

B.Sc. CREDIT-BASED SEMESTER SCHEME
GEOLOGY
SCHEME OF EXAMINATION AND CREDITS
I SEMESTER

Paper No.	Title of the Paper	Paper	Hours/Week	Exam Duration(hrs)	IA	Exam	Total Marks	Credits
GT 101	PHYSICAL GEOLOGY AND CRYSTALLOGRAPHY	T	4	3	30	70	100	2
GP 101	CRYSTALLOGRAPHY AND GEOMORPHOLOGY	P	3	3	15	35	50	1
TOTAL MARKS AND CREDITS FOR I SEMESTER							150	3

II SEMESTER

Paper No.	Title of the Paper	Paper	Hours/Week	Exam Duration(hrs)	IA	Exam	Total Marks	Credits
GT 201	GEODYNAMICS AND MINEROLOGY	T	4	3	30	70	100	2
GP 201	MINEROLOGY AND OPTICAL MINEROLOGY	P	3	3	15	35	50	1
TOTAL MARKS AND CREDITS FOR II SEMESTER							150	3

III SEMESTER

Paper No.	Title of the Paper	Paper	Hours/Week	Exam Duration(hrs)	IA	Exam	Total Marks	Credits
GT 301	PETROLOGY	T	4	3	30	70	100	2
GP 301	PETROLOGY	P	3	3	15	35	50	1
TOTAL MARKS AND CREDITS FOR III SEMESTER							150	3

IV SEMESTER

Paper No.	Title of the Paper	Paper	Hours/Week	Exam Duration(hrs)	IA	Exam	Total Marks	Credits
GT 401	PALAEONTOLOGY AND STRATIGRAPHY	T	4	3	30	70	100	2

GP 401	PALAEONTOLOGY AND STRATIGRAPHY	P	3	3	15	35	50	1
TOTAL MARKS AND CREDITS FOR IV SEMESTER							150	3

V SEMESTER

Paper No.	Title of the Paper	Paper	Hours/Week	Exam Duration(hrs)	IA	Exam	Total Marks	Credits
GT 501	MINERAL RESOURCES AND STRUCTURAL GEOLOGY	T	4	3	30	70	100	2
GP 501	MINERAL RESOURCES AND STRUCTURAL GEOLOGY	P	3	3	15	35	50	1
GT 502	GEOEXPLORATION AND STATISTICAL GEOLOGY	T	4	3	30	70	100	2
GP 502		P	3	3	15	35	50	1
TOTAL MARKS AND CREDITS FOR V SEMESTER							300	6

VI SEMESTER

Paper No.	Title of the Paper	Paper	Hours/Week	Exam Duration(hrs)	IA	Exam	Total Marks	Credits
GT 601	REMOTE SENSING AND ENGINEERING GEOLOGY	T	4	3	30	70	100	2
GP 601	REMOTE SENSING AND FIELD GEOLOGY	P	3	3	15	35	50	1
GT 602	HYDROGEOLOGY AND MINING GEOLOGY	T	4	3	30	70	100	2
GP 602	HYDROGEOLOGY AND MINING GEOLOGY	P	3	3	15	35	50	1
TOTAL MARKS AND CREDITS FOR VI SEMESTER							300	6

Total Marks = 1200 and Total Credits = 24

* NOT: T – Theory and P – Practical

SEMESTER I

GT-101. Physical Geology and Crystallography

70 Marks

2 Credits/Week = 4hrs/Week, 52 hrs/Semester

Unit 1

Physical Geology

Introduction: Definition, Aim and Scope of geology, relationship with other branches of science, branches of Geology. 2 hrs

Planet Earth: Forms and Dimensions of the Earth and its position in solar system. 1 hr

Origin of Earth: Nebular, Planetesimal, tidal, twin star & meteoritic hypothesis, Age of the Earth, Radiometric methods (Rb-Sr, U-Pb, Tm-Nd, Pb-Pb). 3 hrs

Interior of the Earth: Crust, Mantle and Core, their composition based on Seismic evidences. 3 hrs

Concept of Isostasy. 1 hr

Unit 2

Epigenic Processes: Weathering, Definition, Types: Mechanical, Chemical and Biological, weathering products. 2 hrs

Soil and soil profile. 1 hr

Wind: Definition, Geological action a) Erosion – Definition, Abrasion Attrition b) Geomorphic (Erosional) features – Pedestal rocks, ventifacts. Mode of transportation – suspension, saltation, traction. Depositional features-Loess, Sand dunes, Barchans. 4 hrs

