

**GUIDELINES FOR THE MINIMUM CORE THEMES (STUDY AREAS) FOR REGISTRATION IN THE CATEGORY:**

**GEOGRAPHICAL INFORMATION SCIENCE (GISc) TECHNICIAN**

COMMON COURSES		Lectures
<b>1</b>	<b>Mathematics, Applied Mathematics &amp; Statistics</b>	<b>75</b>
	Logarithms, Binomial expansions, Determinants, Trigonometric functions, Radian Measure, The derivatives of a function. Applications of differentiation, Integration, Real numbers and the coordinate plane. Vector algebra with applications to geometry. The mean value theorem (Enrich with computer based models). Differentiation of functions of one, two and three variables. Integration. Theory and use of matrix algebra. Linear programming; solving of equations. Elementary differential equations. Vector functions, space curves and arc lengths. Vector algebra with applications, Complex numbers.	
<b>2</b>	<b>Physics (General Science)</b>	<b>20</b>
	Vector quantities, Propagation of light and the use of lenses. The electromagnetic spectrum Motion. Energy, work and power. Principles of electricity and electromagnetic waves. Laser. Atmospheric and surface properties relating to aerial photography. Principles of electricity and electromagnetic waves. Laser. <i>Atmospheric and surface properties related to aerial photography.</i>	
<b>4</b>	<b>Information Technology</b>	<b>60</b>
	Basic components and operation of a personal computer, Software: operating system, Word processing: formatting, tables, etc. Use of spreadsheet: formulae, data handling and graphs. Other software applications. Introduction to database theory and database management systems. Relational and other database models, Design and development of databases and applications with Microsoft Access. Queries and reports to provide information to database users. A group project using various software packages. Entity relationship modelling, database development life cycle. How it relate to GIS. Introduction to scripting & programming	
<b>5</b>	<b>Geo-spatial Information Science</b>	<b>120</b>
	Basic CAD functions, construction lines, scales, line styles, circles, curves, hatching & text enhancements. Basic understanding of CAD functions, concepts & principles. CAD co-ordinate systems. Fundamentals of GIS, Spatial concepts, Spatial data, GIS hardware & software, Data input, GIS data analysis, Practical applications of GIS. Understand concepts and theory to perform spatial queries. Understand, explain and perform overlay analysis. Understand, explain and perform distance based spatial analysis. Understand, explain and produce output symbology for spatial queries. Understand, explain and perform advanced overlay operations. Buffering, Spatial statistical analysis, Spatial Analysis: Introduction to spatial analysis techniques classification, interpolation, extrapolation, geo-referencing, topology, spatial statistics, Perform basic 2.5D vector surface queries under supervision. Process and/or create simple cartographic models under supervision. Create schematic diagrams. TIN and general digital terrain applications in environmental and temporal studies; GIS project: The module provides the student with the opportunity to build a GIS application. Project stages include: problem and hypothesis generation, project methodology, data, needs analysis, database design, data analysis and communication of final information products. Open source software	

<b>6</b>	<b>Photogrammetry and Remote Sensing</b>	<b>60</b>
	Aerial photography. Analogue & digital Aerial cameras. Co-ordinate systems. Photogrammetric scanners, Stereoscopy, Photo interpretation, Airborne GPS. Flight planning	
<b>7</b>	<b>Coordinate Systems and Map Projections</b>	<b>40</b>
	The shape of the earth: need of map projections. Types and properties of map projections. Spherical trigonometry. Choice, construction and the use of different projections. Introduction to Geoids and datums. To include co-ordinate systems e.g. Geographical co-ordinates 3D geocentric co-ordinates, Projected co-ordinates including UTM GNSS co-ordinate systems. Distinguish between concepts of co-ordinate transformation and co-ordinate conversion. Application in GIS. Emphasis on those projections used in SA.	
<b>10</b>	<b>Business and Project Management</b>	<b>25</b>
	Develop and improve student's ability to communicate effectively in English within the discipline of Civil Engineering. Written communication, spoken communication, communication in the workplace, Academic literacy, Information literacy. Economic principles, Types of enterprises ,office organisation and methods, Contracts and contract documents, Theory of management. Work study and work measurement. Quality assurance. Entrepreneurship	
<b>11</b>	<b>Professional Practice &amp; Ethics</b>	<b>25</b>
	Introduction to the law, Different divisions of the South African system of Government. Ownership of property and cadastral systems: registration and transfer of land. Professional registration & ethics. Access to Information Act. SDI.	
<b>12</b>	<b>Category Specific Research Project</b>	<b>30</b>
	The research project must have a design and or analysis component and include reporting and presentation of final results	
	<b>Category specific courses</b>	
<b>17</b>	<b>3D Modelling / Cartography / Visualisation (Data Quality)</b>	<b>75</b>
	Introduction to Cartography, Map production procedures (Basic steps), Map design, Cartographic Representation, Generalization, Computer assisted cartography, Cartometry, Map data sources. Map librarianship, copyright. Practical digital mapping. Map Production.	

<b>22</b>	<b>Data Acquisition (from primary and secondary sources including Surveying, GPS,etc)</b>	<b>20</b>
	<p>Basic principles of surveying. The South African co-ordinate system.Distance measurement. Determination of co-ordinates with polars and traverses. Determination of heights, long and cross sections. Detail surveying with tacheometry. Areas and volumes. The use of the level, theodolite and total station.Trigonometric height determination.Introduction to stereo plotters, Stereo compilation, Photogrammetric co-ordinate systems, Analytical photogrammetry, Rectification / DEM / Orthophotos, Digitising, Introduction to photogrammetric aerial triangulation, Demonstrate basic GNSS knowledge, Basic understanding of GNSS. Position determination from GNSS. Errors in GNSS. Attribute libraries.Data Acquisition and Quality: Module that covers the principles and methods for acquiring spatial data and managing the quality of the collected data. The module focuses on the relationship between data quality and their fitness for use in GIS applications.</p> <p>Error modelling and data uncertainty: design and presentation of spatial data. Understand and manage data errors in relation to spatial data, Identify and manage positional errors, Identify and manage attribute errors, Identify and manage compilation errors, Identify and manage processing errors, Data cleaning, migration &amp; manipulation, Identify the different sources for other vector data sets. Identify the different sources for other raster data sets.</p> <p>Collect and capture metadata for spatial data. Give a detailed account of sources of metadata information. Understand and explain national and international metadata standardisation efforts. Understand and explain the use of metadata. Describe metadata for spatial data. Understand various spatial and attribute data transfer formats. Assess fitness for use of spatial data. Log, report on the results, and determine whether or not the data are fit to use. Demonstrate meticulousness and thoroughness. Understand the parameters given for doing the assessment. Demonstrate an ability to check data manually, semi-automatically and fully automatically.</p>	
<b>23</b>	<b>Geographical Science</b>	<b>50</b>
	<p>Spatial analysis, Geomorphology (including coastal geomorphology), Climatology (including ocean influence), Biochemical cycles and the biosphere, Population (includes settlement), Introduction to GIS, Geographic concepts. (incorporating Survey Drawing 2). Basic drafting skills.Projections: orthographic, isometric. Free hand sketching, Topographic and map work, Scales, grid-lines, Cadastral maps/plans. Subdivision application, area &amp; consistency calculations. SG. Office &amp; Deeds Office documentation. Introduction to Cartography, Map design: symbolisation &amp; generalisation. Reproduction: analogue &amp; digital.</p>	
	<b>Further lecture time for electives</b>	
		<b>600</b>