

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

ENGINEERING SURVEYOR

COURSE

Common Courses

Lectures

1	Mathematics and Applied Mathematics	125
	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, space curves and surfaces, intersection of lines/planes, distance from points to lines/planes. Basic statistics, including sets, probability, permutations and combinations mean, standard deviation and normal distribution. Euclidean and analytical geometry, trigonometric identities, laws of sines and cosines, proportion, co-ordinate systems, areas and volumes.	
2	Physics	50
	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	Basic Surveying and Engineering Surveying	150
	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.	
4	Information Technology	50
	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, databases and database management systems, use of information technology in surveying, 2-D CAD, security of systems and information. Spreadsheet design and formatting	
5	Geo-spatial Information Science	25
	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	Photogrammetry and Remote Sensing	50
	Electro-magnetic energy in remote sensing, 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, photogrammetric measurement and data processing including geometry of images, relative and absolute orientation, 3D resection, 3D intersection, bundle adjustment and aero triangulation . Determination of 3-D coordinates in close-range photogrammetry. Accuracy and reliability assessment of photogrammetrically derived data, image (photo) interpretation , image processing (including image enhancement, image feature extraction, classification). creation of 3D computer model of landscapes settlements and buildings. Virtual globes	
7	Coordinate Systems and Map Projections	50
	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 modles and projection properties), reference datums and common ellipsoids, SA Survey co-ordinate system and UTM system. Projection-to-projection transformations	
8	Adjustments, Error Theory and Statistics	75
	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)	
9	Earth and Environmental Science	25
	Aastronomical geography, geomorphology, climatology, South African geography, structural geology, engineering geology, interpretation of geological maps, integrated environmental management, environmental impact assessment. Water management, Environment impact assessment, Environment management costing	
10	Business and Project Management	25
	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	
11	Professional Practice and Ethics	25
	Professionalism, professional ethics, different types of professional practices, structuring a practice, client relationships, social responsibility; Registration and SA Council for Professional and Technical Surveyors (including legislation and rules),	

12	Category Specific Research project	50
	Report-Portfolio of evidence demonstrating practical skills: Triangulation / GPS, Levelling, Traversing, Computer Applications, Cadastral Surveying, Topographical Surveying	

Category specific courses

14	Geodesy and Satellite Surveying	50
	Geodetic surveying, global positioning satellite systems, satellite orbits and orbital parameters, time systems, 3-D positioning.	
15	Precise Engineering Surveying	50
	Setting out of tunnels , bridges, dams, tall buildings and industrial structures, including supervision and monitoring.	
16	3D Modelling/Cartography/Visualisation	50
	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, interactive maps, Web maps, general purpose maps, relief representation, thematic maps (including statistical mapping), image maps, intellectual property rights and copyright, privacy rights, information economics, computer-assisted cartographic systems, map printing.	
Further Time for Electives		
24	Cadastral Studies and Land Tenure	50
	South African cadastral survey system and the Land Survey Act and Regulations, curvilinear 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). Work reservation and misconduct	
Grand Total		900