Rivers: Definition, stages of rivers (youth, mature and old) Geological action of rivers – Erosion – Hydraulic action, Abrasion, Attrition, Corrosion, Erosional features-Pot holes, ‘V’ shaped valleys, waterfalls, meanders, Ox-bow lakes, Canyons & Gorges, Transportation – Suspension, saltation, solution, Depositional features – Alluvial fans and cones, Deltas, Flood plains, Natural Levees. 4 hrs

Unit 3

Oceans: Definition, topography of seafloor, Zones – Littoral, continental shelf, slope and Abyssal, Movement of Sea water Tides, waves, and currents. Geological work of Ocean-Erosions, transportation and deposition. Features of Marine erosion and deposition. Coral reefs - Definition, formation & origin, Types - Fringing reef, barrier reef and Atolls. 4 hrs

Glaciers: Introduction, Definition, Glacial morphology, types of glaciers – Ice sheets, Piedmont glaciers, Geological work of glaciers Erosion, Transportation and Deposition. Glacial erosion plucking, Abrasion, frost wedging, Glacial Erosional features-Cirques, ‘U’ shaped valleys, hanging valets, Transportation, glacial deposits-Moraines, Drumlines, Eskers, Kames, buried valleys, Tillites. 4 hrs

Groundwater: Geological action of Groundwater, Erosional features – sinks, caverns, solution valleys, Transportation – solution Depositional features – Concretions, Stalactites and Stalagmites. 3 hrs

Unit 4

Hypogenic Processes: Volcanoes: Definition, description of typical volcano classification – central, fissure, active, dormant, extinct. Products of volcanoes-solid, liquid, gases; hot springs, Geysers, fumaroles. Distribution and causes of volcanoes. 3 hrs

Earthquakes: Definition, focus, epicenter, distribution, causes and effects, classification, seismic waves – P, S and L. Seismograph and seismogram, Richter scales, recent earth quakes in India. 4 hrs

Mineralogy: Introduction, definition, relation with other branches of science, branches of Mineralogy: a) Crystallography, b) Physical Mineralogy, c) Chemical Mineralogy, d) Optical Mineralogy, e) Descriptive Mineralogy.

Crystallography: Introduction, Formation – Crystals, Crystalline and Amorphous. Definition of crystal and crystal elements, law of Constancy of interfacial angle, contact Goniometer, Measurement of interfacial angle Crystallographic axes – Definition, Axial characters (Constants). Classification of crystals into 6 systems. Symmetry elements – Center, Plane, Axis and Composite symmetry. 4 hrs

Unit 5

Classification of crystals based on Symmetry elements, Nomenclature of Symmetry classes, Dana, Ford, Weiss notation, Miller's indices. 2 hrs

Forms – Unit, fixed, variable, closed, open, and general. 1 hr

Study of the following symmetry classes with their forms.

i) $4/m - 3 2/m$, Galena Type, ii) $4/m 2/m 2/m$ – Zircon type, iii) $6/m 2/m 2/m$ – Beryl type, iv) $2/m 2/m 2/m$ – Barite type, v) $2/m$ – Gypsum type, vi) – 1- Wollastonite type. 5hr

Twins – Definition, parts, types and twin laws. 1 hr

GP-101. PRACTICALS

35 Marks

Crystallography and Geomorphology

Verification of Euler's formula, Interfacial angle & its measurements. Notations: Miller's Indices, Weiss notation. Classification of Crystals into systems based on their axial characters.

Study of symmetry elements and forms of Isometric, Tetragonal, Hexagonal, Orthohombic, Monoclinic and Triclinic systems. Twins.

Geomorphology: Study of important Geomorphological models.

REFERENCES

Principles of Physical Geology – Arther Holmes, 1993, Chaman and Hall, London

Principles of Geomorphology – W. D. Thron Bury, 1985, Wiley Eastern

Study in Applied Geomorphology – Hemalatha Singh, 1991, Anupama Publication

Text book of Mineralogy – Dana, 1966, Wiley Eastern Ltd.

An Introduction to Crystallography – F.C. Phillips, 1963, John Wiley and Sons.

Elements of Crystallography – Tareen, J. A. and Jutti, TRN, 1980, University Press.

