

I Semester

AG HCT - 1.1: BASIC GEOLOGY

UNIT I:

Physical Geology: - Introduction: Definition of Geology, Relationship with other branches of Science, Importance, Scope and Branches of Geology, Origin and Age of the Earth, Volcanoes:- Definition and classification of volcanoes, Causes of volcanoes. Earth Quakes: - Definition, causes and effects of Earthquakes. **(13 Hours)**

UNIT II:

MINERALOGY- Definition and Branches of Mineralogy, Physical and Chemical properties of Minerals, Classification of minerals - Based on chemical composition and silicate structures. **(13 Hours)**

UNIT III:

PETROLOGY- Introduction: Definition and relationship of petrology with other branches of Geology, Classification of Rocks based on Origin:-Igneous, Sedimentary and Metamorphic rocks. **(13 Hours)**

UNIT IV:

STRUCTURAL GEOLOGY –Introduction: Definition and importance of structural Geology, Primary and Secondary. Ripple marks, Sun cracks, Rain prints, Stratification, Current bedding and Graded bedding, Folds, Faults, Joints, Unconformities, Recognition and significance of unconformities. **(13 Hours)**

Books Recommended:

1. Physical Geology: John Wiley & Sons.
2. Physical Geology: Leet, L. Don., & Judson.
3. Geomorphology: Cotton, C.A.,
4. Elements of Mineralogy: Read, H.h., & Ford, W.E.
5. Text book of Mineralogy: Dana, E.S., & Ford, W.E.
6. The Principles of Petrology: Tyrrell, G.W.
7. Manual of Sedimentary Petrography: Krumbein, W.C., & Pettijohn, F.J.
8. Metamorphism: Harker, A.
9. Structural Geology: Billings, M.P.
10. Structural Geology: Nevin, C.M.

AG HCT - 1.2: GEOMORPHOLOGY

UNIT I:

Nature ,definition, scope and recent trends in Geomorphology- Geomorphic classification of Land forms – Evolution of various Land Forms- Drainage Pattern- Geomorphic Cycle and their interpretation. Rocks- Origin – Classification – Distribution **(13 Hours)**

UNIT II:

Earth Movements – Epeirogenic and Orogenic Earth movements- Theories of Continental Drift – Isostasy and Plate tectonics – Earth Quakes - Volcanoes and their distribution. **(13 Hours)**

UNIT III:

Geomorphic agents and processes – Weathering – Erosion –Mass wasting –Cycles of erosion Concept – Land forms of Sea – Marine deposits – Coral reefs- Lacustrine deposits- Earth's Heat Budget and Global Climate Change . **(13 Hours)**

UNIT IV:

Geomorphic processes – Erosional and Depositional Land forms made by Rivers ,Glaciers ,Wind , Underground Water and Seas and Oceans. **(13 Hours)**

Books Recommended:

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|---------------------------------|-----------------|
| 1. Text Book of Geomorphology | - A.L.Bloom |
| 2. Principles of Geomorphology | -W.S. Thornbury |
| 3. A text Book of Geomorphology | - P.Dayal |
| 4. Indian Geomorphology | - H.S. Sharma |

AG HCT - 1.3: STRUCTURAL GEOLOGY

UNIT I:

Introduction.Major divisions/layers of the earth.Continental and Oceanic crusts.Plate tectonics. Seafloor spreading, Mid oceanic ridges, **(13 Hours)**

UNIT II:

Island arcs, Oceanic trenches, Continental margins, Hot spots, Orogenic mountain belts, Orogenic belts of India, Global tectonics in relation to plate tectonics. **(13 Hours)**

UNIT III:

Concept of stress and strain. Strain analysis using deformed objects. Geometric Classification of folds. Mechanics of folding. Foliations and lineation. **(13 Hours)**

UNIT IV:

Shear Zones – Geometry and Mechanics, Large scale thrusts and their significance in tectonics Classification of unconformities. Faults – Mechanics, classification and their recognition in the field Joints- Mechanics and classification **(13 Hours)**

Books Recommended:

1. Principles of Physical Geology: A Holmes, Nelson, London 1965
2. Basic concepts of physical Geology: E.W.Spencer, Oxford & I.B. 1971.
3. Physical Geology: Strahler Wiley & Sons. 1974.
4. Dynamic Earth: H. Leep, McGraw Hill 1973
5. Changing Earth: B. Meers Reinhold N.Y. 1973.
6. The Dynamic Earth System: A.M. Patvardhan, Prentice Hall of India Pvt. Ltd., 1999.
7. Plate Tectonics & Crustal Evolution: K.C. Condie, Pergamon Press, 1986.
8. Palaeomagnetism & Plate tectonics: M.M. McElhinny, Cambridge Univ. Press.
9. Understanding Earth by Traak Press, Raymond Seiver Treeman & Co.,
10. Tectonics by E.M. Moores, R.J. Twiss, Freeman & Co.,

AG SCT - 1.4; SURVEYING:

UNIT I: Lecture:

Chain Survey, Compass Survey. **(13 Hours)**

UNIT II: Lecture:

Plane Table Survey, Dumpy level survey, GPS survey. All these data collected by various surveys and interpretation. **(13 Hours)**

UNIT III: Tutorial:

Chain Survey, Compass Survey, Plane Table Survey, Dumpy level survey, GPS survey. **(13 Hours)**

UNIT IV: Tutorial:

All these data collected by various surveys and interpretation. **(13 Hours)**

Books Recommended:

1. Surveying and leveling- Late T.P. Kanetkar and S.V. Kulkarni.

AG SCT - 1.5: GEMSTONES AND INDUSTRIAL MINERALS

UNIT I

Introduction to precious and semi-precious stones. Gem Industry in India, Qualities of Gemstones. Classification of Gemstones. Study of the following gemstones: Diamond, Topaz, Ruby, Sapphire, Emerald, Aquamarine, Tourmaline, Alexandrite, Lazurite and Turquoise. **(13 Hours)**

UNIT II

Quartz varieties of gemstones, Pearl, Coral and Amber, Zodiacal and astrological gemstones, Distribution of gemstones in India. **(13 Hours)**

UNIT III

Characters of different materials used in following industries with respects to their specification and preparations. Ceramic, Abrasives, Chemical and Refractory industries. **(13 Hours)**

UNIT IV

Fertilizers, Paints, Glass, and Cement industries, Building materials. **(13 Hours)**

Books Recommended:

01. The geology of ore deposits – John .M.Guilbert and Chartes.F.Park. Jr.W.H.Freeman and Co., New York 1986
02. Interpretation of ore textures – BastinE.S.

