Paper—V Economic Geology, Geology of raw material and resources of India and Metamorphic petrology 3 hrs 50

Paper--VI Environmental Geology applied geology, field geology.

Practical III Pertaining to paper V & VI

Practical work 35
Sessional work 5
Field work 5 5 hrs 50
Viva on field work 5

Note: In addition to the courses prescribed for laboratory work, Geology excursion will be arranged each year for study of rocks in field and visits to mineralised area and sites of Geological occurances.

Detailed Courses of Reading

B. Sc. Ist year General for examination 1989 after 8 to 10 lectures of an hour for each unit.

Poper—I : Crystallography, Descriptive and Optical Mineralogy.

Crystallography

Unit I : Introduction and definition of Crystallography.

—Elementary idea about crystal formation.
—Elements of internal structure.
—Morphological characters of crystals, Faces, edges, solid angle, Crystal forms, Heminorphism, Hemiherdism
—System of crystal notation, parameter, indices, use of contact Goniometer.
Unit 2: General idea of symmetry operations.  
- Elements of symmetry.  
- Laws of Crystallography.  
- Preliminary idea about stereographic projection of crystal.  
- Basis of classification of crystals in systems and class.

Unit 3: Study of symmetry and forms of the following symmetry classes.

Isometric System: Galena type, Pyrite type, Tetrahehdrite,  
Tetragonal system: Zircon type, Chalcopyrite type  
Hexagonal system: Beryl type, Caleite type, Tourmaline type.  
Orthorhombic system: Barytes type.  
Monoclinic system: Gypsum type.  
Triclinic system: Axinite type.  
- Elementary idea about twinning its type.

Minerology

Unit 4: Definition and scope of minerology.  
- Physical characters of minerals depending upon cohesion and elasticity; Specific gravity, light, Heat, Electricity, magnetism, taste and odour.  
- Classification of minerals.  
- Elementary idea about crystal chemistry.  
- Isomorphism, Polymorphism, and Pseudomorphism.

Unit 5: Study of physical and chemical properties, classification, alteration, Occurrences and uses of following groups of minerals and their species:

Quartz,  
Felspar,
Feldsparoid (Nepleline, Sodellite, Azurite).
- Amphibole: (Hornblende, Tremolite, Actinolite, Asbestos).
- Pyroxene: (Hypersthene, Enstatite, Augite, Diopside).
- Mica: (Muscovite, Biotite, Lepidolite).

Unit 6: Study of Physical, Chemical properties alteration occurrence and uses of following minerals:

Optical Mineralogy

Unit 7: General principles of optics.
- Construction, uses description of Petrological microscope.
- Accessory plates and their uses.
- Elements of optical crystallography.
- Isotropism and Anisotropism.
- Uniaxial and Biaxial minerals.
- General idea about refractive index, double refraction, extinction, Pleochroism and interference colours.

Unit 8: Study of optical properties of the minerals given unit 5 and 6 of the paper.

Paper-II: Palaeontology, principles of Stratigraphy; Sedimentation and sedimentary petrology.

Unit I Board Classification of Organism.
- Introduction, definition and importance of palaeontology and its branches.
- Fossils: definition, requisites and mode of occurrence and preservation.
—Applied aspects and uses of fossils in various fields of earth science Viz. as indices of Palaeography, palaeoclimates, Palaeoecology, organic evolution and stratigraphic relation.

—Concept of organic evolution.

Uni 2 Study, classification, Morphology, Distribution and Geological history of the classes:
Phyllum Mollusca. Palecepoda (Bivalvia), Gastropoda, and Cephaopoda.
Phylum Crachiopoda.

Unit 3 Study of Phyllum Arthropoda (class Trilobita) its Morphology, classification and Geological history.
Phyllum Coelentrata (Class Anthozoa-coral) Morphology, Geological history.
Phylum Echinodermata: Brief survey of major classes class Echinoridea and Crinoidea their Morphology, classification, Geologica distribution.
Phylum Protochordata (Order Graptol-idea) its Morphology, distribution and Geological history.

Unit 4 A brief account of the vertibrata sequena through the time.
Evolutionary trends in man, horse.
—Introduction of plant kingdom-classification.
—Description, Morphology of following plant fossils: - Glassopteris, Gangamopteris, Vertibraria, Ptilophyllum, Lepidodenoron, Willeansonia.
Principles of Stratigraphy, Sedimentation and sedimentary Petrology.

Unit 2 Stratification and various factors (Physical Chemical
and biological controlling stratification.
—Code of stratigraphic nomenclature in India, various stratigraphic units.
—Correlation (Both for fossiliferous and unfossiliferous rock different method).

Unit 6 Sedimentary cycles and processes of sedimentation

— Lateral various in rocks,
— Facies concept in stratigraphy.
— Standard Geological time scale.
— Transportation, Deposition of sediments in Marine basin.

Unit 7 Digeneeess and Lithification.

— Composition of sedimentary books.
— Textures and structure of sedimentary rocks and their formation.
— Classification of sedimentary rocks.

Unit 8 Megascopie and microscopic study of the following rocks types: Conglomerates, Braccia; Arkose, Sandstone, Grewacke, Shale, Limestone, Marl, Dolomite, Peat, and Lignite.

Practical I relating to Paper I and II.

A Crystallography

Study of crystal models, Drawing of crystallographic with unit cell, Morphological study of (Symmetrical elements) drawing of Clinographic projection of crystal forms of normal classes of the following system:—
Cubic, Tetragonal, Hexagonal, Orthochompic Molecu—
linic.

Uses of Ceniometer measurement of interfacial angle.
Minerology

Study of physical properties and determination of hardness and specific gravity and optical phenomenon of minerals in hand specimen.

Megasopic study and spot identification of minerals (listed in theory papers) and their diagnostestic character.

Microscopic study and identification of the following minerals:—

Quartz, Orthoclase, Microcline, Plagioclase, Olivine, Augite, Hypersthene, Hornblende, Actinolite, Biotite, Muscovite, Clacite, Tourmaline, Zircon, Garnet, Chlorite, Sphene.

Palaeontology

Description and identification of following important fossils their age and Taxonomy.

Mollusea: Trigonia, Gryphea, Unio, Pecton, Spondylus, Arca, Cardita, Natica, Furrillita, Cerithium, Murex, Pleurotomaria, Phyesa, Trochus, Orthoceras, Nautilus, perispheca, Hildoceras, Ceratites, Stephanoceras, Belemninites.

