UNIVERSITY OF CALCUTTA

SYLLABUS

FOR

THREE-YEAR HONOURS
DEGREE COURSE OF STUDIES

GEOLOGY
2010
### The Curriculum / Course Structure of three-year B.Sc. in Geology Honours

<table>
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<th>Exm</th>
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**FIELD WORK:** In three years, there must be **three different field trips totaling at least 35 days of field work**. The recommended split up of days is:

- Year 1: 10 days
- Year 2: 15 days
- Year 3: 10 days

**Number of required Exam-days:**

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Syllabi for Three-Year B.Sc. (Honours) Course in Geology

Honours

PART – I

THEORY

Paper 1

Unit – I (75 marks, 95 hours)

Group A, 50 marks, Introduction to Earth Systems Science

1. Earth Systems Science: Definitions and Scope.
2. Elementary information on solar system, members of the solar system, terrestrial and Jovian planets. Origin of the solar system, nebular hypothesis, formation of planets. Layered structure of Earth, differentiation of Earth’s core, mantle and crust, formation of Earth’s oceans and atmosphere.
8. Earth’s internal processes, magmatism, metamorphism, deformation. Volcanoes and volcanism, products of volcanic eruption, eruptive styles, volcanic belts, recent volcanism in India.
11. Heat flow, basic concepts, geothermal gradient. Hotspot and mantle plume.
13. Principles of determination of relative ages of rock bodies and geologic events. Absolute ages of rocks and minerals, fundamental principles of radiometric dating. Age of the Earth. Geologic Time Table up to the level of Eras and Periods.

1. Scope and definitions; Physical properties of minerals: form and structure, colour and transparency, lustre, streak, specific gravity, hardness, cleavage, fracture, para-, dia- and ferromagnetic properties, radioactivity.
2. Classification of minerals on the basis of chemical composition.
3. Diagnostic physical properties of the following minerals:
   Haematite, magnetite, goethite, ilmenite, chromite, pyrolusite, psilomelane, bauxite;
   Pyrite, chalcopyrite, pyrrhotite, sphalerite, galena;
   Calcite, aragonite, dolomite, magnesite, siderite, malachite;
   Fluorite, gypsum, barite, wolframite, apatite, graphite;
   Quartz, feldspar, muscovite, biotite, pyroxene, amphibole, beryl, tourmaline, garnet, serpentine (including asbestos variety), talc, chlorite, kyanite, sillimanite, staurolite.

Group C, 10 marks, Crystallography

1. Essential characteristics of crystalline and non-crystalline states of matter.
2. Crystal measurements: interfacial angle, zone, law of constancy of interfacial angles, principles of stereographic projection, notation of crystal faces, edges and corners, crystallographic axes, Miller indices, law of rational indices, general zonal relations of faces.
3. Stereographic projections
5. Classification of crystals into systems and classes
6. Crystal habit, types of crystal aggregates, general twin laws.
7. Space lattice, unit cell
PART – I
THEORY

Paper 2
Unit – I (75 marks, 95 hours)

Group A, 15 marks, Mineralogy – II
1. Crystal chemistry: chemical bonds of different types, coordination principles, Pauling's rules, electronegativity, polymorphism, polymorphism of SiO₂, CaCO₃, Al₂SiO₅, displacive and reconstructive transformations, order-disorder transformations as in alkali feldspar, enantiotropy and monotropy, diadochy and solid solution, exsolution, pseudomorphism, defects in crystals.
2. Atomic structure of silicates, classification of silicates on the basis of their atomic structures. Outline of atomic structures of Olivine, Pyroxene, Amphibole, Mica - group of minerals.
3. Classification of the following rock forming minerals: Feldspar, Olivine, Pyroxene, Amphibole, Mica, Garnet.