03. Economic Mineral Deposits – Bateman. A.H.
04. Ore Microscopy – Cameron E.N.
05. Ore Deposits – Park Jr. C.F.
06. Geology of Mineral Deposits – Smirnor U.J.
07. The Ore Minerals and their intergrowths – Raibor
08. India's Mineral resources – Krishna Swamy S.
09. Metallic and Industrial Minerals Lamey Carl.A.
10. Introduction to India's Economic Minerals – Sharma. N.L. and Ram K.S.
11. A treatise on Industrial Minerals of India -Sinha R.L.
12. Non Fuel Mineral Deposits of India – Mukarjee 1999 – Allied publications.
13. Minerals in world affairs - Lovering
14. Minerals in worlds and Industry – Vorkii
15. Mineral Economics – Sinha R.K. and Sharma N.L. Oxford I.B.H. Publication co.,
16. Concerning Mineral Sesouran – Allen
17. An introduction to Mineral Economics by K.K.Chatterjee New Age International Ltd., 2004.
18. Granite Industry: Emerging Trends and Developments by N.C. Ghose, A.N. Trivedy and S.N.Virhave 2000.

AG HCP- 1.6: SURVEYING & GEMMOLOGY LAB

SURVEYING:

Various methods of Surveying used in engineering geology

2. Chain Surveys
3. Plane table surveys
4. Use of Surveying equipments
5. Determination of Engineering properties of Geological materials
6. Interpretation of borehole data
7. Preparation of bore logs / Lithologs.

GEMMOLOGY :

Visual observation of gem stones

2. Use of refractometers
3. Identification of Anisotropic and Isotropic gem stones
4. Determination of specific gravity
5. Observation of inclusions to identify synthetic from natural gem stones.

AG HCP-1.7: STRUCTURAL GEOLOGY & GEOMORPHOLOGY LAB

Study of Geological maps, tracing of outcrops, construction of geological cross sections.
Dip and strike problems.. Interpretation of underground structure from borehole data.

Study of Geomorphological models.

II SEMESTER

AG HCT- 2.1: IGNEOUS AND METAMORPHIC PETROLOGY

UNIT I:

Genesis, properties, emplacement, crystallization and differentiation of magmas. Phase equilibrium studies of simple systems, Role of volatiles in magma evolution (effect of volatiles on melt equilibria). Magma-mixing, mingling and immiscibility, Gravitational, Filter - Pressing, gas-streaming and fractional crystallisation.. Assimilation Processes and mechanism.

(13 Hours)

UNIT II:

Igneous Rocks: Igneous rocks – classification, Petrology and geotectonic evolution of granites, gabbros, kimberlites, anorthosites, basalts, andesites and alkaline (carbonatites) rocks. Petrogenetic aspects of important rock suites of India, such as the Deccan Traps and layered intrusive complexes.

(13 Hours)

UNIT III:

Metamorphic Rocks: Characteristics of different grades and facies of metamorphism. Metamorphic structures and textures; isograds, Mineral reactions with condensed phases, solid solutions, mixed volatile equilibria and thermobarometry. Metamorphism of pelites, mafic-ultramafic rocks and siliceous dolomites.

(13 Hours)

UNIT VI:

Material transport during metamorphism., role of fluids in metamorphism, P-T-t path in regional metamorphic terrains, plate tectonics and metamorphism. Metasomatism and granitization, migmatites. Paired metamorphic belts. Regional metamorphic terrains of southern Peninsular India, their general characters and tectonic setting.

(13 Hours)

Books Recommended:

1. Igneous and Metamorphic Petrology, Turner & Verhoogen, Mc Graw Hill.
2. Principles of Petrology: G.W. Tyrell, Asia Publ. House.
3. Metamorphic Petrology: H.G.F. Winkler
4. Igneous & Metamorphic rocks: Antony.
5. Interpretation of Igneous rocks : K.G. Cox & Others.
6. Metamorphic Petrology: Bhaskar Rao

7. Metamorphic Petrology: Miyashiro
8. Igneous and Metamorphic petrology: MYRON.G.BEST, Brigham young University.

AG HCT-2.2: MINERALOGY

UNIT I:

General introduction to subject mineralogy, Physical and optical proprieties of mineral. General study of the following groups of minerals: Native elements- Gold, Silver, Copper and platinum

Sulphides- Stibnite group, Oxides–Carbonates (Calcite and aragonite), Silicates-Mica , Quartz, feldspar & Feldspathoids, pyroxenes, amphibolites, Garnet and olivine **(13 Hours)**

UNIT II:

Crystal structure in general, Silicate structure (Types of silicate structures), Isomorphism and polymorphism **(13 Hours)**

UNIT III:

Conception of Optics (nature of light, simple harmonic motion, wave motion and wave surface), A general study of Isotropic and anisotropic substances. Reflection, refraction, index of refraction, critical angle birefringence, pleochroism and extinction angle **(13 Hours)**

UNIT IV:

Elementary concept of crystallography

Classification of crystals into six crystal systems, A brief study of 32 symmetry classes of crystals. Hermann Mauguan and Shoenflies symbols. Crystal formation and irregularities (both internal & external) in crystals. Twinning in crystals **(13 Hours)**

Books Recommended:

1. Introduction to Rock forming Minerals Vol. 1 to 4 : Deer, Howie & Zussman, Longmans, 1966.
2. Dan's manual of Mineralogy :Hurlbut, C.S., John Wiley 1959.
3. Mineralogy of Students: Belady Mill Oliver & Boyd, 1972.
4. Optical Crystallography :Earnst.E.Wahlstrom, John Wiley & Sons.
5. Elemenets of Optical Mineralogy: Winchel&Winchel, Wiley Eastern 1968.
6. Optical Mineralogy: Roger,S.R.F. &Kerr.P.F., Mc.Graw Hill 1960.
7. Elementary Crystallography :Burger.M.
8. Essentials of Crystallography: Flint Peace Publi.
9. Elements of X-ray Crystallography :Azaroff.

10. A text book of Mineralogy :E.S.Dana.
11. Elements of crystallography by Phillips.

AG HCT 2.3: STRATIGRAPHY AND PALAEOLOGY

UNIT I

Definitions of craton, shield, basement and supracrustals. Archeans of Aravallis, Extra Peninsular, Central India and Karnataka craton. **(13 Hours)**

UNIT II

Proterozoic successions – Cuddapah, Kaladgi and Vindhyan basins. Gondwana Formations of India – their tectonic relations, origin and distribution. Cretaceous Formations of Tiruchirappally. Deccan Traps – Classification, distribution and age. Siwalik Formations.

(13 Hours)

UNIT III

Principles and procedures in paleontology, Nature and methods of preservation of fossils, Importance and use of fossils, Origin and evolution of life, Life zones in the ocean..

(13 Hours)

UNIT IV

Taxonomic classification, Morphological features, Evolutionary trends and geological distribution of Principle groups of invertebrates – Corals, Brachiopods, Pelcypods, Cephalopods, Trilobites and echinoids. Plant life through ages, Gondwana flora. Micropalaeontological studies – study of shell morphology, Classification and the geological distribution of foraminifera, Pollen and Spores. **(13 Hours)**

Books Recommended:

1. Geology of India D.N.Wadia Tata Mac Graw Hill Co 1975.
2. Pre-Cambrian Geology of India: S.M.Naqvi&JJW Rogers, Oxford University, Press London.
3. Pre-Cambrian of South India: S.M.Naqvi&JJWRoers, Memoir No.7, Geol.Soc.of India 1988
4. Geology of Karnataka: B.P.Radhakrishna&R.Vaidyanadhan 1994.
5. Purana Basis of Peninsular India – middle & late Proterozoic: B.P.Radhakrishna(Ed) Memoir no. 6, Geol. Soc. Of Inida.
6. Purana basins of Peninsular India Memoir 6, Geol.Soc.of India.

7. Precambrian of the eastern Indian Shield Memoir 8, Geol. Soc. of India.
8. Precambrian of the eastern Aravalli Mountain Memoir 7, Geol. Soc. of India.
9. Deccan volcanism memoir 3, Geol. Soc. of India.
10. Cretaceous Stratigraph and Palaeoenvironments. Memoir 37, Geol. Soc. of India.
11. Elements of Palaeontology Claude Babin John Witney & Sons 1980.
12. Hand Book of Palaeontological Technique: B.Kummel Freeman Co., 1965.
13. Introduction to Micro Fossils: D.Jones Harper, 1956.
14. Out lines of Palaeontology: H.H.Swinnerton Edward Homold 1965.
15. Palaeontology: Invertebrates Henry woods Cambridge University Press 1982.
16. Invertebrate Palaeontology and Evolution. IV Ed. Blackwell: Clarkson, E.N.K.1998.
17. Bringing Fossils to Life – An introduction to Palaeobiology: MC Graw Hill: Prothero.D.R. 1998.
18. Plant life through the ages: A.C. Seward Hafner Publication 1959.
19. Principles of Micropalaeontology: M.F.Glaesser Hafner Publication 1972.
20. Microfossils: M.D.Brassier George Allan 1981.
21. Applications of Micropalaeontology : P.K.Kathal

AG SCT 2.4: MARINE GEOLOGY

Unit- I

Morphology of the oceans; oceanic crust- structure, petrology and source of oceanic crust; crustal changes after formation. Sea level history. **(13 Hours)**

Unit- II

Nearshore geological processes on the continental shelf – Marine zones, Continental margin types: Divergent margins, Convergent margins, Transform active margins; collision processes on convergent margins. **(13 Hours)**

Unit- III

Deep sea sediments; Classification; Terrigenous deep sea sediments; Biogenic sediments; Authigenic sediments. The geologic record of bottom currents- Method of study; erosion, transportation and deposition. **(13 Hours)**

Unit- IV

Palaeo-oceanography and sediment history of the ocean basins- Pacific, Atlantic and Indian Oceans, Oceanic history of Calcium Carbonate Compensation Depth (CCD), Global palaeo-oceanography evolution- critical events in ocean history. **(13 Hours)**

Books Recommended:

1. James P. Kennett 1982, Marine Geology, Prentice Hall
2. Shepard, F.P. 1948, Sub Marine Geology, Harper and Row
3. Seibold, E and Berger, W.H. 1982 The Sea Floor, Springs- Verlag
4. William W.A. Nikovechine and R.W. Strenburg, The World Ocean
5. Pipkin, B.N., Gorsline, D.S., Cassey, R.E. Hammind, D.E., 1972 Laboratory Exercises inoceanography, Freeman

AG SCT-2.5: MINERAL DRESSING

UNIT I

Principles and scope of mineral processing. Properties of ores and minerals applied to mineral beneficiation. **(13 Hours)**