Brachiopoda: Terebratula, Spitzfer, Syringothyiris, Phynchonella, Products Atrypa.

Echinodermata: Homiaster, Micraster, Plyphaster, Cidares.

Coral: Calc poco, Zaphrentes.

Graptolite: Monograpthus, Dydmograpthus.

Plant Fossils: Glossopteris, Glaeocystis, Verticilia, Ptilophyllum.

Megasopic and Microscopic study of sedimentary rocks given in the theory and their identification and environment.
B.Sc. II Ind year Pass course,
For examination in 1990 and after (8 to 10 lectures per unit).

Paper III : Physical General Geology and Structural Geology.

Physical and General Geology

Unit 1. Geology definition its subdivisions, scope and relation with other sciences.
- Earths relation with solar system, Earths shape structure and surface relief, Origin and Age of the earth, Interior of the earth.

Unit 2. Basic Idea of diastrophism.
- Earthquakes, Volcanism, their causas, effects, types and distribution.
- Mountain building - epeirogenic and orogenic movements

Unit 3. Weathering and Mass wasting.
- Erosional, depositional features and Geological works of Running water, Ground water and Glaciers.

Unit 4. Erosional, depositional features and Geological works of wind, oceans and lakes.
- Principles of isostacy, continental drift.

Structural Geology

Unit 5. Elementry concept of structural geology.
- Mechanical principles of deformation.
- Definition of force, stress and strain, mechanics of plastic deformation.
- Elementry dip, strike, thickness and width of outcrops.

—Joints sets system and classification. Distinction from faults.

—Elementary idea about refolding uses of folds.

Unit 7. —Faults; its terminology. Types and classification of faults. Effects of faults on the outcrops.

—Reverse faults and thrusts. Normal faults and uses of faults. Definition on window, klipe and Nappe.

Unit 8. Unconformity, its types, their recognition.

—Distinction between unconformity and faults.

—Inclin-outclir and their significance.

—Horn and grabben.

—Clinometer compass—Brunton compass and measurement of dip, strike and direction.

—Elementary idea of topographic features.

—Location I own position on topographic maps.

Paper-IV Stratigraphy and Igneous Petrology.

Stratigraphy:—

Unit 1 Brief account of Archaecozoic rocks.

—Dharwar Super Group of Karnataka.

—Iron ore group of India.

—Distribution of Protozoic rocks in India and type area stratigraph of the Cuddapah super group and Vindhyan supergroup.

Unit 2. Distribution of Palaeozoic rocks in India.

—Haimanta system and math quartzites.
Permo carboniferous of Spiti and Kashmir.
Gondwana Super group (Lower Gondwana sequence, upper Gondwana sequence and classification.

Unit 3 Distribution of mesozoic rocks in India.
-Iriassic of Spiti.
-Jurassic of Kutch.
-Cretaceous rocks of South-East Coasts.
-Bagh bed, Umaria marine bed.

Unit 4 Deccan Trop-Intertrappean and Infratrappean.
-Distribution of Tertiary rocks in India.
-Siwalik system in Jammu.
-Subathu, Dharmsala, Dagsai and Kasauli group.
-Karewa beds of Kashmir.

Igneous Petrology:

Unit 5 Igneous rocks and their constituents.
-Nature and composition of Magma.
-Forms and structures of Igneous rocks, Extrusive and Intrusive rocks.
-Elementary idea about origin of Magma.

Unit 6 Common Textures of Igneous rocks.
-Bases of classification of Igneous rocks,
-Tabular classification.
-Elementary idea of strickeirens classification.

Unit 7 Crystallisation of Unicompontent system.
-Binary system.
-Crystallization of quartz Albite and Albite-Anorthite system-
-Bowens reaction principle and reaction series.
Unit 8 Elementary idea of Magma tite differentiation and assimilation. Petrographic description and elementary idea of Petrogenesis of the following:
- Granite
- Charnockite
- Syenite and Nepheline syenite
- Gabbro
- Peridotite
- Basalt
- Dolerite
- Diorite

Practical II Reading to paper III and IV

Structural Geology: — Reading to paper to geographical maps of survey of India in different scales.

Locating own position on map.

— Measuring dip, strike, dissection, bearing and back-bearing with clinometer compass and Burtnon compass.

— Completion of outcrops on contoured maps.

— Study and interpretation of simple geological maps.

— Preparation of geological cross section of simple maps

— Simple problems on width of outcrops and thickness of strata.

— Determination of true dip and direction from two apparent dips and apparent dip direction from true dip direction.

Stratigraphy: — Recognition of simple stratigraphic rock and preparation of stratigraphic column.

Igneous Petrology: Megascopic study and description of following rocks and their classification and identification.

Tranite
Pegmatite
Charnockite
Seynite and nepheline syenite
Gabbro
Dolerite
Basalt
Phonalite
Dacite

Microscopic study, description, classification and identification of following rocks,

Granite.
Charnockite.
Seynite.
Nepheline Syenite.
Gabbro.
Basalt.
Diorite.

B.Sc. IIIrd Year Pass Courses

For examination in 1991 and after at the end of 3rd year
(8 to 10 lectures per unit).

Paper V : Economic Geology, Geology of Raw material, resources of India and Metamorphic Petrology.

Economic Geology, Raw material and resources of India.

Unit I Economic Geology: its definition, scope and terminology.

—Syngentic-Epigenetic minerals deposits.
—Fundamentals of classification of mineral deposits.
—Control of ore mineralization.
—Geological thermometers.
Unit 2  Fundamental of ore genesis,
Brief idea about processes of ore formation.
Magmatic and Hydrothermal processes.
Oxidation and supergene, enrichment.
—Mechanical and residual concentration.

Unit 3  Physical properties, chemical composition, mode of occurrence Geographical and Geological distribution and uses of following ore deposits of India.
Iron
Manganese
Copper
Lead & Zinc.
Aluminium.
Mineral wealth of Himachal Pradesh.

Unit 4  General appraisal of India’s mineral wealth and raw material.
—Fuel minerals-coat petroleum their origin, distribution and uses in India.
—Physical properties, composition; occurrence and origin of following non-metallic minerals in India.
—Mica
—Magnesite
—Gypsum

Metamorphic Petrology:

Unit 5  Metamorphism, definition and process.
—Agents and their rock in metamorphism.
—Types of metamorphism.

Unit 6  Texture and structure of metamorphic rocks.
—Classification of metamorphic rocks.
—Nomenclature of metamorphic rocks.
—Elementary idea of Depth zones in metamorphism.
—Concept of facies.