Group B, 15 marks, Optical Mineralogy
1. Optical behaviour of crystals: isotropic and anisotropic media, double refraction, polarization of light, methods of production of plane polarized light, construction of polarizing microscopes; Ray velocity surface, Optical indicatrix of uniaxial and biaxial crystals.
2. Absorption colour and Pleochroism
3. Interference phenomenon in crystals, order of interference colour, birefringence, extinction
4. Determination of Refractive Index by (a) comparative method using Becke line, and by (b) liquid immersion method of isotropic minerals
5. Interference phenomenon in convergent light, Michael Levy chart of interference colours, interference figures, and use of interference figures for determination of optic sign
6. Diagnostic optical properties of the minerals prescribed under practical Paper 2, Unit II, Group 1.

Group C, 25 marks, Principles of Petrology
1. Concept of system, component, phase; different types of system; intensive and extensive variables; rocks as systems.
2. Elementary thermodynamics: concept of enthalpy, entropy, molar volume, Gibbs free energy, chemical potential, fugacity and activity.
3. Concept of chemical equilibrium and equilibrium constant; pressure-temperature dependence of Gibbs free energy; relation between Gibbs free energy and equilibrium constant K.
4. Phase rule and its derivation; mineralogical phase rule; degrees of freedom, invariant, univariant and bivariant equilibrium condition; cryoscopic relationship; concept of the liquidus; one-, two- and three-component systems
5. Concept of ionic and redox potential and pH; factors controlling chemical sedimentation.

Group D, 20 marks, Structural Geology – I
2. Folds, parts of a fold, antiform, synform, neutral fold, anticline, syncline, nomenclature of folds based on fold shape and orientation of axis and axial plane. Equal area projection diagrams of different types of folds. Ramsay’s classification of folds, variation of thickness of folded layers, isogons. Outcrops of folded planes on horizontal and sloping surfaces. Relation between major folds and minor folds.
3. Foliation: morphological features of cleavage and schistosity, morphological classification of rock cleavage. Relation of cleavage and schistosity to major folds.
4. Types of lineation and their geometrical relation to folds.
PART – I
PRACTICAL

Paper 1
Unit – II (25 marks, 40 hours)
Group 1, 15 marks, Mineralogy – I

Systematic study of hand specimens of the minerals listed below on the following points:
Form and structure, colour, transparency, lustre, streak, cleavage, parting, fractures, hardness,
specific gravity, magnetism, and treatment with dilute HCl.
Haematite, magnetite, goethite, ilmenite, chromite, pyrolusite, psilomelane, bauxite;
Pyrite, chalcopyrite, pyrrhotite, sphalerite, galena;
Calcite, aragonite, dolomite, magnesite, siderite, malachite;
Fluorite, gypsum, barite, wolframite, apatite, graphite;
Quartz, feldspar, muscovite, biotite, pyroxene, amphibole, beryl, tourmaline, garnet, serpentine
(including asbestos variety), talc, chlorite, kyanite, sillimanite, staurolite.

Group 2, 10 marks, Crystallography

1. Study of crystal models: symmetry elements, forms, and crystal systems.
2. Orthographic projection of cubic, tetragonal and orthorhombic crystal models.
3. Stereograms (with and without the stereonets) from given crystallographic data.

PRACTICAL
Paper 2

Unit – II (25 marks, 40 hours)
Group 1, 15 marks, Optical Mineralogy

1. Study of the following minerals in transmitted polarized light: quartz, orthoclase, microcline,
plagioclase, perthite, nepheline, olivine, orthopyroxene, clinopyroxene, hornblende, tremolite,
kyanite, sillimanite, andalusite, cordierite, staurolite, epidote, zoisite, garnet, tourmaline, zircon,
sphene (titanite), muscovite, biotite, chlorite, apatite, carbonate, scapolite.
2. Becke test, determination of order of interference colour, use of 1 lambda, and ¼ lambda accessory
plate; extinction angle, scheme of pleochroism of minerals.