SEMESTER II

GT-201. Geodynamics and Mineralogy

70 Marks

2 Credits/Week= 4hrs/Week, 52 hrs/Semester

Unit 1

Geodynamics: Introduction, Continental Drift, evidences, and sea floor spreading, hot spots. 2 hrs

Plate Tectonics: Evolution of plate-tectonics theory, plates and their margins, constructive and destructive margins, Plate boundaries – Divergent, Convergent and Transform fault, Causes of movements of plats, origin, distribution and significance of mid oceanic ridges, trenches and island arcs. Paleo-magnetism, relation between orogeny, magnetism, metamorphism and metallogeny. Evolution of oceans and continents. 10 hrs

Unit 2

Mineralogy: Introduction, definition, relationship with other branches of science.

Physical mineralogy – Mineral definition, formation and broader classification on minerals. 1 hr

Properties of minerals. 2 hrs

Characters depending upon the state of aggregation – habit, form.

Properties depending upon Cohesion, elasticity, cleavage, fracture, hardness and tenacity.

Characters depending upon light – color, streak, luster, diaphaneity, play of colors, opalescence, luminescence, fluorescence, phosphorescence, tarnish and iridescence. 6 hrs

Characters depending upon electricity – conductivity, pyro, piezo.

Magnetism: para, dia and ferro-magnetism, thermo-electricity.

Specific gravity and methods of determining specific gravity. 4 hrs

Unit 3

Optical Mineralogy: Introduction, nature, transmission, reflection, refraction, refractive index, critical angle, total reflection, double refraction.

Polarization of light, Polaroids, Nicols prism. 2 hrs

Optical classification of Crystals. 2 hrs

Birefringence by Michael Levy's chart. 2 hrs

Pleochroism. 2 hrs

Interference colors. 2 hrs

Unit 4

Extinction Angle, Twinning. 2 hrs

Optical Accessories - Mica plate, Gypsum plate and quartz wedge. 2 hrs

Chemical Mineralogy: Isomorphism, polymorphism, pseudomorphism, Chemical Bonding-Ionic, covalent, metallic, Vander-Waals bonding. 4 hrs

Descriptive Mineralogy:

Classification of minerals based on chemical composition and structure. 1 hr

Silicates – Classification of silicates based on their structure – nesosilicates, sorosilicates, cyclosilicates, ionosilicates, phyllosilicates and tectosilicates.

3 hrs

Unit 5

Descriptive Mineralogy

Study of the following groups of minerals: Olivine, Garnet, Pyroxene, Amphiboles, Mica, Quartz and Feldspar groups. 8 hrs

GP-201. PRACTICALS

35 Marks

Mineralogy

Identification of following minerals based on their physical properties.

Oxides – Corundum Halides – Fluorite, halite, Carbonates – Calcite, magnesite and Dolomite, Phosphate – Apatite, Sulphate – Beryl, gypsum, Silicates – Nesosilicates – Olivine, Garnet, Andalusite, Kyanite, Sillimanite, Staurolite.

Sorosilicates – Epidote, Cyclosilicates – Barite, Tourmaline

Inosilicates:

a) Pyroxenes – Hypersthene, Augite

b) Amphibole – Actinolite, Tremolite and Hornblende.
Osilicates – Talc, Myscovite, buotite, lepidolite.

Tectosilicates:

a) Quartz & its varieties

b) Feldspars – Mircrocline, orthoclase and plagioclase

c) Zeolites – Natrolite, stilbite

Optical Mineralogy:

Petrological Microscope.

Determination of refraction and double refraction.

Determination of reflective refringence by Becke's method and Kolk's method

Determination of vibration direction and sign of elongation.

Determination of Interference colors.

Determination of Pleochroism – Dichroism – Pleochroism

Measurement of Extinction Angle.

REFERENCES

Plate tectonics and crustal evaluation – Candie, K.C. 1997, Elsevier Publications.

Manual of Mineralogy – Klein, C. and Hurburst, Jr. C.S, 1993, John Wiley

Text book of Mineralogy – Dana, 1966, Wiley Eastern Ltd.

Rock forming Minerals – Deer, W A Howie, Zussman, J., Long man

Optical Mineralogy – 4th Edition, Kerr, 1977, McGraw Hill, Book inc. NY

SEMESTER III

GT-301. Petrology

70 Marks

2 Credits/Week= 4hrs/Week, 52 hrs/Semester

Unit 1

Pertology: Introduction, definition of rock, relationship with other branches of Geology. 1 hr

Classification of rocks – Igneous, sedimentary & Metamorphic. 2 hrs

Igneous Rocks – Introduction, forms of igneous rocks – Extrusive and Intrusive. 4 hrs

Concordant: - Sill, Laccoliths and Phacolith and Discordant: - Dyke, Ring Dyke, cone sheets, volcanic neck, batholiths, stock and boss.