Unit 7. Dynamic metamorphism and its products.
—Dynamothermal metamorphism and its products.
—Contact metamorphism of pelite and carbonate rocks.
—Regional metamorphism of Politic and carbonate rocks.

Unit 8. Introduction to metasomatism, types and products.
—Petrographic study of common types of metamorphic rocks and their identification.
—Metamorphic facies.
Migmatites.

Paper—VI : Environmental Geology, Elements of Applied Geology and Field Geology.

Environmental Geology

Unit 1. Fundamental principles of environmental geology, its definition and scope.
—Basic concepts in brief.
—Physical system.
—Geologic Hazards, landslides, its causes and remedial measures, prevention and identification.

Unit 2. Geologic resources and energy minerals.
—Minerals and pollution.
—Water resources and energy.
—Fossil fuels and energy.
—Atmosphere its pollution, causes and remedies.
Unit 3 Earthquake hazards, its causes and remedies.
   —Prediction of Earthquakes.
   —Constructions in Earthquake prone areas.
   —Volcanic hazards, its causes and remedies.
   —Deforestation, causes and effects.

Unit 4 Human activity-forming and sullage industries.
   —Water pollution and pollution load.
   —Pollutants and remedies.
   —Elementary idea of water quality and destructive effects of water pollution.
   Waste disposal and treatments.

Elements of Applied Geology and Field Geology

Unit 5 Introduction to industrial mineralogy
   —Industrial specification of minerals for following industries.
   —Fertilizer.
   —Building material (cement and construction).
   —Location of chemical industries and regional planning.

Unit 6 India’s Mineral Policy
   —Properties of gemstones.
   —Methods of mineral exploration.
   —Introduction to mining methods (open cast and underground).
   —Future resources of mineral supplies.

Unit 7 Introduction and utilization of ground water and hydrologic cycle.
   —Methods of groundwater exploration.
   —Artificial recharge.
Unit 8 Principles of remote sensing techniques,

- Study of soil types.
- Principles of Geological Surveying.
- Geological mapping with chain and compass.

Practical-III

Economic Geology:

Megascoopic study of physical Chemical properties and identification of following ore minerals:

- Iron: magnetite, Hematite, Pyrite, Prystiotite, Ilmenite.
- Manganese: Pyrolusite Psilomelane Rhodosite, Rhodo Croûte.
- Copper: Cuperite Chalcopyrite, Chalcocite, Melachite.
- Lead-Zinc and Tin: Zincite, Sphalrite Cassiterite,
  Galena, Cerussite.
- Aluminium: Corundum, Bauxite, spinel.

Other Minerals: Halite, Kainite, Calcite, Anhydrite, Gypsum, apatite, Fluorite, Barytes, Beryl Magnesite, Cinnabar, Graphite, Lignite, Anthracite, Chromite, Lepidolite, Muscovite, Biotite, Talc, Stibnite, Realgar, orpiment, tapax, native, copper, Molybdenite, Azurite, Graphite, Siderite.

Metamorphic Petrology:

Megascoopic study of following rocks and their description and identification. Petrological description and identification of the following rocks:

Phyllite, Schist, Gneiss, Marble.

Chain and compass mapping.
B.Sc. Honours Course in Geology

Scheme of Examination

The 3 year B.Sc. Honours course in Geology will consist of Examination in Theory papers and the practicals including the field work. There shall be Eleven Theory papers (Paper I to XI) each of Three duration. There shall be one Practical (containing two parts of 4½ hours duration each at the end of 1st and 2nd years and three practicals of 4½ hours each at the end of 3rd years.

The honours examination for the Degree of Bachelor of Science shall also include.

1. A qualifying test in English at the end of 1st year of two papers of - 50 marks each.

2. A qualifying test in one of the following subjects at the end of 2nd year one paper 100 marks.
   a- Physical Science consisting of Physics/Chemistry.
   b- Life Sciences consisting of Botany/Zoology.

N. B.* The candidates offering Physics/Chemistry as subsidiary shall have to opt for life sciences & those offering Botany/Zoology shall opt for physical sciences as qualifying subject.

Subsidiary subjects: Each candidate shall offer two subsidiary subjects for these subjects shall be taken for both theory and practicals at the end of 1st and 2nd years.

(i) Physics and Mathematics or Chemistry.

(ii) Zoology & Botany (iii) Botany or Zoology & Chemistry.

Note: - i) Each of the candidate shall offer two subsidiary and one qualifying subject (other than the subsidiary) subjects offered.
ii) 50% of marks secured in the two subjects in the examination shall be added towards the classification of results of the successful candidates.

iii) 20% marks in the theory and practical examinations of Geology as Main subject shall be assigned for the teachers concerned on the basis of the student’s performance in the tutorial and assignments as ‘Assessment’.

Scheme of Honours Examination Geology

B. Sc. Part-I (Honours) Examination in Geology 1st examination at the end of 1989 and later.

Paper-I : Physical Geology, Basic Gromorphology and Elements of structural Geotectonics 100 Marks

Paper-II : Morphological crystallography and Mineralogy (Physical, Chemical, optical). 100 Marks

Paper-III : Invertibrate Palaeontology. 100 marks

Practicals : I Related to paper I, II & III 100 marks

Laboratory records 15 marks

Records on Geology based on field training of 10 days minimum, 25 marks

Viva based on related theory/practicals 10 marks

Total 450 marks

B. Sc.-II (Honours Examination in Geology. 1st Examination at the end of 1990 and later.

Paper-IV : General Palaeontology Vertibrata.
Palaeobotany and Micropalaeontology & Stratigraphie Palaeontology. 100 marks

Paper V : Geotectonics & Sedimentation 100 marks

Papers-VI : Crystal Chemistry & Igneous Petrology. 100 marks

Practicals II : Related to paper III, IV, V & VI
Outdoor field work report of minimum 10 days tour.
Laboratory records 25 marks
Viva on theory & field work 15 marks

B, Sc. III (Honours) year 1991

Paper-VII : Sedimentary and Metamorphy Petrology. 100 marks

Paper-VIII : Indian Stratigraphy 100 marks

Paper-(IX) : Orogenesis and Indian Mineral deposits 100 marks

Paper-X : Elements of applied Geology
Field Geology and Environmental Geology. 100 marks

Paper XI : Objective type paper based on whole course 100 marks

Practical III Related to papers VII & VIII
Laboratory work including internal assessment. 75 marks

Practical IV Related to paper IX including internal assessment & Laboratory work
75 marks

Practical V Related to paper X
Surveying and field geology, including assessment.
Field Report (i) Geological field work and study of outcrops in related areas
for about 10 days = 75 marks
25 marks
(ii) Practice of geological mapping in the selected areas and visit to areas of mineralization for about 21 days (three weeks)

(iii) Field collection

Viva related to course

Total 750 marks

Detailed courses of study

B. Sc. Part-1 (Honours) first examination 1989 later 8-9 lectures for each unit of 60 minute duration.

Paper I Physical Geology, Basic Geomorphology and elements of structural Geology.