UNIT II

Size reduction – Crushing, Rittinger law, Kick’s law, Bond’s theory Crushers and grinding mills. Sizing and screening. **(13 Hours)**

UNIT III

Principles of concentration processes.Gravity concentration.Jigging, Bring’s test.Operation of Wilfley Table, comparison of jigging and tabling. Heavy media separation Magnetic separators primary magnet type and secondary magnet type; **(13 Hours)**

UNIT IV

Flotation principles, types and functions of reagents used. Flow sheets of metallic ores; gold, copper, lead, zinc. Flow sheets of non-metallics; barite and Coal. **(13 Hours)**

Books Recommended:

1. Principles of Mineral Dressing A.M.Gaudin Mc. Graw Hill
2. Elements of Ore Dressing. A.F. Taggart, John Wiley
3. Principles of Mineral Beneficiation Wells & Wells.
4. Mineral Processing. Pray. Elsevier.

5. Ore Processing S.K.Jain Prayor Elsuvier.

AG OET- 2.1: NATURAL DISASTER MANAGEMENT

UNIT I:

Introduction to Geological hazards, Exogenic geological process. Land slide, Floods, Hurricanes, Thunders, Desertification , Tsunami, cyclones & Lightening. **(13 Hours)**

UNIT II:

Hypogene processes- Earth movements, Earthquake, Volcanoes. Causes for Epigene and Hypogene processes, effects monitoring system, methods of minimizing effects and controlling menthods **(13 Hours)**

UNIT III:

.Disaster Management definition, vulnerability, risk, rehabilitation and Recovery, pre and post disaster activities, Disaster preparedness, Planning action plans and procedures. **(13 Hours)**

UNIT IV:

Damage need assessment, assessment teams, survey methods, tools and techniques. Emergency supplies and services. National Polices of disaster management, disaster management bill 2005.

(13 Hours)

Books Recommended:

- 1.Emergency and disaster planning manual, Laura G Kaplan McGraw Hill Text 1996 ISBN 0070340838
- 2.Disaster planning and Recovery: A Guide for facility Alan M Levitt
- 3.Disaster Management – Christ J Skinner
- 4.Geological Hazard: Their assessment, avoidance and mitigation F G Bell, E & F NSpon, Rutledge, London 1999
- 5.Disaster Mangement: A Disaster managers hand book W Nick Carter, Asian development Bank, Philippines 1991

AG OET- 2.2: RAINWATER HARVESTING

UNIT I:

Water harvesting, history, objectives and concepts, water harvesting techniques, uses of water harvesting. Rooftop water harvesting in urban and rural area, Assessment of available rooftop water resources, design, estimation, implementation and socio economic analysis. **(13 Hours)**

UNIT II:

Community based projects. Recycling of harvested water for drinking, industry, ensuring quality without contamination for drinking water, Utilization of harvested water for recharging of subsurface water. **(13 Hours)**

UNIT III:

Government policy and schemes. Overland flows, design of bunds terraces, runoff, water harvesting and recycling in agriculture, horticulture and forest areas. Construction of nala bund, check bund, farm pond, community tanks. **(13 Hours)**

UNIT IV:

Environment and socio-techno-economic feasibility of water harvesting and recycling. Water harvesting techniques and recycling in agriculture, horticulture and forest areas. Contour bunds for tress, semi-circular bunds, permeable rock dams, background technical detail and construction, maintenance husbandry. **(13 Hours)**

Books Recommended:

1. Atawale, R.N., Water harvesting and sustainable supply in India, Rawat publication, New Delhi, 2004.
2. SheelaSanghvi and prem S Pahwa"Water harvesting purification and distribution, Management".Dominent publishers and distributors, New delhi-2001
3. Khan M.A, Watershed management, Agrobios (India) jhodhpur-2003
4. Rajesh rajora, integrated watershed management, Rawat publications, New Delhi-2004

AG HCP -2.6: PETROGY LAB

Classification, identification and petrographic study of the following groups / families based on megascopic, microscopic and structural studies of Igneous rocks ; Granites, granodiorites, gabbros-ultramafics, lamprophyres, andesites, dacites, rhyolites and volcanic glasses, Sedimentary rocks – megascopic and microscopic identification of common sedimentary rocks; sandstones, greywackes, siltstones, shales, limestone, dolomite, conglomerate. Heavy mineral analysis. Metamorphic rocks - megascopic and microscopic identification of schists, amphibolites, gneisses, granulites, eclogites and hornfelses.

AG HCP -2.7: MINERALOGY LAB

Study of minerals belonging to major groups and their identification with aid of megascopic characters and optical properties. Identification of crystals and crystal systems. Calculation of axial ratios of minerals of tetragonal, orthorhombic and monoclinic systems by stereographic methods.

III Semester

AG HCT-3.1: ORE GENESIS & ORE MICROSCOPY

UNIT I

Introduction. Geological processes of formation of economic mineral deposits, Magmatic, Hydrothermal, Residual and Mechanical concentration, Oxidation and supergene enrichment.

(13 Hours)

UNIT II

Sedimentation and Evapoavation, Metamorphism and Metasomatism..Geothermometry, Metallogenic Provinces and Epochs, Global metallogeny as related to plate tectonics. **(13 Hours)**

UNIT III

Introduction to Ore Microscopy, Preparation of samples for Ore Microscopic studies; Qualitative properties- Colour, Reflectance, Bireflectance and Reflection Pleochroism. Isotropism and Anisotropism, Internal reflection, Polishing hardness, Scratch hardness, Crystal form and habit, Cleavage and Parting and twinning. **(13 Hours)**

UNIT IV:

Quantitative properties- Micro indentation hardness and Reflectivity. Microchemical techniques, Modal analysis. Textures of Ore minerals, assemblages and paragenesis. Application of Ore Microscopic studies in mineral technology. **(13 Hours)**

Books Recommended:

1. The geology of ore deposits – John .M.Guilbert and Charles.F.Park. Jr.W.H.Freeman and Co., New York 1986
2. Interpretation of ore textures – Bastin E.S.
3. Economic Mineral Deposits – Bateman. A.H.
4. Ore Microscopy – Cameron E.N.
5. Ore Deposits – Park Jr.C.F.
6. Geology of Mineral Deposits – Smirnor U.J.
7. The Ore Minerals and their intergrowths – Raibor
8. Ore Microscopy and Ore Petrology- J.R.Craig & Vaughan.

