

**GUIDELINES FOR THE MINIMUM CORE COURSES FOR REGISTRATION IN THE CATEGORY:**

**PROFESSIONAL MINE SURVEYOR**

**COURSE**

**Lectures**

**Common Courses**

1	<b>Mathematics and Applied Mathematics</b>	<b>175</b>
	Differential and integral calculus of functions of one variable, differential equations, partial derivatives, Taylor series, mean value theorem, solving systems of linear and non-linear equations, trigonometric functions, hyperbolic functions, conic sections, complex numbers, vector geometry, matrix algebra, linear transformations, space curves and surfaces, intersection of lines/planes, distance from points to lines/planes, differential geometry. series and polynomials. Basic statistics, including sets, probability, permutations and combinations mean, standard deviation and normal distribution. To be added to allow for changes in matriculation syllabus: Euclidean and analytical geometry, trigonometric identities, laws of sines and cosines, proportion, co-ordinate systems, areas and volumes.	
2	<b>Physics</b>	<b>75</b>
	Kinematics, Newton's laws of motion, work, energy, power, rotational dynamics, torque, angular momentum, gravitation, periodic motion, simple harmonic motion, interference, wave motion, diffraction, refraction and reflection of waves, Doppler effect, electric charge and field, electric potential, capacitance, resistance, electric current, electromagnetic induction, magnetic field, electromagnetic spectrum. Optics	
3	<b>Basic Surveying and Engineering Surveying</b>	<b>150</b>
	Measurement science, distance measurement (optical, mechanical and electro-optical), angular measurement, measuring equipment (distance and angular, including sources and management of instrument errors, calibration and expected precision), spatial reference systems, distance and direction from coordinates, position determination using observed angles/directions, distances, or combinations of these, and Satellite Navigation Systems, setting out of pre-determined positions, heighting, areas, volumes, interpretation of maps/plans, design and setting out of horizontal and vertical curves, cross and longitudinal sections, cut and fill calculations, preparation of maps/plans, 2 D coordinate transformations, control surveys, topographic surveys. Inertial navigation systems.	
4	<b>Information Technology</b>	<b>50</b>
	Introduction to computer hardware, operating systems, data communications (local and wide area cover networks), word processing, spreadsheets, internet, software development (scientific/engineering) in a current programming language, systems development (including systems analysis and design), databases and database management systems, use of information technology in surveying, 2-D CAD, security of systems and information. Spreadsheet design and formatting	
5	<b>Geo-spatial Information Science</b>	<b>25</b>
	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, hybrid), data modelling, geo-spatial databases and DBMS, applications of geo-spatial data using spatial analysis, spatial modelling and spatial statistics, visualisation and representation of geo-spatial information (including digital cartography).	

6	<b>Photogrammetry</b>	<b>25</b>
	Earth satellite orbits, geometry of sensors and sensor systems (airborne, spaceborne and terrestrial), camera calibration, acquisition of images (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, Laser scanning	
7	<b>Coordinate Systems and Map Projections</b>	<b>50</b>
	Two- and three-dimensional coordinate systems, grid reference systems, shape of the Earth, mathematical representations of the Earth, (including reference ellipsoids) geographical coordinates, different types of map projections, Including mathematical modes and projection properties) projection-to-projection transformations, reference datums and common ellipsoids, SA Survey co-ordinate system and UTM system.	
8	<b>Adjustments, Error Theory and Statistics</b>	<b>75</b>
	The nature of observations and data acquisition, types of errors, means, norms ,accuracy, precision, reliability, probability, confidence intervals, distributions and probability density functions, auto- and cross-correlation, hypothesis testing, least squares theory, simple and multiple regression, distribution functions, law of error propagation, least squares adjustments of survey observations( paramatric and condition equation case), network adjustment (including free networks), adjustment of coordinate transformations, design of survey networks, statistical analysis of results and interpretation of data.	
9	<b>Earth and Environmental Studies</b>	<b>50</b>
	Environmental pitfalls in minerals exploration, Mining and the environment, Water management, Air pollution from mining operations, Environment impact assessment, Compiling an EMPR, Environment management costing	
10	<b>Business and Project Management</b>	<b>50</b>
	Management functions (planning, controlling, organising, decision-making), human resource management, financial management and management accounting, marketing and client relations, labour legislation, taxation, project planning, costing, resource allocation, project control and reporting, business communication, report writing, contract law. Risk maangement and Health and Safety management	
11	<b>Professional Practice</b>	<b>25</b>
	Professionalism, professional ethics, different types of professional practices, partnerships and partnership law, structuring a practice, client relationships, SA survey profession and SA Council for Professional and Technical Surveyors (including legislation and rules), social responsibility.	
12	<b>Research project</b>	<b>50</b>
	The research project must have a design and or analysis component and include reporting and presentation of final results	

**Category specific courses**

13	<b>Cadastral Studies and Land Tenure</b>	<b>25</b>
	Land ownership and land tenure (including indigenous systems), rights in land (including servitudes, leases, statutory rights), nature and function of the cadastre, cadastral surveying systems, South African cadastral survey system and the Land Survey Act and Regulations, curvilinear boundaries, case law on boundaries, registration systems, Deeds registration, conveyancing, division of land, consolidation of land, legislation applicable to land ownership and division of land, sectional titles (including Sectional Titles Act and Regulations).	
16	<b>Precise Engineering Surveying</b>	<b>75</b>
	Shaft Surveying, Deformation surveying, Surface subsidence, deformation caused by mining activities, types of deformation, Risk modelling and analysis, Mine Health and Safety Act, Specialised instrumentation (including sources of errors, calibration and expected precision) Specialized surveying equipment (precise Level, Total stations, Geomos, Piezometers, inclinometers) Design of precise control networks, monumentation, automated surveying equipment applications, network adjustments, analysis of data, presentation of data	
17	<b>3D Modelling (Mine Planning)</b>	<b>50</b>
	Mine Planning Terminology, Mine Ventilation layouts, Mine Ventilation constraints (gasses, airflow, Health and safety act requirements), Environmental control - airflow, cooling, calculation of volumes of narrow tabular and massive type ore bodies, design of mine development to allow safe holing on gradient, mine design, layout and sequence, deep, intermediate, shallow, single reef/seam, multi reef/seam, wide reef/seam, irregular ore body, pipe deposits, massive ore bodies, stopes, tunnels, large excavations,	
18	<b>Mineral Management</b>	<b>50</b>
	Mineral rights, law of the Certificate of Competency, land use systems and types, land use planning and control, environmental and physical influences, community dynamics, social impacts, integrated environmental management, environmental impact analysis, mining property valuation	
19	<b>Mine Valuation / Evaluation / Geostatistics</b>	<b>150</b>
	Sampling Theory, sampling procedures, sampling and assay errors, ore flow, pay limits, ore reserves, ore/metal accounting factors, financial mine planning, classical statistics, non-spatial estimation techniques, data analysis, classical estimation methods, geostatistical estimation methods, ore genesis, structural geology, SAMREC code	
20	<b>Mining Geology</b>	<b>50</b>
	Mineralogy, petrology, physical geology, structural geology, historical geology, economic geology, prospecting methods, geological maps, chemistry	
21	<b>Rock Mechanics</b>	<b>50</b>
	Purpose of rock engineering, elastic theory, stresses and strains - compression, tension, shear, Young's Modulus, Poisson's Ratio, strength of support materials - rock types etc, convergence, distribution of stress around openings, fracture around openings, effects of geology, factors governing rock behaviour, energy release rate, excess shear stress	
	<b>Further time for electives</b>	<b>0</b>
	Grand Total	<b>1250</b>