Physical Geology & Basic Geomorphology

Unit-I History development of Geology its branches, scope, aims, applications, and relation with sciences.

— The Earth's surface relief, shape, size and its relation to solar system.

— Weathering and mass wasting.

— Mass movement and Geomorphological subdivisions of Indian sub-continent.

Unit-2 Erosional and depositional features and the geological work of the following:

(i) Running water (ground water including springs and geogser) (ii) Glaciers; including elementary idea about glaciation (iv) wind
Unit 3  Internal structure and constituents of earth.
        - earth quakes, Volcanism and other igneous activities, their causes, effects and distributor.

Unit 4  Important methods of geological age determination salts contents of ocean, rate of sedimentation, rate of erosion Radioacture, Palaeontological methods.
        Basic Principles of unformatism, Actualism catastrophism.
        Origin of Earth, Nuclear, hypothesis, two star, hypo and other modern theories.

Structural Geology

Unit 5  Definition scope and utility of subject Mech. turnepal.
        - Definition of force, stress, strain.
        - Mechanism of Plastic deformation.
        Strike dips (Apparent True) slope, gradient, thickness of bed, width of outcrop, depth;
        Description of folds.
        Various schemes of folds, classification, refolding plunge rake of fold.
        Drag fold, their geometry geneis.
        Effects of folds on topography and width of outcrops their recognition in the field.
        Economic importance of outlair, inliar.

Unit 6  Faults terminology, definition, and structures Associated fault plane, Elements of faults, translation and
rotational movement.
—Classifications of faults based on rake of net slip, separation, attitudes of faults in relation to adjacent bed,
—angle of dip of fault plane.
Effect of faulting on outcrops and their economic importance.
—Recognition of faults in the fields.
—Thrusts and related structures.
—Geometry of points, definition, classification.
—Origin of joints and their relation with other structures.

Unit 7 Elements of planner, linear structures, schistocity Rock leakage liniation its definition, types, classification origin and significance.

—Unconformity, definition and types.
—Their recognition and significance, distribution from other structures.

Unit 8 Major tectonic events during Earth's history with special reference to Indian sub—Content.

—Plutons-definition, classification, types and modes of emplacements.

—Characteristics of Epi—Meso—Kata zones plutons.
—Interrelationship of igneous plutons, tectonic setting and mineral deposits.
—Important sedimentry and igneous structures their
classification and significance in geological history of an area.

- Foliation and its definition, types, classification origin and its relationships with bedding and metamorphism

Paper-II Morphological crystallography and mineralogy. (Physical, Chemical, and Optical)

Morphological crystallography

Unit 1 Introduction to crystallography forms and morphology of crystals - Elementary idea of crystal formation.
- System of crystal rotation.
- A general idea of symmetry operation. Elements of symmetry interfacial angle and its measurement.

Unit 2 Law of crystallography.
- Elements of internal crystal structure.
- Elementary idea about the different types of projections of crystal.
- Basis of classification of crystals into a system. Class (point group) and interventional symbols.
- Study of symmetry of Holohedral classes of cubic system, Tetrahedral system.

Unit 3 Study of symmetry and forms of following symmetry
- Hexagonal: Beryl type, calcit type, Tourmaline type.
- Orthorhombic system: Bicynites type.
- Monoclinic system: Gypsum type.
- Triclinic system: Axonale type.
Unit 4 Mineralogy Descriptive.

—Physical Mineralogy, definition and scope of minerals.
Physical properties of minerals.
—Elements of sellicate structures.
—Classification of minerals.
—Elementary idea of crystal chemistry, isomorphism, polymorphism & pseudomorphism.

Unit 5 Introduction to chemical properties.

—Study of physical chemical properties and occurrences and uses of SIVICA group, Feldspar group, Miegefelds pailions group.
—Study of physical, chemical properties, occurrences and use of Amphicle group, Pyroxene group, Iodivine group, Epidote group, Zeolite group and Struphite, kyanite sillimanate, andalusite, chlorite, tale, serpenpine, calcere barites Fluorite, Epidote, Tournalve, Apaptite, Beryl, Zireon, Topaz, Coriendum diamond.

Mineralogy Optical

Unit 6 Nature of light and wave theory, nature of wave float and wave surface in isotropic and anisotropic minerals.
Reflection, refraction and total reflection, Double reflection and back effect, Nicol prism.

Extinction and extinction angle.

Pleochroism, Polarisation of light and absorption.

Unit 7 Description, construction, use of petrological microscopes its handling.

— Optical properites of minerals in plane polarised light
— Accessory plates and their use.
— Study of minerals in concergent polarised light.
— Optic figures, their determination, optic sign determination from interference figures.

Paper III Invertibrate Palaeontology

Unit 1 Broad units of classification of organisms, especially invertibrates:

— Introduction definition and importance of Palaeontology.
— Fossils—definition, requests and mode of fossilization.

Unit 2 Uses of fossils in various fields of Geology as indices of Palaeogeography, palaeoclimates, Palaeoecology, organic evolutions stratigraphy correlations.

Unit 3 Applied aspect of Palaeontology.

— Bathymetric distribution marine organisms.
— Elementary idea of binomial monomenclature and definition of species.

Invertibrate life through geological ages.
Unit 4 Basic Concept of organic evolution.
   —Systematic methods of fossil collection.
   —Study of phylum mollusca, its evolution, distribution and geological history of classes (Gastropoda, Paleceproda, cepha).

Unit 5 Study of Phylem Brachupoda its evolution, distribution, geological history and main evolutionary trends languages.

Unit 6 Study of unit Arthropoela (Class trelobita) with special ref. to evolutionary trends, provencialism, its stratigraphic sequence.
   —Study of class Anthozoa (Phylem acclentilata) stratigraphic importance and geological history, ontogeny, phologency of coelenrot.