Structures: - Vesicular, Amygdaloidal, blocky, ropy, pillow, columnar. 2 hrs

Unit 2

Textures: Significance of textures, factors determining textures, types of textures equigranular: - Panidiomorphic, hypidiomorphic and allotriomorphic, Inequigranular:- Porphyritic, poikilitic, ophitic, basaltic, intergrowth, flow textures. 4 hrs

Classification: Basis of classification – Chemical, Mineralogical, Textural and Tabular classification of Tyrrel. 4 hrs

Important rock types: Granite, Granodiorite, Diorite, Gabbro, Peridotite, Dunite, Syenite, Dolerite, Porphyries, Pegmatite, Basalt, Andesite, Rhyolite and Kimberlites. 3 hrs

Unit 3

Petrogenesis: Introduction, Concept of system, Chemical potential and phase rule. Magma, generation of magma in mantle and crust, physical properties of magma temperature, pressure and viscosity, composition of magma and lava. 4 hrs

Crystallization of magma – Unicomponent and binary system. Bowen’s reaction principle.

Differentiation and Assimilation. 1 hr

Sedimentary Petrology: Sedimentary rocks: sedimentation – weathering, transportation, lithification and diagenesis. 2 hrs

Unit 4

Sedimentary Petrology: Structures of sedimentary rocks – Stratification, lamination, ripple marks, current bedding, graded bedding, sun cracks, rain prints. 4 hrs

Textures of sedimentary rocks: - size and shape of the grains and cementing material. 2 hrs

Classification based on mode of formation – residual, mechanical, chemical and organic. 2 hrs

Based on grain size: Rudaceous, Arenaceous, argillaceous. 2 hrs

Important rock types: Clastic sediments – conglomerate, Breccia, Sandstone, Graywacke, Shales.

Metamorphic rocks: Metamorphism, agents of metamorphism – temperature, pressure and chemically active fluids, process of Metamorphism. 4 hrs

Unit 5

Metamorphic rocks: Kinds of metamorphism – Cataclastic, thermal, dynamo – thermal metamorphism. 2 hrs

Concept of grades, Facies and zones. 2 hrs

Fabric of metamorphic rocks – Cataclastic, maculose, schistose, granulose, gneissose, Granoblastic, porphyroblastic, relict. 3 hrs

Thermal metamorphism, metamorphic aureole, effects of thermal metamorphism on argillaceous rocks and calcareous rocks. 5 hrs

Important rock types: Gneiss, Schist, Slate, Marble, Quartzite, Amphibolite and Charnokites. 3hrs

GP-301. PRACTICALS

35 Marks

Petrology

Microscopic Identification of Minerals

Study of optical properties of the following rocks forming minerals – quartz, orthoclase, plagioclase, microcline, biotite mica, hornblende, augite, hypersthene, Calcite, olivine, garnet, actinolite, sillimanite, kyanite, tourmaline.

Megascopic Identification of rocks

Igneous rocks - Granite, syenite, diorite, gabbro, peridotite, dunite. Porphyries, Pegmatites, Dolorites, rhyolites, trachite, andesite, and basalt.

Sedimentary rocks: Sand stone, shale, grit, conglomerate, breccia, limestone.

Metamorphic rocks: Quartzite, Marble. Schist, gneiss, slate, charnockites

Microscopic identification of rocks: Igneous, sedimentary and metamorphic rocks as listed above.

REFERENCES

Igneous & Metamorphic Petrology - Turner. W & Verhoogen. J, 1970, Mc Grill Hill

Igneous Petrology – T.F.W. Barth – 1962, John Wiley and Sons

Metamorphic Petrology – BashkarRao, 1985, Oxford and IBH

Sedimentary Petrology – Perijohn, 3rd edition, 1986

SEMESTER IV

GT-401. Paleontology and Stratigraphy

70 Marks

2 Credits/Week= 4hrs/Week, 52 hrs/Semester

Unit 1

Palaeontology

Introduction of paleontology: Relationship with other branches of geology. Classification of life: Plants and Animals – Vertebrates and invertebrates – Phylum, Class, Order, genera and species.

2 hr

Definition of Fossil, Fossilization – Factors (conditions) for the preservation of fossils, Mode of fossilization-unaltered soft parts (Mummification)-unaltered hard parts, altered hard parts – Carbonization, petrification, Traces of fossils-cast, mould, tracks and trails, coprolites.

