Code: GG Geo-Engineering and Geo-Informatics

Engineering Mathematics

Linear Algebra: Matrices and Determinants, Systems of Linear Equations, Eigen Values and Eigenvectors.

Calculus: Functions of Single Variable, Limit, Continuity and Differentiability, Mean Value Theorems, Evaluation of Definite and Improper Integrals, Partial Derivatives, Total Derivative, Maxima and Minima, Gradient, Divergence and Curl, Vector Identities, Directional Derivatives, Line, Surface and Volume Integrals, Stokes, Gauss and Green's Theorems.

Complex Variables: Analytic Functions, Cauchy's Integral Theorem, Taylor and Laurent Series.

Probability and Statistics: Definitions of Probability and Sampling Theorems, Conditional Probability, Mean, Median, Mode and Standard Deviation, Random Variables, Exponential, Poisson's, Normal and Binomial Distributions.

Programming in C: Variables, Data Types, Expressions, Control Structures, Arrays, Functions, Pointers, Structures.

Geo-Engineering and Geo-Informatics

Geomorphic processes and agents; development and evolution of landforms; slope and drainage; processes in deep oceanic and near-shore regions; quantitative and applied geomorphology.

Mechanism of rock deformation; primary and secondary structures; geometry and genesis of folds, faults, joints and unconformities; cleavage, schistosity and lineation; methods of projection; tectonites and their significance; shear zones; superposed folding; basement-cover relationship.

Crystallography - symmetry, forms and twinning; crystal chemistry; optical mineralogy, classification of minerals, diagnostic physical and optical properties of rock forming minerals.

Engineering properties of rocks and soils; rocks as construction materials; role of geology in the construction of engineering structures including dams, tunnels and excavation sites; natural hazards. Ground water geology – exploration, well hydraulics and water quality.

The earth as a planet; different motions of the earth; gravity field of the earth, Clairaut's theorem, size and shape of earth; geomagnetic field, paleomagnetism; Geothermics and heat flow; seismology and interior of the earth; variation of density, velocity, pressure, temperature, electrical and magnetic properties of the earth; earthquakes-causes and measurements, magnitude and intensity, focal mechanisms, earthquake quantification, source characteristics, seismotectonics and seismic hazards; digital seismographs.

Continents. Earth Composition. Earth – Orbit.

Oceans - Depth, Bottom, Relief.

Minerals: Physical Properties of Minerals.

Surveying and Geo-informatics Methods: Principles of surveying; Errors and their adjustment; Maps - scale, coordinate system; Distance and angle measurement - Levelling and trigonometric levelling; Traversing and triangulation survey; Total station; Horizontal and vertical curves. Photogrammetry - scale, flying height; Remote sensing - basics, platform and sensors, visual image interpretation; Basics of Geographical information system (GIS) and Geographical Positioning System (GPS).

Basic principles of remote sensing – energy sources and radiation principles, atmospheric absorption, interaction of energy with earth's surface, aerial-photo interpretation, multispectral remote sensing in visible, infrared, thermal IR and microwave regions, digital processing of satellite images. GIS – basic concepts, raster and vector mode operations.

Study of Rain Fall: Estimation of Run-Off and Evapotranspiration, Water Table.

Environment: - Meaning, Scope, Components Environments.

Soil: Texture, Strength, Porosity and Permeability.

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