Unit 7 Study of phylum Echuderneta, its division into various classes. Class Echidocdeea its geological importance, history.
   —Morphology and geological history of test of class Eindodces main evolutionary trends.

Unit 8 Phylum prolochordata (order Graptolocica),
   —its morphology and classification.
   —main evolutionary trends.
   —stratigraphic significance and geological distribution.
   —Study of ineya fossils phylum protozoa (Foraminifera),
   —its historical aspect, its life cycle, diamorphism, polymorph.
—Morphology of test and geological history of foraminifera.

Practicals: I related to paper I, II, III.

Laboratory work

Geomorphology—Delineation of simple Geomorphic features.
—Drawing of longitudinal and cross valley-profile.

—Area altitude relation.

—Simple morphometric relationships.

Structural Geology: Continue line, startum contour common symbols of representing fold, thrust, joints, foliation, unconformities.
—Effects of topography on outcrops.
—Completion of outcrops on maps.
—Study of topographic and geological maps.
—Drawing of geological section.
—Structural problem relating to dip, strike, direction and thickness outcrops, beds, fault, plant solution.

Morphological crystallography:
—Use of goniometer.
—Morphological study of symmetry and form of holoagym.
—Metric classes of all the crystal systems.
—Study of symmetry hemachedral-classes.
—Drawing of chnographic projections of forms and defining them.

—Determination of Axial ratio of Tetragonal crystals.

Minarology:

Use of Walker steel yards, Zolly’s balance and determine.

—Action of specific gravity of minerals
—Use of hardness box and determination of hardness of minerals.
—Study, description and identification of minerals given in theory, there occurrence, use.

Optical Minarology:

Use of petrological micrographic
—Study of optical characters of following minerals (then section).

Under plane polarised light and cross nicle: quartz, Orthoclase, Microcline, plagioclase, olivene, angenete, Hypothrene, hornblend, Actinolite, Biotite, Muscovite, caloete, tourmative, zircon, sphene, garnet, chlorite, kyanite, leculete, nephclone, sordalete epidote, staurolite, talc, agipentene (Optical profit) e.g. ref. Index, Extinction, Pleochroism, and interference colours).

Invertebrate Palaeontology:

Morphological description and Identification of following fossils.

Brachiopoda: Lingula, productus, Spirifer, Rhynohnelia, Pentamerus, Terebratula, Pholodomva, Pecten, Ostrea-Gryphaca,
Unio, arca, cardita, Merytrex, Nucula, Accetryonia, Pholodomya, Inoceramus.

Gastropoda: Murex, Tarritella, Netica, Cerethium, Cyprea, Conus, Physa, Sycon.

Cephalopoda: Orthocerus, Nantilus, Goniatites, Ceratites, Phylocerac-Perisphinctes, Baculites, Tuldoceras.

Gropotoideae: Monograptus, Tetrograptus, Dendrograptus.

Coral: Calocola, Zaphreytis, Montluvalthia, Favoates.

Echinoidea: Micraster, Hemiaster, Clypeaster Clydeas, connus, Schizaster, eidaris, Hemicidaris.

Trilobita: Paradoxides, Olenus, Calymene, Agnustus, Bryozoa, Trymeous-Flicestilla, Polypona.

Sessional work:

Every student shall be required to keep and maintain up-to-date record of practical work during the session properly signed by the teachers concerned, submit it to Hand of the Deptt. At the time of respective practical examinations.

Field work:

Every student shall be required to attend field Training around Dharmsala and shall submit the report of field work to the Head of the Deptt. All collections of specimens properly and arranged. The marks of field work shall be given on the basis of above mentioned filed report and collection.

Vava-Voce:

Every student shall appear for via based on theorys Practicals. Field work done by the students during the session.
B. Sc.—Part-II (Honours)

First examination in 1990 and after 8, 9 lectures of 60 marks each/unit.


General Palaeontology

Unit 1 Broad classification of organisms especially vertebrate-species identification of fossils, describing a species, Functional morphology and Adaptation, Extinction of organisms and its causes.

Unit 2 Broad classification of plant kingdom.

—Laws of Floral, Faunal succession.
—Ecology & Palaeoecology.
—Fossils as evidence of evolution with spe, ref. of Horse.
—Occurrence of Principle divisions of plants and vertebrates in geological column.

Pre-cambrian Palaeontology (Preliminary) and its stratigraphy importance.

Vertebrate Palaeontology

Unit 3 Introduction of vertebrate Palaeontology.

—Main morphological and classification characters and division of vertebrate.
- A brief account of vertebrate sequence through Geological time.

Unit 4 Evolution of Law:
- Evolution history of Horse (EQUUS) & Trends of Evolution it
- Evolutionary History and Trends of evolution in Man.

Micropalaecontology:

Unit 5 Definition and scope of micropalaecontology.
Classification of micro organisms.
- Collection, Preparation, and preservation of micro fossils.

Broad Morphological history and evolutionary trends in Foraminiifera test.
- Ecology of Foram differa.
- Broad Morphological history of Ostracode and there ecology.
- Diagramatic illustrations and Identification, Morphology of following foraminifers Alveolina, Textularia, Globigerina, Quainque loqlina, Nummulites, Assilina, Fusulina.

Palaeobotany:

Unit 6 Introduction to palaeobotany, importance of Palaeobotany and palyeopalynology in geological studies.
- Identification and morphological description of important lower & upper Gondwana plant fossils.
- Laboratory study of prtrification, compresion, impresssion.

Stratigraphic Palaeontology (Principle of Stratigraphy)

Unit 7 Principles of stratigraphy.

- Evolution of stratigraphic nomenclature.
- Concept of species and zones.
- Order of superposition.
- Concept of correlation, time correlation, rock correlation, Biological method of time correlation.

Unit 8 Geological concept of time the modern time scale, Eva-Period peopoe.

- Brief knowledge of paleogeography palaeocology, and Palaeoclimatology, Standard Geological time scale.

Paper V: Structural Geology, Geotectonics & Sedimination.

Geotectonics:

Unit 1 Crust and interzone of earth.

- Esostasy, Principle, definition.
- Deformation of Earth's crust, evidence of slow and Abrupt movements.

Unit 2 Epidrogency, organic movements.

- Mountains their classification and structures.
- Geosynctics.
- Elementary knowledge of different geotectonic Units.
shield, organic berks, mid oceanic ridges, land Arks, Tranches, risively.

Unit 3. Distribution of land & sea with special reference to oceans and continents - belt of volcanic actucrty and earth quakes.