Group 2, 10 marks, Structural Geology – I

1. Reading and interpretation of topographic maps.
2. Use of Clinometer and Brunton compass, measurement of attitude of planar and linear structural
elements.
4. Stereographic projection of planes and lines: solution of simple structural problems using a net, e.g.,
true dip – apparent dip relations, determination of axis of cylindrical folds.
5. Construction of block diagrams of homoclinal beds and folded beds.
PART – I
PRACTICAL

Field Work

Field work of approximately 10 days
Reconnaissance study of areas preferably having sedimentary rocks with fossil bearing units, igneous rocks
and metamorphic rocks; students are to be introduced to different types of rock exposures e.g. surface
outcrop, sections like river cut, road cut, railway cut etc.; field work should include reading topographic
maps, locating oneself on topographic maps; measurement of attitude of planar and linear structures;
measurement of true bed thickness; collection of samples and preparation of field report.

Suggested areas (other appropriate areas will also be acceptable):
1. Maihar-Jabalpur (Madhya Pradesh);
2. Himalayan sections: Darjeeling district (West Bengal), Himachal Pradesh;
3. Nagpur-Chirimiri;
4. Deccan trap and intertrappeans in different parts of Maharashtra;
5. Gondwana basins of Jharia and Ranigunj;
6. Different parts of South India including Cretaceous succession of Trichinopally.
PART – II
THEORY

Paper 3
Unit – I (50 marks, 75 hours)
Group A, 20 marks, Igneous Petrology – I

1. Physical properties of magma – factors influencing physical properties of magma; ascent and emplacement of magma.
2. Forms of igneous rock bodies: description of the major forms of extrusives and intrusives and a general idea of their mode of emplacement – central eruptions, fissure eruptions, pyroclastic deposit, volcanic neck, sill, dyke, ring dyke, cone sheet, laccolith, lopolith, phacolith, stock, batholith.
3. Description and origin of the following structures of igneous rocks: vesicular structure, amygdaloidal structure, pillow structure, flow banding, flow lines, schlieren, ropy lava, block lava, columnar joint.
4. Description and general idea of origin of textures and microstructures of common igneous rocks: porphyritic, poikilitic, ophitic, perthitic, corona, symplectite, spherulitic, spinifex, cumulus, intergrowth, equigranular, directive.
5. General knowledge of the basis of classification of igneous rocks – mineralogical, textural, chemical, chemico-mineralogical, and associational. Concept of CIPW norm and its significance; Hatch and Wells classification of igneous rocks; IUGS classification of plutonic rocks; TAS diagram for volcanic rocks.
6. Important mineralogical and textural features of the following rocks with Indian examples: alkali feldspar granite, alkali granite, granite, granodiorite, tonalite, trondhjemite, pegmatite, aplite; rhyolite; syenite; foid syenite, diorite; trachyte, phonolite, andesite; dolerite, gabbro, norite, anorthosite; basalt, spilitic, oceanite, ankaramite; pyroxenite, peridotite, kimberlite; lamprophyre, carbonatite, pyroclastic rocks including agglomerate, volcanic breccia, ignimbrite, welded tuff, tuff, and ash.

Group B, 30 marks, Structural Geology – II

2. Basic concepts of superposed deformation, interference patterns in superposed folding, deformation of older planar and linear structures, geometry of new structures.
3. Concept of buckle (flexure), flexure slip, bending and slip (shear) folds, geometrical characteristics of folds formed by buckling and inhomogeneous simple shear.
6. Fold and thrust belt, imbricate structure, fault related folding, duplex structure.
7. Shear zone, basic concepts, shear zone rocks, common structures in shear zones.
8. Unconformity: types of unconformity, criteria for distinguishing unconformity from faults and intrusive contacts.
PART – II
THEORY

