

PEO Exams to Cover GKE

Exams to Cover Additional Foundation Science (1b of GKE)

04-BS-5 Advanced Mathematics (Math in 1b)

Series Solutions of Differential Equations: Series solutions of ordinary differential equations, boundary value problems and orthogonal functions, Fourier series. Numerical Methods: Use of computers for numerical solution of engineering problems, including techniques involving library subroutines and spreadsheets. Approximations and errors, interpolation, systems of linear and non-linear algebraic equations, curve fitting, numerical integration and differentiation, and ordinary differential equations.

04-BS-1 Mathematics (Math in 1b)

Calculus, Vector, and Linear Algebra: Applications involving matrix algebra, determinants, eigenvalues; first and second order linear ordinary differential equations, Laplace transforms. Vector algebra; vector functions and operations; orthogonal curvilinear coordinates; applications of partial derivatives, Lagrange multipliers, multiple integrals, line and surface integrals; integral theorems (Gauss, Green, Stokes). Power series.

04-BS-2 Probability and Statistics

Concepts of probability, events and populations, probability theorems, concept of a random variable, continuous and discrete random variables, probability distributions, distributions of functions of a random variable, sampling and statistical estimation theory, hypothesis testing, simple regression analysis.

04-BS-10 Engineering Thermodynamics (physics in 1b)

Thermodynamic states of simple systems; the laws of thermodynamics; equilibrium, PVT and other thermodynamic diagrams; equation of state; compressibility charts and steam tables; calculation of property changes; enthalpy; applications of thermodynamics, cycles, reversibility; thermodynamics of phase changes, Gibbs phase rule, gas-vapour mixtures.

04-BS-13 Biology (1b)

Cellular reproduction, growth, and differentiation; metabolism and bioenergetics of living cells; cell structure and function related to the material properties of plant and animal tissues; introductory microbiology — characteristics and classification of microorganisms; interactions of microorganisms with man in the natural world; kinetics and mathematical models of microbial growth; engineered biological systems such as bioreactors, bio-instrumentation, and waste treatment systems.

04-BS-12 Organic Chemistry (1b)

Principles of organic chemistry developed around the concepts of structure and functional groups. The main classes of organic compounds. Properties of pure substances. Introduction to molecular structure, bond types, properties, synthesis and reactions, reaction mechanisms, as a means of systematizing organic reactions.

Exams to Cover Foundation Geoscience (2a and 2b of GKE)

04-Geol-A1 Mineralogy and Petrology

Introduction to crystallography and crystal chemistry. Physical and chemical properties of minerals in hand specimens. Identification of minerals and rocks with the petrographic microscope. Field and laboratory classification of igneous and metamorphic rocks. The nature of

magmas and processes of magmatic differentiation. Metamorphic facies concepts. Interpretation of mineral assemblages of igneous and metamorphic rocks in the light of the phase rule and phase relations of relevant mineral assemblages. Textural and physical properties of rocks relevant to engineering problems.

4-Geol-A3 Sedimentation and Stratigraphy

Classification of sedimentary rocks, processes of weathering, erosion, sedimentation and diagenesis. Formation of carbonate, clastic and chemical precipitate rocks. Principles of stratigraphic and paleontological correlation; sedimentary facies: geological and practical significance. Distribution of major Precambrian and Phanerozoic systems. Facies associations; modern and ancient sedimentary environments. The engineering properties and behaviour of sedimentary rocks and the use of stratigraphic principles in the solution of engineering problems.

NTEExam 04-Geol-A4 Structural Geology

Stress and strain. Brittle and ductile rock deformation behaviour. Fabric analysis of deformed rocks. Structural features of stable and mobile parts of the crust. Fold and fault development. Mountain building and orogenies. Theories in geotectonics. Methods of structural analysis. Field mapping and graphical data processing; maps, cross-sections, block diagrams, structure contour maps, stereographic projections, equal area nets, and strain indicators. Kinematic and dynamic interpretation. The application of structural geology to the solution of engineering problems.