—Diastrophism

Unit 4 Continental drift its causes, evidences.

—Outline of theories of continental drift.

Introduction to plate tectionics.

—Sea flour spreading, conventional current hypothesis, Palaomayntism.

Sedimentation:

Unit 5. Sedimentation praacesses and lethification, diagnosis.

—Deposition of clastic, non clastic rocks.

—Concept of sedimentry facies, lateral and vertical vareation.

Unit 6 Parameters & Reconstruction of mient sedimentary environments their implication in the stratigraphy—Summery description of sedimentary environments.

Unit 7. Epicotogency and orogeny, its relation to rate of sedimentation, igneous activity, global tectionics and sedimentry externalities their relation and importance.

—Determinination and interpretation of stastical parameters Roundness, sphearsity & chogation of detricial grains.
Physical, chemical, biological parameters of sedimenation.

Unit-8 Introduction to Stratigraphic mapping fossils, permeability

Paper-VI: Crystal Chemistry and Igneous Petrology.

Crystal Chemistry

Unit I. Atoms, ions and periodic table, bonding forces in crystals.


Igneous Petrology:

Unit-2 Introduction and scope of petrology.

- Igneous rocks and their constituents.

- Nature and composition of magmas their properties, chemistry and cooling behaviour-volatile constituents of magma.

Origin of magma, Nature of Mantle.

- Texture & structure of igneous rocks.

Unit-3 Magma types and magma series.

- Primary magma Partial and derivature magmas.

- Forms and structures of igneous rocks, extrusive, intrusive.

- Basis of classification of igneous rocks.

- Chemical, Tabular, Modern classification.

Unit-4 Saturation principle, elementary idea about Struckeisen’s classification.

- Principles governing crystallization of silicate melts.
- Variation diagrams.
- Phase relationship.

Unit-5 Crystallization of unicomponent magma (system).
- Binary system with Eutatic, with solid solutions, and with intermediate compound making, incongruent-meltly.
- Crystallization of following binary systems.
  (a) Diapride-Anortheta system.
  (b) Quartz-Albita system (c) Albita-Anortheta system with role of pressure, volatiles and trachionationism about systems.

Unit-6 Bowen's Reaction principle and reaction series, its petrographic evidences.
- Elementary idea about megnatic differentiation.
- Fractional crystallization and liquid immesublitys, Hybrialism.
Partial melting and fusion.

Unit-7 Distribution of igneous rocks in time and space.
- Consenquanity and kinds of igneous rocks.
- Petrographical proviances and periods.
Granitic magma its field relationship, enplacement (gramatic).
- Anatexis-Palingensis-Granityation.

Unit-8 Basaltic magma, and classification of basalts.
- Elementary idea about mealomericic ridges basalt, Oceanic island basalts, centinetal flood basalts, opheoletes
spilites. Petrographic description, and elementary idea of petrogenesis of important igneous rocks.

Practicals: related to papers IV, V, VI.

Laboratory work: Palaeontology: (a) Identification and description of Schizocnura, Sphenopteres, Dadoxion, Glossopteris, Gangameptery, Vertebrae, Thinnfelda, Cladophlebis, Pilophyllum, Otozamites, Williamsonia, Avencolne, Textaria, Globogherine, Quinqueloculina, Nummulites, Assilina, Dissepculina, Miogypsina, Dictyonoides, Orbitolina, Ostracoda.

Geology: (a) palaeographic map of Gondwana land.
(b) A few advanced geological maps their interpretation and section drawing.

Igneous Petrology: Study of following igneous rock types and their petrological description, in hand specimen and their identification. Granite, Granodiorite, Syenite, Nepheline Syenite, diorite, Granite, Nonodiorite, sodaite, dolerite, Peridotite, Rhyolite, Basalt.

Viva-Voce: The viva of the student shall be based on the theory papers and on the geological field work done during second year (Honours).

Sessional Work: Every student shall be required to keep the record and maintain up-to-date practical work during the course of study. The note books duly signed by concerned teachers must be submitted to Head of Department.

Field work: Every student shall be required to undertake a field trip of concerned subjects and the report of field work, collection of specimens must be submitted to Head of the deptt. The marks assigned to the students for field work shall be on the basis of report and collection.
First examination in 1991 and after 8 to 9 lectures of sixty minutes each for every unit.


Unit I: Sedimentary processes, products: An outline of classification of sedimentary rocks, Residual deposits, their piode of formation characteristics and important types.

Unit II: Sedimentary structures & classification in detail.

— Determination of palaeo-current direction.

— Important permeability structures (bedding, cross, graded bedding) Parting, Lamination, ripple marks & sole structures.

Unit III: Chemical and mineralogical compositions, including.

— Heavy microrns of sedimentary rocks.

— Heavy minerals, their significance in dumentionary analysis and graphical methods.

— Golisch’s Stability series.

Unit IV: Classification and types of lime stone, characteristics origin of lime stone, classification, characteristics of types of sandstone. Concept of Maturity of clastic sediments.

— Mechanical analysis and Graphical representation of clastic sediments.

— Petrological description of sedimentary rocks.
Metamorphic Petrology

Unit 5 Definition & scope of metamorphism.

- metamorphic processes & Metamorphism.
- Agents and their roles in metamorphism.

Kinds of metamorphism-Metamorphic minerals under Prograde, retrograde metamorphism.

- Texture, structures, Fabric of metamorphic rocks & their significance.
- Classification & nomenclature of metamorphic rocks- Deport: zone, grades, facies of metamorphism.

Unit 6 Barrovian zones of required metamorphism & principle of Isograde mapping.

- Roschbushes: zones of thermal metamorphism.
- Dynamic metamorphism & its products.
- Contact metamorphism of Peletic, mafic and carbonate rocks.

Unit 7 Metamorphic differentiation.

Metasomatic types and products (introduction).

Chemical behaviour of metamorphic rocks-equilibrium phase rule and graphical representation of phases (introduction).

- Migmatites.
Unit 1 Physiographic divisions of India.

- Introduction of Indian Stratigraphy.
- Basement complex and gneissic their composition and age.
- Eocene unconformity and its significance.
- Pre-cambrian stratigraphy of Dharnar super group and its main equivalents in Indian shield.

Unit 2 Aravalli Super group:— Concepts of Dharnar, Delhi
- cycles in relation to orogeny and stratigraphy.
- Distribution of proterozoic (Parana) rocks in India the type area Stratigraphy of Cuddapah, Delhi, Vindhyan Bijowar Super groups.