AG HCT-3.2: MINERAL EXPLORATION

UNIT I:

Gravity and Magnetic Methods

- Concept of scientific methods of exploration- Geophysical and Geochemical exploration
- Principles of Exploration Geophysics concept of Geophysical Anomaly – factors controlling Geophysical Anomalies
- Gravity method – Principles behind gravity method Relative measurement of earth gravity – Types of gravimeter – Field procedure corrections to gravity data – concept of Bouguer Anomaly - Generalized interpretation of Gravity data- salient case studies
- Magnetic Method Principles of magnetic method – main and anomalies magnetic field associated with the earth – concepts of total field intensity, intensity of magnetization and magnetic susceptibility measurement of magnetic field- Types of magnetometers – Magnetic anomalies and their interpretation – salient case studies. **(13 Hours)**

UNIT II:

Seismic and Electric Methods

- Seismic Method Principles of seismic method – Types of seismic waves, movement of seismic waves within subsurface – Seismic instruments and field procedures
- Seismic Reflection Method : Principles of reflection method – zero offset time – NMO-CDP and multiple coverage techniques
- Seismic Refraction Method Principles of refraction method single and multiplayer refraction measurement of seismic velocities and layer thickness
- Processing of seismic data – salient case studies
- Electric Method – Principles of electrical method – electrical properties of rocks
- Resistivity Method – factors controlling resistivity of rocks measurement of resistivity – Electrode configurations and field procedures – Interpretation of resistivity data – salient case studies
- Self potential method – origin of self potential instrumentation and field procedure – salient case studies. **(13 Hours)**

UNIT III:

Electrical Methods II and well logging

- Induced polarization method – electrolytic and electrode polarization – instruments and field procedure – salient case studies
- Electromagnetic Method – Principles – instruments – parallelline and Horizontal loop method-salient case studies

□□ Well logging – techniques – principles and instrumentation of electrical, radioactive, sonic, caliper logging techniques interpretation of logs (13 Hours)

UNIT IV:

Geochemical Methods

□□ Geochemical methods – Geochemical cycle – Dispersion patterns – Geobotanical indicators of minerals – surface and subsurface methods of sampling
□□ Geological Principles of ore search – Introduction to Assaying and valuation of mineral Deposits (13 Hours)

Books Recommended:

1. Geochemistry in mineral exploration Rose, A.W Hawkes. H.E & Webb J.S. 1979.
2. Principles of Geochemistry B.Mason John Wiley & Sons.
3. Principles of geochemical prospecting. Ginzburg. I.I. Petgamon Press, N.Y. London.
4. Biochemical methods of Prospecting - Malyuga, D.P.
5. Principles of Mining Geology, Arokiaswamy.
6. Geological prospecting and exploration – Kreiter, V.M.
7. Rock geochemistry in Mineral Exploration. G.J.S.Govett. Elsevier Publication. 1983.
8. Introduction to geophysical prospecting - Milton B Dobrin
9. Geophysical prospecting for oil – Nettleton L L
10. Exploration geophysics – Jakaosku J J
11. Outlines of geophysical prospecting - A manual for geologists – M B Ramachandra Rao
12. Geophysical Methods in Geology – P V Sharama
13. Applied Geophysics in search for minerals – Eve A S Keys
14. Geophysical Exploration – Heilava C H
15. Exploration Geophysics for geologist and Engineers – Bhimasanakaran and Gaur
16. Mining Geophysics – D S Paransis
17. Principles of Applied Geophysics – D S Paransis
18. Introduction to Geophysics – C H Howel

AG HCT-3.3: HYDROGEOLOGY

Unit – I

Groundwater: Origin, types, importance and occurrence, Hydrologic cycle. Hydrologic properties of rocks – Porosity, Permeability, Specific Yield, Specific Retention, Hydraulic Conductivity, Transmissivity, Storage Coefficient; Aquifer types; Subsurface distribution of groundwater; Groundwater occurrence in the different geological formations. (13 Hours)

Unit – II

Groundwater movement, Darcy's law and its applications, Determination of Permeability in laboratory and in field: Well hydraulics: Confined, Unconfined, Steady, Unsteady and radial flow, water level fluctuations, Types of wells, drilling methods. **(13 Hours)**

Unit – III

Groundwater Quality: Physical, Chemical and bacteriological parameters; Quality criteria for groundwater use, graphical presentation of water quality data, Saline Water intrusion in coastal aquifers problem of arsenic and fluoride. **(13 Hours)**

Unit – IV

Groundwater Exploration: Geophysical and geological methods of groundwater exploration, Remote Sensing techniques and Radio isotopes in hydrogeological studies. Artificial recharge of groundwater, consumptive and conjunctive use of surface and groundwater; Groundwater budgeting and basin management. Ground water provinces of India. **(13 Hours)**

Books Recommended:

1. Todd, D.K., (1987), Ground water hydrology, John Wiley & Sons, New York.
2. Davies, S.N. and De Wiest, R.J.M., (1966) Hydrogeology, John Wiley & Sons, New York
3. Karanth, K.R., Hydrogeology. Tata McGrawHill Publ., New Delhi.
4. Karanth, K.A. (1997) Ground water assessment, development and management, Tata McGrawHill Publ., New Delhi

AH SCT-3.4: INDIAN MINERAL DEPOSITS

UNIT I:

Study of important metallic and non-metallic deposits of India with reference to Geology, Mode of occurrence, Mineralogy and Indian distribution of the following:- **Metallic deposits:** Iron, Manganese, Copper, Lead, Zinc, Gold, Silver and Aluminum. **Non metallic deposits:** Asbestos, Barites, Magnesite, Mica, Clay, Phosphorite, Sillimanite, Kyanite and Andalusite. **(13 Hours)**

UNIT II:

Minerals used for chemical Industry- mineralogy, genesis, uses, distribution of Sulphur and Pyrite, Baryte, Fluorspar in India. Minerals used for Ceramic Industry: mineralogy, genesis, uses, distribution of Gypsum, Talc, Steatite and Soapstone and Clay in India.