3 hrs

Types of fossils: Index fossils, Zone fossils, Remine fossils, Derived fossils, Synthetic fossils, Persistent fossils, Extinct fossils and Living fossils – utility of fossils.

2 hrs

General classification, morphological characters, distribution and geological history of the following groups.

i. Graptozoa – Graptolites, Mono graptus and Diplograptus.

2 hrs

ii. Foraminifera

1 hr

iii. Coelentrata – Corals – Development of Septa in rugose corals.

2 hrs

iv. Brachiopoda – Description of a typical shell of a Brachiopod types of hinge line, Classification – Inarticulata and articulata.

3 hrs

v. Mollusca: a) Gastropoda – types of coiling b) Cephalopoda – Classification – Nautiloidia, Ammonoidia – development of suture lines in ammonidia.

3 hrs

vi. Pelecypoda – Dentition

2 hrs

vii. Arthropoda – Trilobites

2 hrs

viii. Echinodermata.

2 hrs

General methods of fossilization of plant fossils - Morphological characters, description and range in time of the following fossils – Lepidodendron, calamites, sigillaria, glossopteris, gangamopteris, ptilophyllum cardaites, Alithoptris.

Biological evolution through time.

5 hrs

Unit 2

Stratigraphy

Principles of Stratigraphy

Introduction, law of catastrophism, law of uniformitarianism, law of order of superposition. 1hr

Nature of geological record, imperfection geological record, geological clock, homotaxis contemporaneity.

2 hrs

Correlation – types of correlation, criteria for Stratigraphic correlation-lithological, structural, metamorphic, paleontological and geochronological.

2 hrs

Standard geological time scale.

1 hr

Classification of geological record in to six eras, a general account of individual era with regard to their nomenclature, distribution, lithology, classification, climate and fossil records.

3 hrs

Unit 3

Indian Stratigraphy:

Physiographic divisions of India and its relationship with geological distributions.	1 hr
Archaean and Proterozoic formations of Peninsular India – distribution and classification with reference to Karnataka, Sargur Group, Dharwar supergroup.	2 hrs
Proterozoic: distribution, classification and economic importance of Cuddapah System and Kaladgis, Vindhyan System and Bhima Series, Kurnool System.	2 hrs
Paleozoic Group: Paleozoic rocks of the Spiti.	1 hr
Gondwana Group: Classification, lithostratigraphy, biostratigraphy and economic importance.	2 hrs

Unit 4

Mesozoic: i) Triassic of Spiti ii) Jurassic of Kuchch iii) Cretaceous of Trichinapoly	2 hrs
Deccan traps: Distribution, lithology and biostratigraphy, classification, Intertrappeans, Intratrappeans, Infratrappeans, Bhag beds and Lameta beds, Age of Deccan traps, Economic importance of Deccan traps.	3 hrs
Siwaliks-lithology, distribution, classification, life and age.	2hrs

GP-401. PRACTICALS

35 Marks

Palaeontology and Stratigraphy

Drawing, labeling, description, identification, classification with geological age of the following invertebrate and plant fossil Graptolite, monograptus, diplograptus.

Corals Favosites, Halysites, Lithostrotion, Calceola, Montlivotia and Zaphrantis.

Brachiopoda – Terebratulala, Productus, Lingulla, Orthis, Atrypa, Spirifer, Rhynchonella.

Pelecypoda Lima, Trigonina, Pecten, Hippuritis, Graphea, Cardita

Cephalopoda – Ammonite, Orthoceras, Nautilus, Goniatites, Ceratites, Accenthoceras, Hamites, Baculite, Scaphites, Belemnites

Gastropoda Natica, Turritella, Voluta, Conus, Cerithium and Physa

Echinodermata – Cidaris, Micraster, Hemiaster, Encrinurus and Pentrimites

Trilobites – Calymene, Paradoxide, Trinucleus, Olinellus and Phacops

Plant fossils Lepidodendron, Calamites, Sigillaria, Glassopteris, Gangamgoteis, Ptilophyllum, Cardates, Alethopteris.

Preparation & study of stratigraphic maps.