Unit 3 Introduction to life in Pre-cambrian and Riphean stratigraphy of India.
- Proterozoic and Arochian stratigraphy of Extra peninsular India J. K. Himachal, Kumon, Ghoral only).
- India of Pre cambrian, Pre-cambrian- cambrian boundary in India.

Unit 4 Palaeozoic Era and distribution of Palaeozoic rock of India- Detailed study of different systems of Palaeozoic Cambrian system as salt range, Haminta system Muth Quarlyite.
- Permo-carsonsonferces rocks of salt range, spite-Kumaren Kashmir the malayas.
Unit 5 Introduction to Silurian-Devonian Boundary in India.
Study of 'Gondwana Super group' Lower Gondwana Sequence, Palaeochimates during Gondwana, Palaeography during Gondwana, deposits.

The Idea of Perm-Triassic Boundary.

Unit 6 Mesozoic Era and distribution mesozoic rocks in India.
—Triassic of spites, jurassic of kutch (Petaceous of South East India).
—Deccan traps, Infratrapeans Intertrappean rocks.

Unit 7 Tertiary Era and its distribution in India.
—Swalik system of Jammu, its equivalents in Assam.
—A brief account of Himalayan orogeny.

—Sabathu, Munshee, Dharamsala, Degshai-Kasauli groups.
Introduction to cretaceous-Eocene boundary problem.

Unit 8 Quatmmary Era.
Placisto cene glaciarion ond its products.
—Karewa beds.
—Origin of thar desert & Ganga Plain. Introduction to Pleocene- Pleistocene Boundary problem.

Unit 1  Definition, and General introduction, concept, Terminology and scope.

—Syngentic & epigenetic deposits, ore genesis.

—Concentration factors, economic considerations and characteristic of economic mineral deposits.

—Ore bearing fluids, control of location of ore deposits, their classification required local factors, Primary and secondary features physical, chemical controls.

—Paragenesis and zoaming causes of sequential deposits.

Unit 2  Geothermometry, Geobiometry; Brief idea about ore forming.

—Orthomagnetic and megamatic segregation Pegmatic deposits.

—Metasomatic and pyrometromatic process.

—Hydrothermal process, hypothermal, mesothermal deposits, epithermal zyrothermal process

Unit 3  Mechanical accumulation, sedimentary precipitation and residual processes, secondary and super gene enrichment and oxidation processes. Metamorphic process.

—Concordent ore bodies in sedimentary host rocks

Lime stone host, argillaceous host, arenaceous host, Rudaceous host, chemical sediments host, Igneous host rocks, volcanic host, Plutonic host, Metamorphic host rock bodies.

—Discordent ore bodies.
Unit 4 Disseminated ore deposits & irregularly replavent bodies. Classification of ore deposits

- Elementary idea about the concept of metalogenitic epoch and province.

- Elementary idea about mineralization in relation to geodynamic.

- At concept of plato tectonics.

Unit 5 Introduction to fuel minerals.

Origin of coal, coal series geological and geographical distribution with special reference to India & its uses.

- Study of Indian coal, coal fields, (Theria & Raniganj) Lignite fields, their minerals & mode of occurrence.

- Petroleum & Natural gas its organ, traps cap rock, reservoir

- Rocks mode of occurrence, geological and geographical distribution of gas, petroleum and its uses in India.

Geology of cambary and As an oil fields.

Radioacture & Atomic minerals, Physical, Chemical, Optical properties, mode of occurrence uses geological and geographical distribution India.

- Minerals of chemical Industry, sulphur, and pyrite, Berites Fluorspar, salt and saline products.
- Minerals of ceramic glass industry, gypsum, talc, soap stone Flospar, Glass sands, and clay.

- Minerals of Fertilizer Industry: Rock phosphate and phosphorite.

  Refractory minerals, graphite, dolomite, magnesite, kyanite, sillimanite and andalucite. Ball clays, fire fire clays.

- Rock & minerals used in construction, lime stone, cement and cementing materials used in construction building stone, and crushed stones, sands.

- Minerals for insulation+Electreced industry. Mica and mica deposits of India, Asbestos.

- Minerals used for pigments and filler material.

  Precious & semiprecious stones. Abresive material Beryl, Corbonatite.

Unit 6 Ore minerals and ores of important metallic deposits of India. These genesis, physical, chemical, optical properties and other diagnostic properties, Industrial specification uses and distribution, Copper, Manganese, Iron. chromlite. Nicle.

Unit 7 origin, mode of occurance, distribution, tenor and grade of the following ore deposits in India.

- Precious metals, Gold deposits, Silver and Platinium

- Non ferrous metals, lead-zinc and Aluminium.

- Still Haxdning metals.

- Race elements.
Paper-X: Elements of Applied Geology, Field geology and Environmental geology.

Surveying + Geological mapping

Unit 1 Topographical surveying for Geological works using chain, compass and tape.

- Compass survey in area containing magnetic minerals, Brronton and presinatic compass.
- Plain table survey, alidades, Abreney and dumpy level.
- Ploting of survey & data.

Types of maps used for geological works and preparation of different types of maps and different scales.

- Mine plan maps, minerals deposits maps and minerals for Cash'ing maps and their preparations.

Photogeology + Remote sensing

Unit 2 Principles of Areal photography, and types of areal photography:

- Uses of air surveys and characteristics of vertical photographs.
- Use of stereoscopes and other phogrammetric accessories.
- Interpretation and approval of areal photographs.
- Vertical exaggeration and distribution of relief.
- Preclimanry steps and features, identified on photos, depestumations Structure contours.
Use of available photographs in Geological studies.

Basic idea of remote sensing, satellite imagery, false colour imagery. Application of remote sensing in mineral and oil exploration.

Engineering Geology

Unit 3 Engineering properties of minerals: specific gravity, porosity, absorption, compressive strength, Modulus of elasticity, and Modulus of compression.

Classification, properties, and types of different types of foundations and geological considerations relating to buildings, stones, and road material.

Geological considerations relating to dams and reservoirs, highways, tunnels, bridges.

- Landslides, their problems, and remedies.

- Engineering geology in relation to town planning.

Mining Geology

Unit 4 Mine definition and terminology.

- Classification of mining methods: open cast, quarrying and underground mining. Long wall mining, horizontal mining, stope mining.

- Elementary idea of reserves calculation.

- Sampling of deposits, tenor, and grades.