Paper 4
Unit – I (50 marks, 65 hours)
Group A, 20 marks, Igneous Petrology – II

1. Studies on crystallization of melts (at 1 atm dry pressure and high pH2O) in the following systems with particular reference to phase rule: diopside-anorthite, forsterite-silica, albite-anorthite, albite-orthoclase, diopside-albite-anorthite; diopside-forsterite-silica, nepheline-kalsilite-silica; petrogenetic significance of these systems; Role of volatiles in magmatic crystallization; Bowen’s reaction series and its use in petrogenesis.
2. Concept of petrographic consanguinity, and petrographic province.
3. Processes of diversification of igneous rocks: differentiation, assimilation, and partial melting; Chemical variation during differentiation – silica variation diagram, Fe-Mg-(Na+K) and Ca-Na-K diagram; Commonly used parameters in differentiation: differentiation index, fractionation index, solidification index, Mg-number.
5. Petrogenesis of the following rocks: granite, basalt, anorthosite, alkaline rocks.

Group B, 15 marks, Metamorphic Petrology – I

1. P-T limits of metamorphism, types of changes in metamorphism - mineralogical, textural and chemical.
3. Types of metamorphism on the basis of agents, association, plate tectonic settings and classification of metamorphic rocks. Composition of protolith and its control on metamorphism.
4. Texture of metamorphic rocks, metamorphic crystallization and growth of porphyroblasts in relation to deformation.
5. Classification of metamorphic rocks: Basis of classification: Non-foliated and foliated, High strain rocks; Mineralogy and texture of phyllite, schist, greenschist, greenstone, white schist, blue schist, amphibolite, hornfels, granulite, eclogite.

Group C, 15 marks, Sedimentology – I

1. Scope and purpose.
2. Sediment genesis to diagenesis: processes of sediment generation to formation of sedimentary rocks; Weathering, erosion, transportation, deposition and diagenesis.
3. Texture: primary and secondary; Textural components: framework, matrix, cement, allochemical and orthochemical components; Textural parameters: grain size, shape and their statistics; Surface texture; Fabric: orientation, packing; Porosity and permeability.
4. Classification of sedimentary rocks: based on composition (siliciclastic, limestone, chert etc.), based on source (terrigenous-extrabasinal, chemogenic-intrabasinal), based on grain size (conglomerate-rudaceous, sandstone-aranaceous, shale-argillaceous, calcarenite, calcareous sandstone, micrite), based on mode of deposition (elastic-terrigenous-orthochemical, non-elastic-orthochemical); Naming of rocks according to terrigenous-orthochemical proportions.
PART – II
PRACTICAL

Paper 3
Unit – II (50 marks, 60 hours)

Group 1, 15 marks, Igneous Petrology – I
1. Identification in hand specimen by studying mineralogical composition and texture of the following rock types:
   - Granite, granodiorite, syenite, nepheline syenite, aplite, granophyre, diorite, gabbro, anorthosite,
   - pyroxenite, peridotite, mica-lamprophyre, dolerite, basalt, andesite, and rhyolite.
2. C.I.P.W. norm calculation of granitic and basic rock (without foid).

Group 2, 35 marks, Structural Geology – II
1. Interpretation of maps showing unconformity, intrusive bodies, folded and faulted beds.
   - Construction of structural cross sections.
2. Use of stereographic net in solving structural problems in folded terrains.
3. Determination of net slip on faults using stereographic nets.

PRACTICAL
Paper 4

Unit – II (50 marks, 70 hours)

Group 1, 30 marks, Igneous Petrology – II
1. Plotting of mineralogical and chemical data in triangular diagram.
2. Study, under microscope, of the following textures of igneous rocks:
   - Porphyritic, poikilitic, ophitic, intergranular, intersertal, graphic, perthitic, myrmekitic,
   - hypidiomorphic, allotriomorphic, corona, flowage.
3. Description and identification by microscopic characters of the following rocks:
   - Granite, granodiorite, tonalite, syenite, nepheline syenite, aplite, granophyre, diorite, gabbro,
   - anorthosite, pyroxenite, peridotite, mica-lamprophyre, dolerite, rhyolite, basalt, andesite.

