information sense-making, information use and information-knowledge transformation), graphic space, symbology (point, line, area, pictorial, 3-D), colour, cartographic design, typonomy, generalisation, map use, multimedia mapping, 2-D and 3-D visualisation, Web maps, general purpose maps, relief representation, thematic maps (including statistical mapping).	8		
		CV6 Map use and evaluation	The power of maps; Map reading; Map interpretation; Map analysis; Evaluation and testing; Impact of uncertainty.	8		
DA: Design aspects	Understanding the design aspects of databases for geospatial data,				12	5
		DA4 Database design	Modeling: Conceptual model; Logical models; Physical models.	12		
DM: Data modelling	Understand DBMS and Data modelling				12	5
		DM2 Database management systems	Co-evolution of DBMS and GIS; Relational DBMS; Object-oriented DBMS; Object-relational DBM; Extensions of the relational model.	4		
		DM3 Tessellation data models	Grid representations; The raster model; Grid compression methods; Terrain models including the Triangulated Irregular Network (TIN) model; Resolution; Hierarchical data models.	4		
		DM4 Vector and object data models	Geometric primitives; The spaghetti model; The topological model; Classic vector data models; The network model;	4		
DN: Data manipulation	Ability to implement data manipulation in a GISc environment.				12	5
		DN1 Representation transformation	Impacts of transformations; Data model and format conversion; Interpolation; Vector-to-raster and raster-to-vector conversions; Raster resampling; Coordinate transformations.	6		

		DN2 Generalization and aggregation	Scale and generalization, caveats of generalising algorithms (Douglas-Peucker) and auto-snap-up routines; Approaches to point, line, and area generalization; Classification and transformation of attribute measurement levels; Aggregation of spatial entities.	6		
GC: Geocomputation	Understand basic computer programmes in a geographical information system.				12	5
		GC10 Computer programming	Algorithms; Standard query language (SQL); Scripting	12		
GD: Geospatial data	Ability to demonstrate an understanding of working with Geospatial data				36	15
		GD1 Earth geometry	Earth's shape; geoid, spheres and ellipsoids	4		
		GD3 Georeferencing systems	Geographic coordinate system; Plane coordinate systems; Linear referencing systems. Two- and three-dimensional coordinate systems, grid reference systems, SA Survey co-ordinate system and UTM system.	6		
		GD4 Datums	Horizontal datums; Vertical datums. Reference datums.	2		
		GD5 Map projections	Map projection types and characteristics; Georeferencing; projection properties;	6		
		GD6 Data quality	Primary and secondary sources, Geometric accuracy; Thematic accuracy; Logical consistency, Resolution; Precision; Metadata. Completeness and temporal quality. Digitising and editing of data.	6		
		GD7 Land surveying, land law and GPS/GNSS	Survey theory and electro-optical methods; Land law: South African cadastral survey system and the Land Survey Act and Regulations, registration systems. Global Positioning System (GNSS).	6		
		GD10 Aerial imaging and photogrammetry	Principles of analogue and digital photography, photogrammetric measurement and data processing including geometry of images, relative and absolute orientation. Knowledge of photogrammetric and satellite sensors, methods and products.	6		

GS: GI S&T and society	Ability to understand and apply professionalism, ethics and relevant legislation in the GISc environment				12	5
		GS6 Ethical aspects of geospatial information and technology	Ethics and professionalism in the GISc practice; Codes of ethics for geospatial professionals; Codes of conduct in the GISc field. Legislation regulating the profession. Intellectual property rights and copyright, privacy rights.	12		
OI: Organizational and institutional aspects	Ability to operate safely and within the Geomatics Industry legal requirements				12	5
		OI5 Institutional and interinstitutional aspects	Understanding of Spatial data infrastructures; Adoption of standards; Data transfer and exchange; Spatial data sharing among organizations; Data warehousing.	6		
		OI7 Business and project management	Effective communication within the built environment (written and spoken communication, communication in the workplace); office organisation and methods; contracts; awareness of management theory, marketing and client relations. Introduction to project management.	6		
Credits for specialisation					10	4
		Maximum three core KAs		10		
RM: Research methodology	Ability to demonstrate technical proficiency in the application of relevant technologies and producing a related report				8	3
		RM1 Portfolio of evidence	Technical Report-Portfolio of evidence demonstrating communication skills in the application of relevant competencies applied in the GISc field.	8		
			<b>Total</b>	<b>240</b>	<b>240</b>	<b>100</b>