

**GUIDLINES FOR MINIMUM CORE COURSES FOR REGISTRATION IN THE CATEGORY:  
SURVEYOR**

	<b>Knowledge Area</b>	<b>Outcome</b>	<b>Topic / Themes</b>	<b>Credits</b>	<b>%</b>
1	<b>Mathematics, Applied Mathematics and Statistics</b>	Ability to apply mathematics and statistics in solving geomatics problems at a technologist level	Trigonometric functions; co-ordinate geometry; analytical geometry; Matrix algebra, vectors; Calculus: differentiation; partial differentiation; first order differential equations; integration. solving systems of linear and non-linear equations, conic sections, vector geometry, matrix algebra, Euclidian and analytical geometry; co-ordinate systems. intersection of lines/planes, distance from points to lines/planes. Statistics: regression, distribution and probability density functions, error theory, sampling.	<b>48</b>	<b>13</b>
2	<b>Physics</b>	Understanding of the principles of physics in geomatics practice, instrumentation and technology at a technologist level	Newton's laws of motion, work, energy, power, rotational dynamics, torque, angular momentum, gravitation, periodic motion, diffraction, refraction and reflection of waves, Doppler effect, electromagnetic field, electricity and magnetism, electromagnetic spectrum, Optics	<b>12</b>	<b>3</b>
3	<b>Surveying</b>	Competency in positioning as required at a technologist level	Measurement science, distance measurement (optical, mechanical and electro-optical), angular measurement, surveying equipment (distance and angular, including sources and management of instrument errors, calibration); position determination using observed angles/directions, distances, or combinations of these, (intersection, resection, trilateration and triangulation), heighting; setting out of pre-calculated positions and heights; Areas, volumes, interpretation of maps/plans, design and setting out of horizontal and vertical curves, cross and longitudinal sections, cut and fill calculations, mass-haul diagram, Topographic surveying and creation of maps/plans, 2-D coordinate transformations. concepts of Mobile mapping and introduction to Data fusion.	<b>60</b>	<b>17</b>
4	<b>Information Technology</b>	Ability to apply Information technology in solving geomatics problems	Computer hardware, data communications (local and wide area cover networks), word-processing, spread sheets, Survey software and complementary basic programming, databases and database management systems, use of information technology in surveying, CAD, security of systems and information.	<b>24</b>	<b>7</b>
5	<b>Geographic Information Systems (GIS)</b>	Ability to apply Geo Spatial Information Systems (GIS) in solving survey related problems	Nature of geo-spatial information, geo-spatial information in planning and decision-making, components of a GIS, data acquisition and manipulation, data structures (including vector, raster), data modelling, geo-spatial databases and DBMS, applications of geo-spatial data, data analysis, visualisation and representation of geo-spatial information (including digital cartography). Metadata.	<b>18</b>	<b>5</b>

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6	<b>Photogrammetry and Remote Sensing</b>	Understanding of basic theory, principles and application of photogrammetry and remote sensing	Electro-magnetic energy in remote sensing, geometry of sensors and sensor systems (airborne, spaceborne and terrestrial), images acquisition (including flight planning), image media and formats incl. image compression, principles of analogue and digital photography, ortho-rectification, mosaicing and georeferencing, digital elevation models. Ground Control, photogrammetric measurement and data processing including geometry of images, relative and absolute orientation, bundle adjustment and aerial triangulation . Creation of 3D computer model of landscapes. Virtual globes. Awareness of terrestrial and aerial laser scanning.	<b>24</b>	<b>7</b>
7	<b>Coordinate Systems and Map Projections</b>	Understanding of the principles of co ordinate systems and map projections at a technologist level	Two- and three-dimensional coordinate systems, grid reference systems, geoid, mathematical representations of the Earth, (reference ellipsoids), geographical coordinates, Mathematical models and projection characteristics of map projections), SA Survey co-ordinate system, UTM and other system. Re-projections, 2D co-ordinate transformations	<b>18</b>	<b>5</b>
8	<b>Error Theory and Adjustments</b>	Ability to recognise and adjust survey errors at a technologist level	The nature of observations and data acquisition, types of errors, means, accuracy, precision, distributions. probability, confidence intervals, auto- and cross-correlation, hypothesis testing, Introductory least squares theory, simple and multiple regression, distribution functions, law of error propagation, least squares adjustments of survey observations( parametric and condition equation case)	<b>24</b>	<b>7</b>
9	<b>Earth and Environmental Science</b>	Understanding the relevance of surveying with respect to the environment	A combination of any of the following: Climatology, Geomorphology, structural geology, engineering geology, interpretation of geological maps, integrated environmental management, environmental impact assessment, development science and theory, urban systems and human settlement, sustainable development, natural environmental systems (water, atmospheric, oceanographic, fauna/flora etc.), conservation (natural or heritage).	<b>18</b>	<b>5</b>
10	<b>Business and Project Management</b>	Ability to communicate and interact at an industrial level	Management functions (planning, controlling, organising, decision-making), human resource management, financial management and management accounting, marketing and client relations, contract law, project planning, costing, resource allocation, project control and reporting, business communication, report writing	<b>12</b>	<b>3</b>

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11	<b>Professional Practice and Ethics</b>	Appreciation of issues related to practice management, professionalism and professional ethics	Professionalism, professional ethics, different types of professional practices, structuring a practice, client relationships, social responsibility; Risk management and Occupation Health and Safety management. Relevant geomatics and labour legislation. Work reservation and misconduct. Intellectual property rights and copyright, privacy rights, information economics.	<b>12</b>	<b>3</b>
12	<b>Category Specific applied project</b>	Technical proficiency in producing a report	Report-Portfolio of evidence demonstrating practical skills: Triangulation / GPS, Levelling, Traversing, Computer Applications, Cadastral Surveying, Topographical Surveying	<b>36</b>	<b>10</b>
13	<b>Cadastral Studies and Land Tenure</b>	Understanding of the South African cadastral system	Fundamentals of Roman-Dutch law, immovable property and real rights; land parcels, boundaries, rights and tenure; rights diagrams and deeds (servitudes, leases, sectional titles, 3D rights, off-shore rights, communal rights and rights to mineral and petroleum resources).	<b>12</b>	<b>3</b>
14	<b>Satellite Surveying and geodesy</b>	Ability to operate GNSS as required at a technologist level	Geodetic surveying, global positioning and navigation satellite systems, satellite orbits and orbital parameters, time systems, 3-D positioning. Earth gravity field. Theory and application of GNSS	<b>12</b>	<b>3</b>
16	<b>Precise Engineering Surveying</b>	Competency in precise engineering surveying as required at a technologist level	Setting out of tunnels , bridges, dams, tall buildings and industrial structures, including supervision and monitoring. Inertial navigation system (INS) ( gyrosopes, accelerometers).	<b>24</b>	<b>7</b>
17	<b>3D modelling/digital cartography</b>	Ability to visualise spatial data and differing formats derived from captured survey information	Cartographic communication (including information sense-making, information use and information-knowledge transformation), graphic space, symbology (point, line, area, pictorial, 3-D), colour, cartographic design, generalisation, map use, general purpose maps, relief representation, thematic maps (including statistical mapping), map printing. presentation and manipulation of point clouds.	<b>6</b>	<b>2</b>
			<b>Grand Total</b>	<b>360</b>	<b>100</b>