Group 2, 10 marks, Metamorphic Petrology – I
1. Description and identification of the following rocks in hand specimens: quartzite, marble, schists
   (including biotite-, muscovite-, chlorite-, garnet-, staurolite-, hornblende-, kyanite-, schists),
   - amphibolite, granitoid gneiss, charnockite, khondalite, calc-silicate rock, mafic granulite
2. Study of metamorphic textures in thin sections.

Group 3, 10 marks, Sedimentology – I
1. Study of hand specimens of different types of sedimentary rocks as prescribed under theoretical Paper 4, Unit I, Group C above.
2. Determination of mean, mode, median, sorting, skewness, and kurtosis from grain size data.

PART – II
PRACTICAL

Field Work
Field work of approximately 15 days
(a) Geological mapping of a small area, collection and study of samples and preparation of geological map.
(b) Tape and compass surveying and use of Brunton compass, and GPS.
Suggested areas (other appropriate areas will also be acceptable):
1. Jharkhand: Ghatshila-Galudih;
2. Maharashtra: Nagpur-Ramtek;
3. Rajasthan: Beawar, Zawar;
PART – III
THEORY

Paper 5
Unit – I (50 marks, 70 hours)
Group A, 30 marks, Palaeontology – I

1. Introduction: Definition and types of fossils; major disciplines in palaeontology; significance of study of fossils; Brief introduction to Precambrian and Phanerozoic life forms.
2. Fossilization: definition, conditions and modes of preservation of ancient life forms, taphonomy; imperfections of fossil record.
3. Taxonomy: hierarchical nature of classification of organisms – species to kingdom; identification and classification; species concept in biology and binomial nomenclature; rules and procedure for naming a new species; typomorphic and cladistic taxonomy.
4. Distribution of fossils in space and time; law of faunal succession; index fossil.
5. Principles of functional morphology of fossil taxa; hard part morphology of brachiopoda, anthozoa, echinoidea, bivalvia, gastropoda, cephalopoda and trilobita.

Group B, 20 marks, Metamorphic Petrology – II

3. Regional metamorphism of pelitic and mafic rocks, and contact metamorphism of impure carbonate rocks (both open and close systems).
4. Elementary ideas on crustal anatexis, metamorphic differentiation, migmatite.
5. Granulites: definition and types. Metamorphic belts of India.

PART – III
THEORY

Paper 6
Unit – I (75 marks, 95 hours)
Group A, 20 marks, Sedimentology – II

1. Natural flows: elementary concepts of Newtonian, non-Newtonian, and plastic flows; Reynolds number and Froude number; Concept of flow regime and bedform stability diagram.
2. Primary sedimentary structure: fluidal flow, bedforms - current, wave, and combined flow and their internal structures; structures generated by mass flow; Soft-sediment deformation structures; Biogenic structures including elementary concepts of stromatolite.
4. Sandstone, limestone, dolostone: definition, composition, classification, petrogenesis; Sandstone classification - Pettijohn, Folk; Limestone classification - Dunham, Folk.
5. Brief descriptions of shale, chert, evaporite, BIF, and volcaniclastics; elementary ideas on composition and depositional conditions.
6. Facies concept: Definition of facies; Basic concept of facies association and modelling.

Group B, 15 marks, Principles of Stratigraphy

1. Introduction; Concept of strata and their orders; Law of Superposition; Law of Faunal Succession; Principle of Uniformitarianism.
2. Geochronology: principles of Rb-Sr, Sm-Nd, and U-Pb dating and their applicability.
3. Stratigraphic units: Lithostratigraphy, Biostratigraphy, Chronostratigraphy and relevance of type
   section.
4. Principles of Allostratigraphy, Event stratigraphy, Magnetostratigraphy, Chemostratigraphy,
   Cyclostratigraphy and Seismic stratigraphy.
5. Principles of stratigraphic correlation.