NTEExam 10-GP-M6 Global Geophysics

Theory and research applications in gravitation, rotation and figure of the Earth, seismology and Earth structure, free oscillations of the Earth, seismic risk, geomagnetism and the core, paleomagnetism and continental drift. Thermal energy at plate boundaries and hot-spots. Mantle convection.

NTEExam 04-Geol-B4 Geomorphology and Pleistocene Geology

Basic geomorphological concepts: formation and composition of landforms, geomorphologic cycles. Weathering and soils. Mass wasting. Fluvial processes and landforms. Coastal processes and landforms. Glacial geomorphology and landforms. Frozen-ground phenomena. Karst geomorphology. Physical geology of Canada. Quaternary geology of selected areas of Canada. Influence of geomorphology on human activity.

NTEExam 04-Geol-A2 Hydrogeology

Hydrologic cycle: precipitation, evaporation, transpiration, deep and shallow groundwater circulation. Physics of flow through porous media. Hydraulic conductivity and groundwater storage. Occurrence, transmissivity and storage characteristics of surficial and bedrock aquifers. Groundwater exploration methods: geophysics, remote sensing, mapping, borehole investigations. Groundwater flow patterns: recharge, discharge, flow net construction and analysis. Aquifer development and management. Control of pore pressures and groundwater flow in geotechnical engineering.

04-Geol-B6-3 Metallic and Industrial Mineral Deposits

Nature, mode of occurrence and processes of formation of metallic and industrial minerals including minerals deposited from magmas, high-temperature vapours and aqueous solutions; formed by evaporation or precipitation in surface waters; formed by mechanical accumulation or accumulated by residual weathering. Processes of element/mineral migration and

concentration. Stratigraphic and structural controls on occurrence. Solution geochemistry and isotopic characteristics of ore bearing fluids and ore deposits. Illustrative case histories for important deposits of sulphides, oxides, native elements, silicates, and ionic salts.

04-Geol-A7 Applied Geophysics

Basic principles, interpretation, and limitations of geophysical methods applied to the exploration for coal, oil and natural gas, minerals, groundwater, and for geotechnical studies of the surface and subsurface. Introduction to electrical, electromagnetic, and magnetotelluric surveys; magnetic and gravity surveys; seismic reflection and refraction surveys; radiometric methods. Introduction to geophysical well logging techniques. Case histories of applications to engineering problems.

4-Geol-A5 Rock Mechanics

Engineering properties and classification of intact rocks. Rock mass properties and classification. Laboratory and in-situ testing of rock. In-situ stresses and stress measurement techniques. Stability analysis of rock slopes and excavations. Rock excavation techniques. Design of excavations, slopes, tunnels and shafts. Rock reinforcement and support. Groundwater considerations in rock engineering.

04-Geol-B1 Contaminant Hydrogeology

Groundwater geochemistry, isotopes in groundwater. Movement of dissolved species. Diffusion and dispersion regimes. Classification of contaminants. Organic contaminants, introduction to multiphase flow, LNAPLs and DNAPLs. Assessment, control and remediation of contaminants. Waste management. Deep well disposal.

04-Geol-B6-1 Petroleum Deposits

Physical properties, geochemistry, origin, migration, accumulation, and history of oil and natural gas, and their associated waters. Geological conditions of oil and gas entrapment. Structural and stratigraphic factors controlling the distribution of reservoir rocks, porosity, permeability and fluid saturations. Environmental problems associated with the development of hydrocarbons.

04-Geol-B2 Terrain Analysis

Elements of photogrammetry. Interpretation of aerial photos – recognition elements (tone, pattern, texture, size and shape, occupation). Identification of structures and terrain features. Glacial, fluvial, coastal, and permafrost landforms – identification and engineering characteristics. LANDSAT imagery. Operation, characteristics, and uses of thermal infrared and RADAR rem