Minerals used for Fertilizer industries: mineralogy, genesis, use and distribution of Rock phosphates and phosphorites, Gypsum, Apatite. **(13 Hours)**

UNIT-III

Petroleum – Composition, Origin, Occurrence, Migration and Accumulation of Hydrocarbons; Petroleum traps; Reservoir rocks, conditions & mechanisms. Petroleum exploration - Geological, geophysical and geochemical methods of petroleum exploration; Drilling rigs, Drill holes, Different methods of drilling, Coring; Casing and Cementation and Drilling fluids; Functions of Petroleum Geologist; Formation evaluation: - (a) Geo-Logging and (b) well logs (Electric, Radioactive and Acoustic); Well Completion and Stimulation. **(13 Hours)**

UNIT- IV

Sedimentary Basin; An outline of the oil belts of the world; Case studies of important Onshore and Offshore petroliferous basins of India Origin of peat, lignite, bitumen and anthracite; Classification, Ranks and Grading of coal; Coal Bed Methane (CBM) – An unconventional petroleum system; Coal petrology and Coal measures of India; Coal exploration techniques. **(13 Hours)**

Books Recommended:

1. Geology of Mineral Deposits – Smirnor U.J.
2. The Ore Minerals and their intergrowths – Raibor
3. India's Mineral resources – Krishna Swamy S.
4. Metallic and Industrial Minerals Lamey Carl.A.
5. Introduction to India's Economic Minerals – Sharma.N.L. and Ram K.S.
6. A treatise an Industrial Minerals of India - Sinha R.L.
7. Non Fuel Mineral Deposits of India – Mukarjee 1999 – Allied publications.
8. Minerals in world affairs - Lovering
9. Minerals in worlds and Industry – Vorkii
10. Mineral Economics – Sinha R.K. and Sharma N.L. Oxford I.B.H. Publication co.,
11. Concerning Mineral Sesouran – Allen
12. An introduction to Mineral Economics by K.K.Chatterjee New Age International Ltd., 2004.
13. Granite Industry: Emerging Trends and Developments by N.C. Ghose, A.N. Trivedy and S.N.Virhave 2000.

AG SCT- 3.5: SEDIMENTOLOGY

Unit I: Earth Surface System: Liberation and flux of sediments, Physical, Chemical and Biological processes. Sedimentary structures and textures. Classification of Sedimentary Rocks; Sedimentation and tectonics. **(13 Hours)**

Unit II: Sedimentary environments and facies. Continental alluvial-fluvial, lacustrine, desert-aeolian and glacial sedimentary systems. Shallow coastal clastics. Marine and continental evaporites. Shallow water carbonates. Deep sea basins. Volcanoclastic: on-land and marine. Palaeocurrents and basin analysis. Concept of sedimentary facies; basic principles of palaeoenvironment and palaeoclimate analyses. **(13 Hours)**

Unit III:

Application of trace element, rare-earth element and stable isotope geochemistry to sedimentological problems. **(13 Hours)**

Unit IV: Provenance and Diagenesis of terrigenous and chemical sediments. Diagenesis of mudstones, sandstones, and carbonate rocks: changes in mineralogy, fabric and chemistry. Descriptive study of Common Sedimentary Rocks – Conglomerate, Breccia, Sandstone, Shale, Limestone, Laterite **(13 Hours)**

Books Recommended:

1. Sedimentary Petrology: Petti John CBS Publ.
2. Principles of Sedimentation: Twenhofel
3. Procedures of Sedimentary Petrology: R.E. Carver.
4. Introduction to Sedimentology : S.M. Sena Gupta, Oxford IBH.
5. Principles of Sedimentary Basin Analysis: Miall, A.D. Springer Verlag, 2000.
6. Analysis of Sedimentary Successions: Bhattacharya, A & Chakraborti, C. Oxford IBH 2000.
7. Petrography : William Turner & Martin Frey, CBS Public.
8. Sedimentary Rocks: Pettijohn F.J., Harper & Row 1975
9. Principles of Sedimentary Basin Analysis: G.M. Freeman & Others, John Wiley 1978.
10. Methods of Sedimentary Petrology: Garmon Muller, Hafner Public.

AG OET-3.1: ENVIRONMENTAL GEOLOGY

UNIT I:

Principles of environmental geology; spectrum of environment, ecological perspective of environment; Land and its use, land desertification and land degradation and land management.