**Group C, 40 marks, Economic Geology**

1. Economic Geology and its principal contents; definitions of the terms: protore, ore, gangue, tenor,
   hypogene and supergene ore deposits, epigenetic and syngenetic mineral deposits; mineral
   beneficiation; common morphologies of mineral deposits.
2. Mineral deposits and their litho-tectonic environments, e.g., in continental rifts and continental
   margins, greenstone belts and ophiolites, in convergent plate boundaries, in shallow shelves,
   accompanied by mafic volcanism.
3. An introduction to the following ore forming processes: magmatic crystallization-differentiation and
   magma immiscibility, precipitation from hydrothermal solutions, sedimentation-diagenesis, ore
   forming processes on metamorphism and supergene transformation of protore; placer deposits: their
   distribution and origin.
4. Mineral deposits in space and time.
5. Metallic mineral deposits of India, such as, iron of Jharkhand-Orissa and Karnataka, manganese of
   central India, chromite of Orissa, copper of Singhbhum and Malanjkhand, lead-zinc of Zawar,
   uranium of Singhbhum and Andhra Pradesh, gold of Kolar-Hutti, tungsten of Rajasthan, with
   particular reference to their geologic set up, modes of occurrence, mineralogy, age and genesis.
6. Non-metallic mineral deposits of India such as bauxite, mica, phosphates, barite, diamond and
   graphite, with special reference to their distribution, geology, origin and usage.
7. Specifications of the raw (mineral/rock) materials used in the following industries: iron and steel,
   cement, refractories, fertilizer.
8. Coal, its chemical, petrographic constituents, classification and origin of different varieties of coal
   and their distribution in India.
9. Study of petroleum and natural gas deposits with special reference to their origin, migration,
   accumulation, and distribution in India (both on- and off-shore).

**PART – III**

**THEORY**

**Paper 7**

**Unit – I (50 marks, 65 hours)**

**Group A, 20 marks, Palaeontology – II**

2. Suprageneric categories of Indian Gondwana flora.
4. Suprageneric categories of Gondwana and Siwalik vertebrates of India.
5. Palaeoecology: environment-biota interaction, Palaeoecological significance of corals, bivalves and
   brachiopods; brief idea on application of trace fossils in palaeoecology; plants as indicators of past
   climate.

**Group B, 30 marks, Global Tectonics**

1. Tectonics – definitions and scope; structure of continents and oceans, bulk compositions and
   densities; active and passive continental margins, shield, continental rift systems.
2. Continental drift hypothesis; geological, palaeoclimatological and palaeontological evidence of
   break up of Gondwanaland; criticism of continental drift hypothesis.
3. Palaeomagnetism and palaeopoles; Geographic poles, Magnetic poles, and Geomagnetic poles;
   Apparent polar wandering curve, and continental reconstruction; Polarity reversals, and polarity
   reversal scales.
4. Seafloor spreading, marine magnetic anomalies and their interpretation.
5. Plate tectonics: Structure, composition, and densities of lithosphere and asthenosphere; Plate boundary processes: subduction zones - volcanic arcs and island arcs, paired metamorphic belts, trenches, accretionary prism, marginal basins, oceanic ridges and spreading rates; Transform faults; Ophiolites and their emplacement mechanisms.
6. Elementary ideas on magmatism in oceanic ridges and subduction zone.
7. Plate velocity vectors: relative and absolute velocities; Relative movement of the plates on a spherical Earth, pole of rotation; Determination of pole of rotation from transform faults and mid-oceanic ridges.

PART – III
THEORY

Paper 8
Unit – I (75 marks, 90 hours)
Group A, 25 marks, Hydrogeology, Engineering Geology, and Environmental Geology

Hydrogeology
1. Hydrologic cycle, surface water-groundwater interaction, and Springs
2. Vertical distribution of groundwater, genetic classification of groundwater, Classification of aquifers, water table and piezometric surface
3. Properties of aquifer – Porosity, hydraulic conductivity, transmissivity and storage coefficient
4. Groundwater quality
5. Groundwater provinces of India and West Bengal
6. Water balance – recharge and discharge
7. Basic concepts of rainwater harvesting and artificial recharge

