

Proposed syllabus for the PET Examination for Geophysics

Part B

Physics of the Earth: Earth and Planetary system, size, shape, internal structure and composition of the earth; atmosphere and greenhouse effect; The Earth as a planet; different motions of the Earth; Newton's laws of gravitation, acceleration due to gravity, gravity field of the Earth and its shape; geochronology; isostasy, continents and continental processes; physical oceanography; seismology and interior of the Earth; variation of density, velocity, pressure, temperature, electrical and magnetic properties inside the Earth; Electrical properties: Ohm's law, electrical potential, types of electrical conduction and ranges, basic magnetic properties of the materials, magnetic susceptibility, induced magnetism, hysteresis properties, Electromagnetic principles, skin depth, Elastic properties, hooke's law, poisson's ratio, wave characteristics, reflection, refraction, Earthquakes-causes and measurements; zonation and seismic hazards; geomagnetic field, palaeomagnetism; oceanic and continental lithosphere; plate tectonics; continental drift, heat flow; upper and lower atmospheric phenomena.

Basic Geology: Rocks, minerals and its physical properties, characteristics of igneous, sedimentary and metamorphic rocks, range of their physical properties, introduction to structural geology, Major tectonics divisions of India, Geological time scale, stratigraphy, Stratigraphic nomenclature and classification. General Geology of India, – Geoexploration techniques - Geological, geophysical and geochemical, survey techniques, Basic geomorphologic principles, Introduction to physical geology

Unit - I

Geohydrology: Hydrological cycle, vertical distribution of groundwater occurrence of groundwater, types of aquifers, aquifer characters, porosity, permeability, water balance, water management, sea water intrusion, quality of groundwater and physical property variations.

Unit - II

Remote Sensing: Basic principles of remote sensing; electromagnetic spectrum; passive and active remote sensing, interaction of electromagnetic radiation with matter; interaction of electromagnetic radiation with atmosphere; selective and non-selective scattering; impact of scattering on remotely sensed data; atmospheric windows and absorption bands

Unit - III

Geomathematics: Matrices:, Theories of scalar and vector potential fields , Green's theorem; Image theory, Principles and definitions Introduction to various generalized inversion techniques and their properties. Least square polynomial approximation: the principle of least squares,. Numerical differentiation and Integration: Maximum and minimum of a tabulated function. Numerical Integration-Trapezoidal rule, Simpson' s rule, Romberg integration

Unit – IV

Computer Programming: Architecture and working, low level and high level languages, overview of compilers, operating systems, problem solving on a computer, algorithms and flow charts, integer and floating point arithmetic, Introducton to Fortran programming; constants, variables, data types and expressions, built in functions, executable and nonexecutable statements, assignment, control and input /output statements

Unit - V

Gravity Methods: Principles, Gravity field of the Earth, gravity anomalies, units, variation of g with depth, geoid, spheroid, instruments, survey techniques, data acquisition, data reduction, mass estimation, data processing and Interpretation techniques, Applications.

Unit - VI

Magnetic Methods: Earth's magnetic field, diurnal and secular variations, magnetic anomalies, units of measurement, magnetic susceptibility of rocks, magnetometers, corrections, preparation of magnetic maps, Principles, instruments, survey techniques, data acquisition, data processing and Interpretation techniques, Applications.

Unit - VII

Electrical Methods: Various electrical properties and their concepts, electrical properties of rock forming minerals, Electrical properties of various rocks: Principles, units instruments, survey techniques, data acquisition, data processing and Interpretation techniques, of self potential, Resistivity, Induce polarization methods and their applications .

Unit - VIII

Electromagnetic Methods: Origin of electromagnetic field elliptic polarization, methods of measurement for different source-receiver configuration components in EM measurements, interpretation and applications; Earth's natural electromagnetic field, tellurics, magneto-tellurics; geomagnetic depth sounding principles, methods of measurement, processing of data and interpretation and their applications.

Unit - IX

Seismic Methods: Principles, instruments, refraction survey, reflection surveys, survey techniques, depth determination of different sub-surface layers, propagation of elastic waves, velocity increasing with depth, geophones, hydrophones, recording instruments (DFS), digital formats, field layouts, seismic noises and noise profile analysis, optimum geophone grouping, noise cancellation by shot and geophone arrays, 2D and 3D seismic data acquisition and processing,

Unit - X

Borehole Geophysics: Well logging, techniques- Electric log, Resistivity and density log, SP log, Radiation logging, Sonic logging, applications in Oil exploration and other fields.