(13 Hours)

UNIT II:

Soil profile, origin of soil, classification of soils, soil types of India, and soil conservation; Soil degradation due to irrigation, use of fertilizers and pesticides; Water resources – hydrological considerations, problems and management. **(13 Hours)**

UNIT III:

Environmental management in mining, Impacts of mining activities on the environment, erosion, causes and control. **(13 Hours)**

UNIT IV:

Geoenvironmental hazards – volcanoes, earthquakes, floods, landslides, coastal hazards. Pollution and energy – Global warming, water contamination, waste disposal, alternate sources of energy. **(13 Hours)**

Reference Books:

1. Valdiya, K.S. 1987, Environmental Geology – Indian Context, TATA-McGraw Hill, New Delhi
2. Keller, E.A. 1978, Environmental Geology- Bell and Howell, USA
3. Subramanian, V, 2001, Text book of Environmental Science, Narosa Publication, New Delhi.
4. ChennaKesavulu, N. Text book of Engineering Geology, McMillan India Ltd. New Delhi

AG OET-3.2: EARTH SCIENCE:

UNIT I:

Origin of the Earth. Four subsystems of the Earth : lithosphere, biosphere, atmosphere, hydrosphere, Uniformitarianism. Importance of Earth science. Materials of Lithosphere.

(13 Hours)

UNIT II:

Rock cycle, Igneous rocks, Sedimentary rocks and Metamorphic rocks. Resources from rocks and minerals **(13 Hours)**

UNIT III:

Weathering: Definition, Mechanical and Chemical weathering. Rates of weathering, Soil formations, Soil types and erosion. **(13 Hours)**

UNIT IV:

Hydrologic cycle, Running Water: Work of streams, stream valleys and floods. Drainage basins and pattern. Groundwater: Distribution and movement of groundwater, Hot springs, Geysers

(13 Hours)

Books Recommended:

01. Principles of Physical Geology: A Holmes, Nelson, London 1965
02. Basic concepts of physical Geology: E.W.Spencer, Oxford & I.B. 1971.
03. Physical Geology: Strahler Wiley & Sons.1974.
04. Dynamic Earth:H.Leep, Mc Graw Hill 1973
05. Changing Earth: B.Meers Rein hold N.Y.1973.
06. The Dynamic Earth System: A.M.Patvardhan, Prentice Hall of India Pvt.Ltd., 1999.
07. Plate Tectonics & Crustal Evolution: K.C.Condie, Pergamon Press, 1986.
08. Palaeomagnetism & Plate tectonics:M.M.Mc.Elhimony, Cambridge Univ. Press.
09. Understanding Earth by Traak Press, Raymond Seiver Treeman & Co.,
10. Tectonics by E.M.Moores, R.J.Twiss, Freeman & Co.,

AG HCP-3.6: ORES & ORE MICROSCOPY LAB

Megascopic and microscopic identification of important ore minerals.Study of typical structures / textures and their genetic significance.

Microscopic studies of ores-Important texture, Reflectance, Bireflectance, Microhardness and etch test.

AG HCP-3.7: HYDROGEOLOGY AND GEOSTATISTICS LAB

HYDROLOGY

Morphometric analysis of basins, Calculation of mean areal annual Rainfall, Preparation of water table contours and their interpretation. Study of Depth and yield of bore wells. Analyses of water samples and their interpretation. Ground water exploration by different Geophysical methods.

GEOSTATISTICS

1. Frequency distribution table and graphical representation of data
2. Measures of Central Tendency
3. Measures of Dispersion
4. Correlation studies – simple and bivariate
5. Regression Analysis

IV SEMESTER

AG HCT-4.1: MINING AND MINERAL ECONOMICS

MINING METHODS

UNIT I:

Mining terminology, methods of mining, open cast, underground and alluvial mining. Mining of metalliferous ore deposits. Factors affecting mine layout, surface mining, Mining Machinery, Basic operations of Large open-pit mine. Methods of stopping, shaft sinking. Mine support and ventilation. Blasting and explosives. Coal mining methods. **(13 Hours)**

UNIT II:

Methods and types of drilling and their uses in mineral exploration. Diamond drilling, calyx drilling, cable tool drilling, churn drilling. specification of drilling methods in various geological formation and in different mineral exploration programme. Sampling of drill-core. Logging and storage of cores, Interpretation and analysis of drill core data. **(13 Hours)**

MINERAL ECONOMICS

UNIT III:

Introduction and concepts. Peculiarities in mineral deposits. Concepts in mineral exploration and mineral resource estimation. Classification of Indian mineral resources. Role of mineral industry in national economy. Strategic, critical and essential minerals. India's status in mineral production. **(13 Hours)**

UNIT IV:

Changing patterns of mineral consumption. National Mineral Policy. Mineral Concession Rules. Mineral legislation in India. Mineral production, processing, coproducts and byproducts. Mineral inventory. Consumption and substitution of minerals. Demand Analysis and market survey. Mineral conservation and environment. Mineral information system. Marine mineral resources and Law of Sea **(13 Hours)**

Books Recommended:

1. Elements of Mining Geology - Young
2. Elements of Mining - Lewis
3. Mining of mineral deposits - Shevyekov
4. Introduction of mining - stoces
5. Principles of Mining Geology, Arogyaswamy..

AG HCT-4.2: REMOTE SENSING AND COMPUTER APPLICATION IN GEOLOGY

REMOTE SENSING

UNIT-I:

Introduction to Remote sensing: History and basic concepts. Advantages of Remote sensing, aerial conventional ground surveys. History of space energy. Geostationary and Sun synchronous satellites. Sensors and its resolutions of Land sat, Spot and IRS series. Development of Remote sensing in India. **(13 Hours)**

UNIT-II:

Physics of Remote sensing: Electromagnetic energy, Electromagnetic radiation, interaction of Electromagnetic radiation with atmosphere and Electromagnetic radiation with the earth surface. Atmospheric windows and spectral regions useful for Remote sensing.

Data Acquisition: Platforms- Terrestrial, aerial and space borne. Sensors- passive sensors, photographic cameras, Vidicon television camera, multispectral scanners and microwave radiometer Radar altimeter and scatarometer. Active sensors- Radar and Lidar **(13 Hours)**

UNIT-III:

Multispectral Remote sensing: Multispectral photography and multispectral scanning. Remote sensing in solar optical region- basic characteristics and its interpretation.