Engineering Geology:
1. Engineering properties of rocks and soils
2. Geological investigations for dams and reservoirs
3. Landslides-causes, prevention and rehabilitation

Environmental Geology
2. Natural hazards – earthquake, volcanic eruption, landslides, floods, and droughts
3. Ecology and ecosystem- basic concepts
4. Soil – Formation, erosion and improvement through fertilization, drainage and irrigation.
5. Landuse – impact of human activites on landuse pattern, wastelands, desertification, salinisation and waterlogging
6. Global and Indian water resource, water pollution, effects of water pollution on human health
7. Composition of air, structure of atmosphere, air pollution, effects of air pollution on human health
8. Mining and Geoenvironment- impact of mining on atmosphere, biosphere, lithosphere and hydrosphere; acid mine drainage, measures to mitigate the adverse impact of mining

Group B, 50 marks, Stratigraphy of India
1. Precambrian Geology of India:
   (A) Geologic evolution of the following Precambrian terrains in terms of sedimentation, structure, magmatism, metamorphism, and geochronology:
   Dharwar, Singhbhum, Rajasthan, and Central India
   (B) Introduction to Proterozoic (Purana) basins of India with special reference to Cuddapah and Vindhyan basins.
3. Generalized succession, broad lithology, flora and fauna, correlation and palaeoenvironment of the following Phanerozoic basins of India: Spiti, Kashmir, Assam-Arakan, Kutch, Gondwana, Bengal, and Siwalik.
4. A brief introduction to the Quaternary Geology.

PART – III
PRACTICAL

Paper 5
Unit – II (50 marks, 75 hours)

Group 1, 25 marks, Palaeontology – I

Hard part morphology and identification of the following:
3. Trilobita: Calymene, Phacops

Group 2, 25 marks, Metamorphic Petrology – II

1. Description and identification of the following rocks in thin sections: quartzite, marble, schists (including biotite-, muscovite-, chlorite-, garnet-, staurolite-, actinolite-, hornblende-, kyanite-, sillimanite schists), amphibolite, granitoid gneiss, charnockite, khondalite, calc-silicate rock, mafic granulite
2. Construction of ACF, and AKF diagrams and plotting of the mineral assemblages in greenschist and amphibolite facies.

PRACTICAL

Paper 6
Unit – II (25 marks, 35 hours)

Group 1, 25 marks, Sedimentology – II

1. Study in hand specimens, and model sketches: bedforms and internal structures, sole structures, deformational structures, biogenic structures: interpretation of sedimentation mechanism and environment as much as possible;
2. Petrography of Siliciclastics – quartz arenite, arkose, lith-arenite, greywacke; Carbonates - allochemical, micritic, dolomitic; Chert.

PRACTICAL

Paper 7
Unit – II (50 marks, 30 hours)

Group 1, 20 marks, Palaeontology – II


Group 2, 30 marks, Field Work and Laboratory Notebooks

1. Assessment of Field Notes and Field Reports of all three mandatory field work in the three years.
2. Assessment of all Laboratory Notes for all the Practical papers of Parts 1, 2, and 3.
Unit – II (25 marks)
Group 1, 25 marks, General Viva-Voce

PART – III
PRACTICAL

Field Work

Field work of approximately 10 days
Study in the field of two economic mineral deposits and study of local geology of the deposits, preferably one underground mine and one open cast mine. If possible, one day visit to a dam site.