- Ore beneficiation and related procedures and their use in ore dressing. Indian examples of coal washing and ore dressing practicals.
Geological prospecting practices, techniques, concepts
ore guides, prospecting ore tech.

Modern methods of development exploration—methods
(introductory part).

Geohydrology :-

Unit 5 Introduction and utilization of ground water and hydrological cycle.

—Elementary idea of atmospheres components.

—Origin and vertical distribution of ground water.

Aquifers and their classification and types.

—Interstices: poverty, specific yield, efficiency of storage
  permeability and transmissibility.

—Ground water movement and darcy's law.

—Chemical quality of ground water, Methods of analysis.
  such as light of ground water, Management of ground water resources.

—Elementary idea about artificial recharge, to ground water
  recharge, discharge of ground water relationship in
  aquifer system.

—Occurrence of ground water in India.

—Hydrological data appraisal depth of water maps, fence
  diagram, water table, contour map.
Geochemistry :

Unit 6  Geochemical classification of Elements.

— Metcosites, their characteristics & classification.

— Thermodynamics : basic concepts like Gibbs function.

— Phase rule, phase diagram Solid solution & its types.

— Polymorphism, Tromorphism, substitution & Electronegativity.

— Gold S. Chnudts rule, Elementary idea about Environmental Geochemistry.

— Role of trace elements in chemistry, petrogenises, ore genesis.

— Geochemical prospecting: concept definition, dispersion and geochemical proviences and methods(Elements only).

— Geochemical data appraisal & its interpretation.

— Elementary knowledge of analytical Geochemistry.

Principle of net analysis, + itremetry, spectsophonetry theme photometrys colormetry.

Geophysics

Unit 7  Introduction & fundamental principles of gravity prospecting.

— Instruments for ensuring gravity data, in geological investigations and prospecting.

— The earth’s magnetism : basic concept and definitions variation with time in earth’s magnetic field.
Introduction to instruments in magnetic prospecting and magnetic measurements of land and interpretation of vertical field data.

—Air born magnetometer its advantage and limitation of aero-magnetic surveying.

Introduction to electrical prospecting methods; resistivity method, inductive method.

—Seismic waves this characteristic and principle of seismograph and seismic prospecting methods (reflection refraction).

—Correlation of seismic data with surface and subsurface geology.

—Introduction to Radiometric method of prospecting Principles methosology and detetion of radiations.

Environmental Geology and Gemology

Unit-8 Introduction to environmental Geology basic.

—Concept of physical system.

—Geological resources of energy minerals, water resources and fossil fields.

—Geological wazards of landslides, floods.

—Humenactunity, farming, servage and sulrape industries pollution load, water pollution.

—Elementary idea of water quality and the destrucitive effect of water pollution.

—Air pollution, causes, remedies.
Introduction to gemology.
Occurrence and distribution of gem stone, in India.
Classification and properties of gem stones, their evaluation.

Papee-XI : Objective type questions out of complete course.
Practical-III : Related the paper VII and VIII
Stratigraphy : Preparation of Paleographic maps of Indian Subcontinent during different palaeozoic periods and Gondwana periods.

Study of characters of stratigraphic rocks and preparation of stratigraphic coloums by assigning them their proper ages.
Sedimentology :

Study spot identification and description of following sedimentary rocks in hand specimen, Braccia, conglomerate Greywack, Arkose, sand stone, clay, slate, marl, limestone, delomite, ronstone. Petrographic description, identification, classification of following rocks under microscope, conglomerate, greywack, breccia sandstone, lime stone, shelly line stone, micoceous sandstone.

Metamorphic Petrology :

Study, identification and description, (Petrography & etro-gensis) following metamorphic rocks types in hand-specimens slate, phyllite, schists, gneiss, augun goneisses, molare, quarizite granulate, migmatiter.

Microscopic study of them sectors and petrological description of following metamorphic rocks; slate, phyllite, schests, gneiss augen gneisses, quartzite.
Ore Mineralogy: principles of ore microscopy (reflection) and study of polished section of common oxides sulphide under microscope.

Practical IV: related to paper IX & X

Economic Geology: Distribution of Economic minerals deposits in the outline map of India.

Physical, chemical, properties and spot identification of important Economic minerals and ores these distribution and genesis.

Sulphide: Realgar, orpiment, stibuanite, molybdocule, galena, hantla chalciote, sphrelerite, cinabar, pyroholite, conellite, nirolite jamgonite, stephamite, enagite, stannite.

Halides: Halite, sylurite, florite, cryolite.

Oxides: Culprite, zincite, currundum, Hemalite, Ilmanite, spinel magnetite, franklinite chromic, casselarite, rutile, pyro-

Carbonates: Calcite, aragonite, Polomite, magnetite, siderite, Rhodochrosite, smohsonite, cerrussite, malachite, azurite,

Silicates: Rhodomite, Beryl, garnet, ziron, topage lepidolite, masuzite, soapstone, kelpine, chrysolite, trdanite.

Phosphate: Monagite

Sulphate, Ect: Wolframite, wolfeinite.
Native: - Grainbrite native copper, sulphur.

Industrial mineralogy:

Description and specification of various of minerals Industrial use, description and identification of building material with quality control.

Geomology: - Description and identification of rough, concept cut previous and semi-previous semi-stone.

Specific gravity and optical characters, grading of gemstones.

Hydology: Preparation, interpretation of depth water maps, water taste contour and hydrological analysis. Evaluation of hydrological parameters of aquifer processing and interpretation of pump test data.

Geoprospecting Geoaexloration: - Maps exercises on different methods of prospecting, exploration, sampling, and estimation of reserves.

- Geophysical exploration methods: Electrical, Magnetic methods

Photogeology - Preliminary study of air photograph.

Practical V: Related to paper X (surveying part only)

- Use of chnometer, Proseumatic, and Brunton compass, chain survey plain table surveys, level, dumpy level, theodolite and Microptic, alidade, Plotting to survey and section.

Internal Assessment: - The assessment shall be based on work done in lab, and field by the student during whole year.
Sessional work: Every student shall have to keep the record of the lab. work and duly signed by teacher concerned should be submitted to Head of the Deptt. during practical exams.

Field work: The attending of compulsory field training and submission of report in proper order to the Head of Deptt. along with the field specimen, sample collected only shall entitle them for the marks kept for this purpose. Survey sheets maps prepared must be signed by teacher concerned before being submitted.

Viva-Voce:

The viva at the time of Examination (Practicals) shall be based on the theory and practicals, related to field work done by the students during whole year.