Remote sensing in thermal infrared region: Basic concepts and its characteristics. Geological interpretation of thermal imagery. Advantages of thermal imagery.

Microwave Remote sensing: Basic concepts, characteristics of radar imagery. Radar geometry and resolutions and data acquisition. Advantages and disadvantages of Radar imagery.

Interpretation of lithology, structure, landforms, land use and land patterns using satellite imagery. **(13 Hours)**

COMPUTER APPLICATION IN GEOLOGY:

UNIT-IV: Application of MS Office for geological report generation. Computer applications for statistical problems in Geology, Calculation of mineral formula using Microsoft excel program, Abcissa-ordinate and Trilinear plots using Origin and Tridraw programs, Petrochemical calculations using IGPET / GDP-Pet programs. **(13 Hours)**

Books Recommended:

1. Remote Sensing principles and interpretation, by Sanfrancisco. Sabins, F.F.jr 1978.
2. Remote Sensing and Image Interpretation Lillis and, T.M. and P.W. Kiefer, 1986.
3. Remote Sensing Geology by R.P. Gupta, 1991.
4. Principles of Remote Sensing Curran, Longman.
5. Applied Remote Sensing, Lo.C.P. 1986 Longman.
6. Introduction to Remote Sensing of the Environment, B.F.jr.(Ed), 1978. Kendall/Hunt, Dubuque, Iowa.
7. A Guide to Remote Sensing-interpreting images of Earth Drury S.A.1990. Oxford Science Publications, Oxford.

AG SCT - 4.3; ENGINEERING GEOLOGY

UNIT I:

Engineering properties of rocks, soils like specific gravity, porosity, permeability, compressive strength, hardness, toughness, percentage of wear, tensile strength, modules of elasticity, modules of compression and residual stress and their importance in construction of civil engineering structures. Definition of quarrying of rocks, site for quarry, methods of quarrying – quarrying with hand tools, quarrying with channeling machine, quarrying by blasting, precautions in blasting. **(13 Hours)**

UNIT II:

Neotectonism, seismic hazards and damage assessment, seismic problems of India, Earthquake resisting structures, Classification, causes of landslides, controls of landslides subsidence and its importance, site selection for ghat roads. Detection of causative factors for soil erosion, soil conservative measures. Determination of magnitude measurement and location of epicenter and focus. **(13 Hours)**

UNIT III:

Definition and parts of dam, types of dams, geotechnical considerations in selection of dam sites, case histories – NagarjunaSagar Dam and Srisaillam Dam, characters for investigating relative suitability, geological consideration for reservoir sites. Types of tunnels, objects of geological investigations, methods of investigation, geological considerations in tunnels, types of bridges, Geology for bridge sites, problems of constructing civil engineering structures in areas prone to landslides, faulting, earthquake and coastal erosion. **(13 Hours)**

UNIT IV:

Application of Remote Sensing and GIS in river valley projects: dams and reservoirs, site suitability evaluation (lithological, structural, geomorphological considerations). Application of Remote Sensing and GIS in Seismic hazards, Landslides Ghat roads- bridges, culverts, route location (highway and rail roads) canal and pipeline alignments, tunnel constructions. Site suitability evaluation (lithological, structural, geomorphological, slope, gradient, economic considerations). **(13 Hours)**

Books Recommended:

1. Engineering materials by S.C. Rangwala
2. Text book of Engineering Geology by N.Chennakesavulu.
3. Principles of Engineering Geology and Geotectonics by D.P.Krynine and Judd, W.R.
4. Engineering Geology by B.S.SathyaNarayanaswamy
5. Principles of Engineering Geology by K.V.G.K.Gokhele
6. Engineering and General geology by Parbin Singh.
7. Remote Sensing and Image Interpretation, Lillesand, T.M., Keifer, R.W.,
8. Remote Sensing Principles and interpretation, SabinsF.F.,
9. Remote Sensing Geology, Singh, R.P.,
10. Image Interpretation Geology, Drury, S.A.,
11. Engineering Geology by D.Venkat Reddy

AG SCT-4.4: ENVIRONMENTAL GEOLOGY

UNIT I:

Principles of environmental geology; spectrum of environment, ecological perspective of environment; Land and its use, land desertification and land degradation and land management.

(13 Hours)

UNIT II:

Soil profile, origin of soil, classification of soils, soil types of India, and soil conservation; Soil degradation due to irrigation, use of fertilizers and pesticides; Water resources – hydrological considerations, problems and management. **(13 Hours)**

UNIT III:

Environmental management in mining, Impacts of mining activities on the environment, erosion, causes and control. **(13 Hours)**

UNIT IV:

Geoenvironmental hazards – volcanoes, earthquakes, floods, landslides, coastal hazards. Pollution and energy – Global warming, water contamination, waste disposal, alternate sources of energy. **(13 Hours)**

Reference Books:

1. Valdiya, K.S. 1987, Environmental Geology – Indian Context, TATA-McGraw Hill, New Delhi
2. Keller, E.A. 1978, Environmental Geology- Bell and Howell, USA
3. Subramanian, V, 2001, Text book of Environmental Science, Narosa Publication, New Delhi.

AG HCP-4.5: REMOTE SENSING

Equipments used in Photogeology and Remote Sensing. Stereoscopic study of aerial photographs. Interpretation of aerial Photographs, (Geomorphological, structural and lithological). Study of Satellite Imageries and their Visual Interpretation ((Geomorphological, structural and lithological)

AG HCP-4.6: COMPUTER APPLICATION IN GEOLOGY

Application of MS Office for geological report generation. Computer applications for statistical problems in Geology, Calculation of mineral formula using Microsoft excel program, Abcissa-ordinate and Trilinear plots using Origin and Tridraw programs, Petrochemical calculations using IGPET / GDP-Pet programs.

AG HCT-4.7: PROJECT WORK