Suggested areas (other appropriate areas will also be acceptable):
1. Rajasthan: Zawar and adjoining areas, Khetri;
2. Karnataka: Chitradurga and adjoining areas;
3. Jharkhand and Orissa: Copper, Iron, Limestone;
4. Madhya Pradesh and Chhattisgarh: Iron, Manganese, Coal;
5. Vindhyans of Madhya Pradesh: Limestone.
SUGGESTED BOOKS

Introduction to Earth Systems Science
Text:
2. Tarbuck, E.J. and Lutgens, F.K., 2006, Earth Science, 11th Edn., Pearson Prentice Hall, New Jersey, 726 p. [Earlier editions e.g. 10th or 9th, or even earlier, will also be useful].
Reference:

Mineralogy
Text:
Reference:

Crystallography
Text:
Reference:

Optical Mineralogy
Text:
Reference:

Principles of Petrology
Text:
Reference:
4. Mason, B. and Moore, C.B, 1982, Principles of Geochemistry, 4th Edn., John Wiley & Son, New York, 352 p. [Earlier edition, with Mason as the only author will also be helpful]
Structural Geology
Text:

Reference:

Igneous Petrology
Text:

Reference:

Metamorphic Petrology
Text:

Reference:

Sedimentology
Text:

Reference:
Palaeontology
Text:
Reference:

Principles of Stratigraphy
Text:
Reference:

Economic Geology
Text:
Reference:

Global Tectonics
Text:
Reference:
Hydrogeology, Engineering Geology, and Environmental Geology

Text:

Reference:

Stratigraphy of India

Text:

Reference:
4. Sarbadhikari, T, 1974, Bharater shilastar o bhutatiyo itihash [Stratigraphy and Historical Geology of India], Paschim Banga Rajya Pustak Parshad [West Bengal State Book Board], Kolkata.
UNIVERSITY OF CALCUTTA

COURSE STRUCTURE, THREE-YEAR B.SC. GEOLOGY (H)

Full Marks – 800

Division of Marks

For the first and the second years Geology (H) is taught along with two subsidiary subjects, hence total marks for the first and the second years for Geology are 200 each. In the proposed semester system, for the first four semesters the total marks for each semester will be 100. In the third and final year, only Geology (H) is taught and the total marks will be 400. In the proposed semester system for the final two semesters the total marks for each semester will be 200.

The course structure is made such that it can be used in six different semesters with the examination at the end of each 6-month semester. Also it can be used for 3-year 1+1+1 system with the examination at the end of each year (Part I, II, & III) by using the two papers of semesters 1 & 2 in Part I, the two papers of semesters 3 & 4 in Part II, and the four papers of semesters 5 & 6 in Part III.

Of the total 800 marks for the Geology (H) 500 is in theory, and 300 is in practical.

Each Paper has 100 marks, with two parts (Units): Unit – I is Theory, and Unit – II is Practical. The division of marks for each paper is either

Unit –I: 75 marks and Unit -II: 25 Marks, or, Unit –I: 50 marks and Unit -II: 50 Marks.

Therefore, there will be eight papers each with 100 marks:

Four papers, each having Theory: 50 marks, and Practical 50 marks, and

Four papers, each having Theory: 75 marks, and Practical 25 marks

Each paper in each year (semester) is self contained, that is, if a subject or a module has both theory and practical portions then both will be included in the same paper and will not be carried over to another paper or another year (semester).

Allocation of Time:

A year has 52 weeks. Hence each six-month semester will have 26 weeks, that is 26x7 = 182 days.

There will be 26 weekends, i.e. 26x2 = 52 days
There will be vacations (Summer/Puja) = 30 days
Miscellaneous (Birthdays, Bandhs, Exams etc.)= 20 days

Available days each Semester for teaching = 182-102 = 80 DAYS
Available days for teaching each Year = 2x80 = 160 DAYS

On the average there will be around 160 working days in each year, with 800 hours of teaching (or, 80 working days in each Semester, with 400 hours of teaching).

50% time will be taken up by the classes on the subsidiary subjects for the first two years (first four semesters). On the average, for Geology (H) classes, for each of the first two years (four semesters)
there will be 400 hours each, and in the third year 800 hours (for the last two semesters 400 hours each) of teaching.

**Distribution of Marks and Teaching hours per Year and also per Semester:**

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This time calculation does not include about total 35 days of field work (in three separate semesters) in three different years. For details see at the top of page 3.