REFERENCES

Paleontology invertebrate – H. Woods, 8th edition CBS Publication

Invertebrate Palaeontology and Evolution – 4th edition, Clarkson ENK, 1998 Black Well Publication

Principles of Stratigraphy – Dunbar C.O. 1957, John Wiley and Sons. Inc.,

Geology of India – D.N. Wadia, 1976, TATA McGraw Hill Publications

Geology of India and Burma – M.S.Krishnan, 1982, CBS Publications

Handbook of Geology of Mysore State – B.RamaRao, 1962 Bangalore Printing and Publications

Invertebrate fossils – Moore R C. Lalkar, C G., Fischer, A.G. 1952, Mc. Graw Hill Book Company

Principle of Stratigraphy, Raup and Stanley, S.SM. 1971, Freeman and Company, Toppen and Co. Ltd.

SEMESTER V

GT-501. Mineral Resources and Structural Geology 2 Credits/Week= 4hrs/Week, 42 hrs/Semester

70 Marks

Unit 1

Mineral Resources:

1. Ore genesis: Introduction Economic geology in relation to industry, commerce and national economy. 1 hr

Principles of mineral economies essential, strategic and critical minerals, ore minerals, gangue minerals, tenor of ore. Principles and process of ore formation: 2 hrs

Magmatic process

- 1) Sublimation 1 hr
- 2) Contact metasomatism 1 hr
- 3) Hydrothermal process a) Cavity filling deposits and b) Replacement deposits 2 hrs
- 4) Weathering: a) Residual and b) mechanical concentrations 1 hr
- 5) Sedimentation 2 hrs
- 6) Evaporation 1 hr
- 7) Oxidation and supergene sulphide enrichment 1 hr
- 8) Metamorphism 1 hr
- 9) Pegmatitic deposits 1 hr
- 10) Classifications of ore deposits – Niggli 1 hr
- 11) Metallogenic epochs and provinces 1 hr

Unit 2

Economic mineral deposits: Study of the following mineral deposits of India with special reference to Karnataka, in regard to their mineralogy, origin, occurrence and distribution.

I. Metallic deposits: - gold, copper, iron, manganese, chromium, aluminum, lead and zinc. 5 hrs

II. Non-metallic deposits: mica, abrasives, refractories ceramics, building and ornamental stones, fertilizers and cement. 5 hrs

III. Energy resources: i) fossil fuels, coal & petroleum ii) atomic minerals. 4 hrs

Unit 3

Structural Geology: Introduction-relationship with other branches of geology, Forces – Tensional, shearing and compressional, stress and strain. 1 hr

Concept of rock deformation, Classification of structures, conformity, unconformity. Types of unconformity – disconformity, non-conformity, angular unconformity, recognition and significance of unconformities. 2 hrs

Attitudes of beds definition of dip and strike, description of compass clinometer and determination of dip and strike of beds. 2 hrs

Out crop: Definition, width of outcrop, thickness of bed, factors controlling the width of bed. 2 hrs

Denudational structures: i) Outlier and ii) Inlier 2 hrs

Secondary structures: Folds definition, parts of fold, types of fold, symmetrical, asymmetrical, anticline, syncline, anticlinorium, synclinorium, over turned fold recumbent fold, fan fold, isoclinal fold, chevron fold, monocline and drag fold. 3 hrs

Joints: definition, terminology, dip and strike, joint plane, joint set, joint system, block joint, master joint. 2 hrs

Classification: 1) Geometrical – dip, strike, oblique and bedding joints 2) Genetic classification – columnar, mural, sheet joints; significance of joints. 2 hrs

Faults: definitions, elements of faults, genetic classification of faults-thrust fault, Overthrust, under thrust. Gravity faults-step fault, ridge fault, trough fault, Recognition of faults in field. Foliation, Cleavage and Lineation – Definitions. 1 hr

GP-501. PRACTICALS

35 Marks

Mineral Resources and Structural Geology

Economic Geology: study and identification of the following minerals: Native copper, graphite, sulphur, chalcopyrite, azurite, malachite, realgar, orpiment, cinnabar, stibnite, galena, sphalerite, pyrite, hematite, magnetite, limonite, pyrolusite, psilomelane, bauxite and chromites. Coal and its varieties, selected radioactive minerals and their host rocks.

Structural Geology:

Excercises on structural geology problems:

Thickness problems: 3 types

Dip and strike problems: 3 types

Stereographic projections of structural data

Drawing of sections and interpretation of horizontal series, inclined series, folded series, faulted series, unconformities and complex structural.

