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

MINE SURVEYOR

	Knowledge Area	Outcome	Topic / Themes	Credits	%
1	**Mathematics and Applied Mathematics**	Ability to apply mathematics and statistics in solving mine survey problems	Differential and integral calculus of functions of one variable, differential equations, partial derivatives, Taylor series, solving systems of linear and non-linear equations, trigonometric functions, hyperbolic functions, conic sections, complex numbers, vector geometry, matrix algebra, intersection of lines/planes, distance from points to lines/planes. Basic statistics, probability, permutations and combinations, mean, standard deviation and normal distribution. Euclidean and analytical geometry.	**48**	**13**
2	**Physics**	Understanding the principles of physics in mine survey practice, instrumentation and tecnology	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	**24**	**7**
3	**Mine Surveying**	Ability to manage advance mine surveying operations	Theory and Principles of Surveying-Mine Surveying; Units of measure; Coordinate systems; Survey instruments and their use and adjustments; traversing; levelling-Cut and fill, Gradient calculations; tacheometry; Solution of triangles; Area and Volume determination. Distance measurements, angular measurement, 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. Setting out of pre-determined positions, heighting, design of horizontal and vertical curves, cross and longitudinal sections, 2-D coordinate transformations, control surveys, topographic surveys. Survey computer applications; triangulation; resection; trilateration; missing data calculations; satellite stations; surveying of ore passes; shaft surveying;curves. Gyroscopic and GNSS.	**60**	**17**
4	**Information Technology**	Ability to apply Information technology in standard mine survey applications	Computer literacy, data communications (local and wide area cover networks), word processing, 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, security of systems and information. Spreadsheet design and formatting.	**24**	**7**

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MINE SURVEYOR

	Knowledge Area	Outcome	Topic / Themes	Credits	%
5	**Geographical Information Science**	Abilty to apply Geo Spatial Information science technology in manageing standard mine survey operations	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 data base management systems (DBMS), applications of geo-spatial data using spatial analysis, spatial modelling and spatial statistics, visualisation and representation of geo-spatial information (including digital cartography). Spatial Data Infrastructures (SDI).	**12**	**3**
7	**Coordinate Systems and Map Projections**	Understanding the principles of co ordinate systems and map projections in mine survey	Two- and three-dimensional coordinate systems, grid reference systems, shape of the Earth, mathematical representations of the Earth, (including reference ellipsoids) geographical coordinates, map projections, Including mathematical models and projection properties) Reprojections, 2D transformations, reference datums. SA Survey co-ordinate system and other system.	**12**	**3**
8	**Adjustments, Error Theory and Statistics**	Recognise and adjust observational errors	The nature of observations and data acquisition, types of errors, means, accuracy, precision, reliability, probability, confidence intervals, distributions and probability density functions, law of error propagation, auto- and cross-correlation, hypothesis testing, least squares theory, simple and multiple regression, least squares adjustments of survey observations (paramatric case), 2D coordinate transformations, statistical analysis of results and interpretation of data.	**12**	**3**
10	**Business and Project Management**	Communicate and working in a project team within a mining environment	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 management and Health and Safety management	**12**	**3**
11	**Professional Practice**	Ability to operate safely and within the mining Industry legal requirements	Professionalism, professional ethics, different types of professional practices, structuring a practice, client relationships, social responsibility; Registration with Geomatics Profession Council (including legislation and rules). MHSA, MPRDA, SAMREC and regulations	**12**	**3**
12	**Category Specific project /research**	Ability to demonstrate technical proficiency by producing a report	The project must have a design, research and / or analysis component and include reporting and presentation of final results	**30**	**7**

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MINE SURVEYOR

	Knowledge Area	Outcome	Topic / Themes	Credits	%
14	**Precise Mine/Engineering Surveying**	Ability to produce visual data from captured sampling and survey information	Shaft Surveying, deformation caused by mining activities, Deformation surveying. Specialised instrumentation (including sources of error, calibration and expected precision); presentation of data	**12**	**3**
15	**Mine Planning**	Ability to demonstrate mine planning skills at a mine production unit	Mining methods (underground, opencast, massive); Mine Planning; Mining constraints; mine design (layout and sequence).	**12**	**3**
16	**Mineral Management**	Abilty to demonstrate mineral valuation skills as required at a mine production unit	Mining rights with reference to land use systems and types. Mineral and Pretoleum Resources Act, Mine Health and Safety Act and regulations. SAMREC and SAMVAL codes	**12**	**7**
17	**Mine Sampling**	Ability to apply sampling theory at a mine production unit	Sampling theory and procedures, sampling methods; Sampling reports; Averaging and weighing of sampling results; regular and irregular sampling intervals; Calculation of tonnage and mineral content; sampling reporting systems	**18**	**5**
18	**Mine Valuation / Evaluation / Geostatistics**	Abilty to produce and manage an ore reserve for a mine production unit	Sampling and assay errors Ore flow; pay limits; grade control; life of mine; valuation of mineral deposits. Financial mine planning, classical statistics, non-spatial estimation techniques, data analysis, classical estimation methods, geostatistical estimation methods	**18**	**5**
19	**Mining Geology**	Ability to apply geology knowledge in the management of sampling, survey data and valuation	Mineralogy, petrology, physical geology, structural geology, historical geology, economic geology, prospecting methods, geological maps.	**24**	**7**
20	**Rock Engineering**	Ability to apply rock engineering knowledge in mine planning and monitoring in a mining unit	Purpose of rock engineering, elasticity theory, stresses and strains - compression, tension, shear, Young's Modules, 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	**18**	**5**
			Grand Total	**360**	**101**