Tracing of outcrops

REFERENCES

Ore deposits – Park, Jr. C.F and M.C. Diarmid, 1980

Indian Mineral Resources – S. Krishna Swamy, 1985

Economic Mineral Deposits – A.M. Bateman, 1950, 2nd edition Asia Publications

Structural Geology: Billings M.P, 1972, Printice Hall, New Jersay

Modern Structural Geology, Vol. 1 & 2, Ramsay, J.G. Herber, Jr. Academic Press NY

Structure and Tectonics, - Badgley, P.C, 1965, Harper and Row NY

Ore Deposits of India, Gokhale&Rao, CBS Publication

SEMESTER V

GT-502. Geoexploration and Statistical Geology

70 Marks

2 Credits/Week= 4hrs/Week, 42 hrs/Semester

Unit 1

Geoexploration: Introduction, principles and methods of geoexploration – geological, geophysical and Geochemical. 3 hrs

Geological exploration:Introduction, guides to ores – physiographic, mineralogical, stratigraphic, lithological and structural. 4 hrs

Unit 2

Geophysical exploration: Introduction, definition, physical properties of rocks and minerals, physical fields, geophysical anomalies and applications.

Electrical methods – Electrical methods and principles, resistivity, conductivity, resistivity of rocks and minerals. Prospecting for groundwater – electrical resistivity method, Wenner and Schlumberger methods VES curves, types of curves and curve matching techniques. 4 hrs

Magnetic methods – principles, magnetometers – torsion – vertical force and horizontal force, air borne fluxgate magnetometer. 4 hrs

Unit 3

Geophysical exploration: Gravity methods – gravitational force of the earth, Worden gravimeter, gravity corrections – latitude, free air, Bouguer, terrain, tidal. 4 hrs

Seismic methods – types of seismic waves, principles of refraction and reflection techniques. 4 hrs

Radiometer methods – radioactivity of rocks and minerals, instruments – G.M. counter and scintillation counter. 3 hrs

Unit 4

Geochemical exploration – Basic principles, geochemical cycle and geochemical, litho geochemical mineral exploration, geo-botanical and biogeochemical exploration. 8 hrs

Unit 5

Statistical Geology: Introduction to statistical geology. Determination of mean median, mode, standard deviation for grouped and ungrouped data Construction of frequency distribution tables and diagrams. Application of statistics in geological problems. 8 hrs

GP-502. PRACTICALS

35 Marks

Geoexploration and Statistical geology

Geophysical problems – Seismic, magnetic, gravity anomalies, electrical conductivity (resistivity).

Groundwater exploration by resistivity method.

Interpretation of two layers and three layers resistivity curves.

Determination of mean, median, mode, standard deviation for grouped and ungrouped data.

Construction of frequency distribution tables, histograms

Application statistics in geological problems.

REFERENCES

An outline method of geophysical prospecting – M.B.RamachandraRao, 1975, Prasaranga, University of Mysore.

Introduction to geophysical prospecting – Dobrin, 1981, McGraw Hill Incp.

Statistical models in geology – Krumbin and Graybill, 1965.

SEMESTER VI

GT-601. Remote Sensing and Engineering Geology 2 Credits/Week= 4hrs/Week, 42 hrs/Semester

70 Marks

Unit 1

Remote Sensing: Aerial Remote Sensing: - Introduction to aerial remote sensing, types of aerial photography, Vertical, oblique, geometry of aerial photographs.	2 hrs
Scale of aerial photography.	1 hr
Instruments of aerial photography – Stereoscopes – Rockets, Mirror and Prism.	2 hrs
Interpretation keys – tone, texture, shape, size and patterns.	2 hrs
Application of aerial photography in geological studies.	1 hr

Unit 2

Satellite remote sensing:- Introduction, basic principle of satellite remote sensing-EMR, Platforms, Sensors, scanners, energy interaction with atmosphere, earth surface, minerals, water, soils and vegetation.	2 hrs
Interpretation of satellite images – Visual and digital process.	1 hr
Applications of remote sensing techniques in mapping soil cover, forest cover, surface resources, valley fills, floor, Pediplanes, pediments, denudational hills, structural dykes, lineaments, inselbergs.	3 hrs

Unit 3

Introduction, field equipments, a brief note on taking geological notes in the field collection samples, numbering and making specimens.	3 hrs
The compass clinometer, Brunton compass, use of clinometer in the field. Determination of dip and strike.	3 hrs
Study of toposheets and geological maps.	2 hrs
Selection and preparation of base maps.	2 hrs

Unit 4

Field Geology: Plotting the geological features in the base map and sampling methods.	2 hrs
Preparation of geological reports.	2 hrs
Engineering Geology:-Introduction, role of geology in the field of engineering.	1 hrs
Rock as material of construction, properties of rock required for their selection of building stones and road metals. Important building stones and road metals.	3 hrs

Unit 5

Dams and reservoirs: Types of dams, geotechnical considerations in selection of dam sites and reservoir sites.	3 hrs
Tunneling: Types of tunnels, Geological considerations in tunneling.	2 hrs
Environmental considerations in the location and construction of large dams, reservoirs Tunnels.	3 hrs
Bridges: Geological consideration, stability of bridges, foundation of bridges.	2 hrs

GP-601. PRACTICALS**35 Marks****Remote Sensing and Field Geology**

Stereoscopic vision test

Visual Interpretation of Aerial photographs by using photographic elements – Tone, texture, size, shape and shadow

Study of Aerial photographs – photo index, scale, air and eye base determination, Relief displacement.

Study and Interpretation of satellite imageries for geology, structures, drainage and geomorphology.

Study of Toposheets – Contour, drainage, road and settlements

Preparation of base maps

Morphometric analysis from topographic maps

Use of Clinometers and Brunton compass.

Field Mapping – visit to field for collection of ground data – Location ,measurements of dip & strike of different litho units & preparation of the thematic maps.

Field trip: Field trip for minimum of three days, and submission of field report by students is compulsory.

REFERENCES

Principles and applications of photo geology – Shiv N Pandy, 1987, Wiley Eastern Limited

Remote sensing of the environment: An earth resource and prospective – John R. Renson,

Remote sensing in Geology – Ravi P Gupta, II edition 2005, Springer, New Delhi

Remote sensing and Image Interpretation – T.M Lilies and R.W. Kiefer, 2000 John Wiley and sons, New York.

SEMESTER VI**GT-602. Hydrogeology and Mining Geology****70 Marks****2 Credits/Week= 4hrs/Week, 42 hrs/Semester****Unit 1**

Hydrogeology: Introduction – Hydrological cycle, precipitation, evapotranspiration, run off, infiltration soil moisture storage, aquifer, aquiclude, aquitard, aquifuge. 3 hrs

Types of aquifers and their characteristics confined, unconfined, perched, coastal aquifers, leaky aquifers. 3 hrs

Water budget and groundwater resource estimation. 3 hrs

Unit 2

Occurrence, distribution and movement of groundwater. 2 hrs

Vertical distribution of groundwater – zone of aeration, water table, zone of saturation. 2 hrs

Water table fluctuations – springs and artesian wells. 2 hrs

Hydrological properties of rocks: - porosity, permeability, specific yield, specific retention, transmissibility, storage co-efficient. 4 hrs

Unit 3

Artificial recharge to groundwater – Rain water harvesting, roof top rain water harvesting. 2 hrs

Concept of watershed development and management.	2 hrs
Physical and Chemical quality of waters: Chemical quality of groundwater – introduction, chemical quality, spatial variation of differentions - Ca, Mg, Na, K, S, chlorides, Nitrates, Carbonates, Bi-Carbonates, Fluorides, Silicon oxides total dissolved solids (TDS), Total Hardness (TH), pH, EC, Turbidity, BOD, COD.	3 hrs

Unit 4

Mining Geology: Introduction to mining.	2 hrs
Methods of mining, surface and sub-surface mining.	3 hrs
Surface mining – alluvial and open cast/pit mining and related equipments.	3 hrs
Sub surface mining – stopping and cavity methods, mine safety, mine ventilation.	2 hrs

Unit 5

Mining of metalliferous deposits.	2 hrs
Ore reserve estimation – grade, tonnage and their relationship.	3 hrs
Impact of mining on environment and human health.	2 hrs

GP-602. PRACTICALS

35 Marks

Hydrogeology and Mining Geology

Hydrogeological problems – estimation of annual rainfall by Theisson and polygon methods
 Water budget calculations
 Determination of potential evapotranspiration by Thornth Waite method
 Determination of specific capacity and specific yield of the open wells
 Chemical analysis of water
 Graphical representation of water quality
 Ore reserve estimation problems

REFERENCES

Groundwater Hydrology – Todd. D.K, John Wiley Publications.
 Hydrology – S.N. Davies & R.J.M. Dewiest, 1966, John Wiley Publications
 Groundwater hydrology – Raghunath. H.M, 1982, Wiley Estern
 Groundwater assessment, development and management – Karthik. K.R, 1987, Tata McGraw Hill.
